Application of Primary Health Care Principles in National or Large-Scale Community Health Worker Programs in Low- and Middle-Income Countries

SHAGUFTA PERVEEN
MBBS, MSc Health Policy and Management

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

School of Public Health

Faculty of Health and Medical Sciences

The University of Adelaide

Australia

November 2022

Application of Primary Health Care Principles in National or Large-Scale Community Health Worker Programs in Low- and Middle-Income Countries

Shagufta Perveen

School of Public Health

The University of Adelaide

Supervisory Panel

Prof. Caroline Laurence
Principal Supervisor
School of Public Health
The University of Adelaide

Dr Mohammad Afzal Mahmood
Co-Supervisor
School of Public Health
The University of Adelaide

Table of Contents

List of Tables

List of Abbreviations

AIM	Assessment and Improvement Matrix
ASHA	Accredited Social Health Activist
CHIS	Community health information system
CHW	Community health worker
CHWP	Community health worker program
CIP	Common Indicators Project
GHWA	Global Health Workforce Alliance
HEP	Health Extension Program
HFA	Health for All
HIV/AIDS	Human Immunodeficiency Virus//Acquired Immunodeficiency Syndrome
IMR	Infant mortality rate
LMICs	Low- and middle-income countries
MCH	Maternal and child health
MDGs	Millennium Development Goals
MIS	Management information system
NGO	Non-government organisation
NPFPPHC	National Program for Family Planning and Primary Health Care
PHC	Primary health care
PHCPI	Primary health care performance initiative
PRISMA-ScR	Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews
SDG	Sustainable Development Goals
TB	Tuberculosis
UHC	Universal health coverage
USAID	United Sates Agency for International Development
VHG	Village Health Guide
WHO	World Health Organization

Abstract

Introduction

Primary health care (PHC) has led to improved health outcomes across a wide variety of settings in the past four decades. In low- and middle-income countries (LMICs), community health worker programs (CHWPs) are an essential aspect of the PHC strategy to achieve 'Health for All' and the Sustainable Development Goals. As part of the PHC approach, national CHWPs were envisioned as a strategy to implement the Alma-Ata Declaration in order to reach wider populations in LMICs and serve the unmet health care needs of village communities. Established under the PHC approach, national CHWPs were expected to encompass and promote the principles of PHC and, in doing so, achieve improvements in health outcomes.

National CHWPs, as vehicles to incorporate PHC principles into health care provision, have contributed to reducing the under-five child mortality rate in various LMICs, including Brazil, Indonesia and Nepal. This demonstrates the clear link and need to incorporate PHC principles when implementing national CHWPs, and that the long-term success of these programs is rooted in the application of PHC principles. Therefore, the aim of this thesis is to investigate the application of PHC principles in national CHWPs and generate evidence to guide their application in these programs. This research maps the evidence of the application of PHC principles in national CHWPs in LMICs, identifies a core set of Indicator-Activities to reflect the implementation of PHC principles, and assesses the utility of these identified activities in CHWPs.

Methods

This thesis incorporates three studies, which are outlined below:

Study 1: Although the PHC principles are evident in the program design and policies of the CHWPs in various countries, there is little evidence of the extent to which PHC principles are systematically applied across the national CHWPs beyond program design and policy. Therefore, the initial study—a systematic scoping review—aimed to review the application of four PHC principles (universal health coverage, community participation, intersectoral coordination and appropriateness) in the CHWPs' objectives, implementation and stated outcomes, and to understand their contribution to the outcomes of those programs.

Study 2: This study aimed to determine the relative importance of PHC principles and to identify a set of core Indicator-Activities that reflect the application of different PHC principles in national or large-scale CHWPs in LMICs. Through a Delphi survey involving a range of participants with experience and expertise in CHWP planning, implementation and evaluation in LMICs, a set of 29 Indicator-Activities was identified for the application of PHC principles in these programs.

Study 3: Following on from the Delphi survey to identify Indicator-Activities, the third study aimed to assess the utility of these PHC Indicator-Activities for CHWPs in LMICs. The study included two national CHWPs from Pakistan and Ethiopia. A desk review of the CHWPs' publicly available documents, including case studies, evaluation reports, program planning documents, policy briefs and working papers, was conducted using the READ approach. A data extraction form was developed using the PHC Indicator-Activities to collect information on each Indicator-Activity for the application of four PHC principles and their sub-attributes.

Results

Study 1, the scoping review, included 26 studies published between 1983 and 2019 and covered 14 CHWPs from 13 LMICs. 'Universal health coverage' and 'community participation' were the two commonly reported PHC principles. Similarly, the cultural acceptability aspect of the principle of 'appropriateness' was present in all CHWPs because these programs select CHWs from within the communities. Evidence for the principle of 'intersectoral coordination' was generally missing, along with effectiveness of CHWPs. The review found that the PHC principles were not uniformly applied in national CHWPs. For comprehensiveness and improved health outcomes, these 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 CHWPs in LMICs. Improved documentation of CHWP implementation in published peer-reviewed literature is also needed.

In Study 2, 17 participants from 15 countries participated in the Delphi exercise. Based on participants' responses for the activities that reached consensus, a set of 29 Indicator-Activities for the four PHC principles and their sub-attributes was developed with examples of types of activities for each Indicator-Activity. In the presence of other important and useful tools to measure the programmatic inputs and functionality of

CHWPs, the Indicator-Activities developed can provide guidance on how PHC principles can be applied in the CHWPs. The next step will be to assess the utility of these Indicator-Activities.

Study 3, the document analysis, included 20 documents from two national CHWPs. Strong evidence was found for 22 out of 29 Indicator-Activities, partial evidence was found for four Indicator-Activities and no evidence was found for two Indicator-Activities. One activity was found to be overlapping with the Indicator-Activity of 'joint ownership and design of the CHWP' so it was merged with it. The findings confirmed that the PHC Indicator-Activities identified are likely to be applicable to the CHWPs in LMICs. Future research may focus on assessing the Indicator-Activities in the field and applying them to a broader range of CHWPs.

Conclusion

Given the resurgence of interest in PHC in recent years, there is an opportunity to design, implement and evaluate CHWPs based on the principles of PHC. This thesis identified a lack of uniformity in the application of PHC principles in national CHWPs. While the PHC principles were found to still be important in improving CHWPs' performance and contributing to better health outcomes, there was no tool to facilitate the application of these principles. The set of Indicator-Activities that was developed fills this gap and can be used to assess the application of PHC principles that can inform CHWP designing and monitoring in the context of LMICs.

Strengths of the Research

This thesis employed interrelated study designs with strong methodologies that add to the existing knowledge through a systematic review of the literature (scoping review), expert opinion (Delphi survey) and CHWP review (document analysis). The information was triangulated across these three studies to understand the application of PHC principles in CHWPs and develop a potential tool to facilitate the systematic application of these principles.

Contributions of This Thesis to Existing Body of Knowledge

The tool developed as an outcome of this research adds to the existing body of knowledge by providing a method to assess the application of PHC principles in CHWPs and strengthening the measures already available to assess CHWPs' performance. In addition,

this research reiterates the importance of PHC principles through a systematic approach and a set of comprehensive research methods.

Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

The author acknowledges that the copyright of published works contained within the thesis resides with the copyright holder(s) of those works.

I give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library Search, and also through web search engines, unless permission has been granted by the University to restrict access for a period of time.

Name: Shagufta Perveen

Signature:

Date: 23 August, 2022

Acknowledgments

In the name of ‘ALLAH’, the most beneficent and merciful who gave me the courage and wisdom to complete this doctoral research.

I would like to express my deepest gratitude and special thanks to my supervisors, Prof. Caroline Laurence and Dr Afzal Mahmood, for their invaluable guidance, counselling and continuous encouragement throughout my thesis work. My sincere acknowledgement and deep appreciation are extended to them for their understanding, dedication and patience throughout my candidature, and for having trust in me! Their technical input and expert comments have always helped me proceed in the right direction. I have learnt a lot from both of them and I will always remember this experience of learning.

Special thanks and appreciation is due to Jaklin Elliot for her kind help and moral support throughout my PhD as a Postgraduate Coordinator. Paul Carter and Isabel Mason have always been there to provide IT and administrative support and guidance.

I am thankful to all HDR colleagues for their incessant and humble support during this educational journey, especially Blesson, Hira, Lareesa, Mah Laka, Mumtaz, Sana and Yonatal. Special thanks to Yonatal for helping me connect to the community health worker program officials in Ethiopia to recruit the Delphi exercise participants and obtain program documents.

I greatly acknowledge the participants of the Delphi exercise for their valuable time and input to develop the list of Indicator-Activities that can facilitate the application of PHC principles in community health worker programs.

Sincere gratitude goes to my family and friends, whose love, support and trust in me is the source of illumination and encouragement for me to move forward in life especially my older brother Naeemuddin who has been truly instrumental behind my success throughout my educational journey. I would like to acknowledge Javeria, Munazza and Muneera with their families and Asma, Shireen and Umama for providing unconditional support during my stay in Adelaide and during all the health challenges I faced. Their immense support made me feel at home, especially when I was not able to meet my family even once because of the pandemic.

I acknowledge Ms Kylie Lowe AE for editing my thesis according to the Australian Standards for Editing Practice (ASEP—Standard D, Language & Illustration and Standard E, Completeness and Consistency) for submission.

Last, but not least, I would like to acknowledge the Beacon of Enlightenment Scholarship, the Adelaide Scholarship International (ASI) at the University of Adelaide for my PhD scholarship grant, as well as the Neville Derrington Hicks PhD Scholarship in Public Health Policy 2022 award, which helped me during my studies.

Dedication

In dedication to my six-year-old son **Ashras Khan** for being with me as a spark throughout this journey to complete my PhD in Adelaide. He is the reason for bringing a smile to my face. We passed through the times of stress together, and his cooperation and understanding were very impressive and extraordinary at his age!

Effect of COVID-19 on This Research

As a result of the COVID-19 pandemic and international border restrictions for outbound travel from Australia, several elements of this thesis had to be adjusted from the originally intended study design and aims.

First, Study 2 of this thesis experienced delays in receiving responses from the Delphi participants. Some participants reported being infected with COVID-19, and others were extremely busy taking part in preparations for responding to the pandemic.

Second, Study 3 was originally intended to evaluate community health worker programs on site in Pakistan and Ethiopia in order to assess the applicability of primary health care Indicator-Activities developed as an outcome of Study 2 via the Delphi exercise. However, because of the effects of COVID-19 and outbound international travel restrictions in Australia, it was not possible to access these countries. Instead, the aim of Study 3 was adjusted to assess the applicability of Indicator-Activities via document analysis.

Third, as a result of the significant disruptions caused by the COVID-19 pandemic, we experienced significant delays of up to one year in receiving reviewers' comments on the submitted publications.

Journal Articles Reporting This Thesis

1. **Perveen S**, Mahmood MA, Lassi ZS, Perry HB, Laurence C. Application of primary health care principles in national community health worker programs in low- and middle-income countries: a scoping review protocol. JBI Evid Synth. 2021 Jan; 19(1):270–283. https://doi.org/10.11124/jbisrir-d-19-00315

2. **Perveen S**, Lassi ZS, Mahmood MA, Perry HB, Laurence C. Application of primary healthcare principles in national community health worker programs in low-income and middle-income countries: a scoping review. BMJ Open 2022 Feb. https://bmjopen.bmj.com/content/12/2/e051940

3. **Perveen S**, Laurence C, Mahmood MA. Indicator-Activities to apply primary health care principles in national or large-scale community health worker programs: a Delphi exercise. BMC Public Health 2022 Aug. https://doi.org/10.1186/s12889-022-13996-y

4. **Perveen S**, Mahmood MA, Laurence C. Assessing the utility of primary health care Indicator-Activities in the context of low- and middle-income countries: a document analysis. *Submitted to Journal of Primary Care and Community Health*.

Conference Presentations from This Thesis

- **Perveen S**, et al. (Nov 2022). Assessing the utility of PHC Indicator-Activities in low-income and middle-income countries: document analysis. *[Abstract accepted for Poster Presentation]*. 15th European Public Health Conference, Berlin, Germany

- **Perveen S**, et al. (Nov 2022). Indicator-Activities to apply primary health care principles in national or large-scale community health worker programs: a Delphi exercise. *[Abstract accepted for Oral Presentation]*. 15th European Public Health Conference, Berlin, Germany

- **Perveen S**, et al. (Nov 2021). Indicator-activities to apply primary health care principles in national or large-scale community health worker programs: a Delphi exercise. *[Poster Presentation]*. Implementation Science Health Conference, Sydney, Australia

- **Perveen S**, et al. (Sep 2021). Indicator-activities to apply primary health care principles in national or large-scale community health worker programs: a Delphi exercise. *[Poster Presentation]*. Florey Postgraduate Research Conference, Faculty of Health and Medical Sciences, University of Adelaide, Adelaide, Australia

- **Perveen S**, et al. (Mar 2021). Application of primary healthcare principles in national community health worker programs in low-income and middle-income countries: a scoping review. *[Poster Presentation]*. Consortium of Universities for Global Health Conference [Main theme: Addressing Critical Gaps in Global Health and Development]

- **Perveen S**, et al. (Sep 2020). Application of primary healthcare principles in national community health worker programs in low-income and middle-income countries: a scoping review. *[Poster Presentation]*. Florey Postgraduate Research Conference, Faculty of Health and Medical Sciences, University of Adelaide, Adelaide, Australia

Chapter 1

Chapter 1: Introduction

1.1 Background

For many decades, primary health care (PHC) has been at the centre of efforts to improve health globally, and particularly for disadvantaged population groups, by strengthening health systems and public health measures.[1, 2] PHC is a holistic approach that includes the spectrum of health promotion, disease prevention, clinical care, rehabilitation and palliative services in the community.[3] It includes the key elements needed to improve health security through a focus on community engagement, preventive collective action, access to quality medicines, appropriate prescribing, and a core set of essential public health functions such as surveillance and responsiveness.[3] Such health system and public health strengthening based on PHC is achieved through community-based services and building resilience in the community.

PHC's emphasis on community-based services is an important way to ensure access to care for rural and remote and disadvantaged populations. The health systems in many low- and middle-income countries (LMICs) are fragile and not adequately resourced, which limits their capacity to reach out to the whole population. The Alma-Ata Declaration proposed the development of national community health worker programs (CHWPs) as an important strategy to promote PHC and reach wider populations to address essential health needs in order to achieve better health outcomes.[4] The vision for national CHWPs after the Alma-Ata Declaration was to serve the unmet preventive, curative and promotive needs of communities.[4] As a result, CHWPs became a core strategy to implement the PHC approach in LMICs in order to contribute to improved health outcomes. These programs, established under the PHC approach, were expected to encompass and promote the principles of PHC and, in doing so, achieve improvements in health outcomes.[4]

Over decades of implementation, CHWPs have faced various challenges, such as inadequate training and insufficient salaries for CHWs, lack of supervision and logistical support for supplies and medicines, and lack of acceptance and evidence of effectiveness.[5] The lack of PHC integration into health systems has been identified as one of the main limits to CHWPs' efficacy in LMICs.[6] Moreover, there has been little effort to assess whether CHWPs have incorporated PHC principles. Therefore, the aim of this thesis is to investigate the application of PHC principles in CHWPs and generate evidence to guide

their application in these programs, which can then be used to develop a tool to assess whether a program's activities reflect the application of the principles. This research maps the evidence of the application of PHC principles in national CHWPs in LMICs, identifies a core set of Indicator-Activities to reflect the implementation of PHC principles, and assesses the utility of these identified activities in CHWPs.

1.2 Thesis Outline

This thesis is presented in publication format (with articles either published in journals or currently submitted/under review) and consists of seven chapters.

This chapter (Chapter 1) provides an introduction and overview of the thesis.

Chapter 2 presents a review of the literature on PHC as an approach for strengthening health systems, followed by a description of PHC principles and the significance and continuing relevance of PHC in the contemporary context. A description of the scope and emergence of CHWPs is then presented, followed by the importance of applying PHC principles in these programs. Chapter 2 also discusses the gaps in the evidence, as well as the research aims of this thesis.

Chapter 3 describes the study setting, design and methods used to address the overall aim of this thesis. Further, it presents the conceptual framework, based on the principles of PHC, underpinning this thesis. An overarching description of the methods for each study is presented, along with a description and justification of the use of mixed methods for this research, and how the studies are linked to address the research questions.

Chapter 4 presents the detailed methods and findings from Study 1 of this thesis, which conducted a systematic scoping review on the application of four PHC principles (universal health coverage [UHC], community participation, intersectoral coordination and appropriateness) in the objectives, implementation and stated outcomes of national CHWPs.

Chapter 5 presents the detailed methods and findings from Study 2 (the Delphi exercise) of this thesis. This study aimed to determine the relevance of PHC principles and identify a set of core Indicator-Activities that reflect the application of different PHC principles in CHWPs. The study involved a range of participants with experience and expertise in CHWP planning, implementation and evaluation in LMICs.

Chapter 6 presents the detailed methods and findings from the third and final study of this thesis, a document analysis. The third study aimed to assess the utility of the set of Indicator-Activities developed in Study 2 for national or large-scale CHWPs in LMICs. The study included two exemplar CHWPs from Pakistan and Ethiopia. A desk review was conducted of the CHWPs' publicly available documents, including program reports and evaluations, program planning documents and other documents available through CHWP officials.

Chapter 7, the final chapter, presents the key findings, the significance of this thesis in relation to the existing body of knowledge, and the potential uses of the tool developed as an outcome of this research. It also outlines the strengths and limitations of this thesis and implications for future research.

Chapter 2

'PHC brings promotion and prevention, cure and care together in a safe, effective and socially productive way at the interface between the population and the health system.'[7]

Chapter 2: Literature Review

This chapter presents:

1. PHC as an approach to strengthen health systems
2. CHWPs as a strategy to implement PHC: types, history, scope, benefits and challenges
3. significance of applying PHC principles in CHWPs
4. limited evidence and the knowledge gap in applying these principles in CHWPs
5. research aims for each study in this thesis

2.1 Primary Health Care as an Approach to Strengthen Health Systems

PHC is widely recognised as the key to high-performing health systems.[8] The main goal of PHC as an approach is to organise health systems to achieve the best possible level of health for a population while maximising equity. Therefore, PHC-oriented health systems are composed of a core set of structural and functional elements that support achieving universal coverage and access that are acceptable to the population and equity-enhancing.[3]

2.1.1 Overview

The earliest use of the term 'primary health care' (as a way to strengthen health systems) has been ascribed to Lord Bertrand Dawson of Penn, who chaired the commission for the Dawson Report in 1920.[9, 10] The commission first identified 'primary care' as the most basic level of a structured health system (akin to primary or elementary education) that is concerned with caring for simple, common problems in outpatient settings, and proposed three hierarchical levels of care locations (primary, secondary and tertiary).[9] More comprehensive approaches to reaching the entire population beyond facilities emerged in the 1930s with the development of the Ding Xiang project to train 'farmer scholars' in China.[11] Since then, a number of countries have introduced models of primary care.[9, 10, 12] Sydney Kark and Jack Geiger introduced models of community-oriented primary care in South Africa and the United States during the 1940s to 1960s.[9] Iran initiated the Behdar training project in 1942, followed in 1972 by the West Azerbaijan Project and the Village Behdar Training Scheme.[10] These early initiatives formed the basis of Iran's current rural national PHC system.[10] The foundations for PHC in India were laid by the Bhore Committee in 1943, which submitted its report in 1946 and called for the development of

primary health centres.[12] The Christian Medical Commission, which was established in 1968 in Geneva, began to explore the concept of PHC, which led to high-level discussions between the Christian Medical Commission and the World Health Organisation (WHO).[10] One of the outcomes of this dialogue was an influential book titled *Health by the People*, which was published in 1975 and provided the inspiration for the International Conference on PHC.[10] PHC as an approach to organise healthcare was endorsed by the member states at the World Health Assembly in 1977 and the subsequent international conference in 1978 held in Alma-Ata with the slogan of 'Health for All' (HFA). With representatives from 134 governments and 67 international organisations, this was the largest and most representative global health conference up to that time, and where the concept of PHC that was relevant to LMICs was fully developed and embraced.[10] The following excerpt from the Declaration of Alma-Ata defines PHC as an approach to organise health systems in an integrated and comprehensive manner:[13]

> *Primary Health Care is essential health care based on scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination. It forms an integral part both of the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of individuals, the family and community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process.*

As a result, PHC became the core approach used to reorient health services in most countries to provide comprehensive, evidence-based responses to local health needs with reference to the social context.[3] The Alma-Ata Declaration provides a helpful guide to key functions of health systems that can facilitate improved health outcomes. The Declaration says that PHC:

> *includes at least: education concerning prevailing health problems and the methods of preventing and controlling them; promotion of food supply and proper nutrition; an adequate supply of safe water and basic sanitation; maternal and child health care, including family planning; immunization against the major infectious diseases;*

prevention and control of locally endemic diseases; appropriate treatment of common diseases and injuries; and provision of essential drugs.[13]

This list of functions defines what needs to be in place to benefit both communities and the health systems that serve them.[14]

PHC requires community and individual self-reliance and participation in the planning, organisation, operation and control of PHC services, thereby indicating the importance of 'community' as the central element of the PHC approach. The concept of 'community health' reflects the needs of the community and exemplifies the best of public health research and methods to achieve the shared goal of improving health.[15] Therefore, it can be inferred that PHC should form the foundation of community health work, which involves working in partnership with communities to help them improve their health. When communities take ownership of their health challenges, they take action to overcome them.[14]

2.1.2 Principles of Primary Health Care

The PHC approach is founded on the principles of 1) universal coverage, 2) comprehensiveness, 3) community participation, 4) intersectoral coordination and 5) appropriateness, as outlined by Bryant in 1988 (see Table 1.1).

Table 1.1: Principles of primary health care

	Concept	Description
1.	Universal coverage on the basis of need	This is the call of ***equity***. No one should be left out, no matter how poor or how remote. If all cannot be served, those most in need should have priority. Here is the 'All' in 'Health for All'.
2.	Services should be promotive, preventive, curative and rehabilitative [Comprehensiveness]	Services should not only be curative, but should also promote the population's understanding of health and healthy styles of life, and reach towards the root causes of disease with preventive emphasis. Treatment of illness and rehabilitation are also important. Services should also cover all locally prevalent diseases and public health issues.
3.	Communities should be involved so as to promote self-reliance [Community participation]	The community's role must be more than that of responding to services planned and designed from the outside. The community should be actively involved in the entire process of defining health problems and needs, developing solutions, and implementing and evaluating programs.
4.	Approaches to health should relate to other sectors of development [Intersectoral coordination]	The causes of ill health are not limited to factors that directly relate to health. Other sectors may have a substantial effect on health—in particular, education for literacy, clean water and sanitation, agriculture, improved housing and infrastructure of transportation, communication, women and youth groups, religious bodies, and others.
5.	Services should be effective, culturally acceptable, affordable and manageable [Appropriateness]	Effectiveness and acceptability are mutually dependant. Services must also be affordable in local terms due to limited governmental resources and because the community will often have to share in the costs.

Source: Adapted from Bryant (1988)[16]

Since the principles of PHC were first stated, the terminology describing these principles has evolved. For example, UHC now includes in its definition, (i) equity, (ii) access and comprehensiveness, which were reported as two separate principles by Bryant in 1988.[16-19] UHC means that:

> *all people receive the health services they need, including public health services designed to promote better health (such as anti-tobacco information campaigns and taxes), prevent illness (such as vaccinations), and to provide treatment, rehabilitation*

and palliative care (such as end-of-life 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.[20]

Based on the principles put forward by Bryant and the abovementioned definition of UHC, this research has used four principles of PHC as: (i) UHC, (ii) community participation, (iii) intersectoral coordination and (iv) appropriateness. The operational definitions of these principles are presented below:

(i) ***Universal health coverage***: This principle encompasses universal access and coverage of the whole population, with good-quality, comprehensive care (health promotion, prevention, curative and rehabilitative services) provided according to need and without financial hardships for the user.

(ii) ***Community participation***: This principle promotes that people have the right and duty to participate individually and collectively in the planning and implementation of their health care, and to make full use of local, national and other available resources.

(iii) ***Intersectoral coordination***: This principle encompasses the implementation of an intersectoral approach to coordinate the activities of the health sector by building partnerships with key stakeholders such as citizens, governments, civil society and the private sector. Communities can often respond more readily to broad approaches to the problems of development than to the more fragmented sector-by-sector approach.

(iv) ***Appropriateness***: Services should be effective, culturally acceptable, affordable and manageable for the community in which they are provided. Ensuring effectiveness requires careful planning and management of programs that are directly relevant to local problems. Additionally, information is required that informs PHC decision-makers about the state of the problem and the outcomes of interventions. Acceptability relates to cultural and social factors that determine the possibility that people will accept the services.[21] Effectiveness should not be at the cost of cultural acceptability; indeed, the two are mutually dependent. Services must be affordable in local terms because there are limited governmental resources and the community will often have to share in the costs.

These PHC principles have been discussed and promoted in the available literature in order to strengthen health systems.[18, 22, 23, 24] There is evidence that suggests that countries that have explicitly organised their health systems around PHC principles have contributed to strengthening health systems and improving health outcomes.[3, 7, 16, 25] However, the process of implementing PHC principles has been challenging and varied. Some of the critical challenges include defining and translating principles into practice and translating equity into action, a lack of community participation, insufficient financing to support the transformation of health systems, and a shortage of trained personnel required to implement the approach.[22, 26]

A significant challenge that PHC encountered was the idea of 'selective PHC', which was introduced soon after the Alma-Ata Declaration. The term means 'a package of low-cost technical interventions to control priority endemic diseases of poor countries'.[27] Selective PHC shifted the focus of prevention and treatment away from comprehensive care for all prevalent diseases and public health issues and towards a select few of the most severe health problems in a disease-specific way, for which intervention of proven efficiency existed for resource-constrained settings.[6, 28, 29] Selective PHC aimed to improve the health status of most individuals at the lowest cost in order to achieve interim gains to improve health and medical care for specific diseases.[26, 30, 31] The focus on selective PHC and disease-specific programs was disruptive for the development of a holistic PHC approach and posed difficulties for achieving HFA by the year 2000.[26]

Conversely, considering its founding principles, PHC emphasises a comprehensive approach to address the underlying causes of ill health and improve health outcomes sustainably.[30] It takes into account the health of individuals more holistically, addresses both preventive and curative health care, and promotes health infrastructure development and community involvement, thereby providing more sustainable improvements to health in the whole community[32] and reducing unnecessary reliance on specialised and hospital care.[7, 26] Currently, the global health research community is seeking to build on the best of both approaches (e.g., through 'diagonal' approaches) and determine ways to enhance the application of, and assess, key aspects of PHC in LMICs.[33] This research focuses on PHC and its principles, and not selective PHC.

2.1.3 Continuing Relevance of Primary Health Care

PHC was endorsed at the Alma-Ata conference as an approach for tackling the root cause of ill health that could be universalised in any place, at any time.[25] PHC-based services have demonstrated links to better health outcomes, improved equity, increased health security and better cost efficiency.[3, 7, 25, 34, 35] PHC requires health systems to respond to the challenges of an ever-changing world and growing expectations for better performance. The continued strengthening of health systems requires a myriad of global health challenges to be addressed, including the COVID-19 pandemic, increasing chronic diseases, persistent infectious diseases, maternal newborn and child health conditions, and the demands of an ageing population.[36] In addition, demographic and epidemiological transitions have further strained health systems as new diseases have emerged, while the old remain.[36, 37]

Despite various challenges, PHC as an approach to the development of health systems is considered the element of health systems that can make the greatest contribution to improving population health, particularly in resource-constrained settings.[23] It retains relevance because it can fundamentally support all other programs and goals of a health system.[14] Most recently, the 2018 Astana Declaration again highlighted the significance of PHC and its principles in strengthening health systems, as well as their importance in achieving health-related Sustainable Development Goals (SDGs).[38] The operational framework for PHC that was recently proposed by the WHO also focuses on accelerating the progress of PHC.[39] This recent interest in reinvigorating PHC and the renewed recognition of the importance of community ownership, including expanded use of mid-level and community health workers (CHWs), are indicative of the ongoing relevance of PHC principles.[25] Moreover, the relevance of PHC is also suggested by the threat of global pandemics, which require multisectoral efforts, and the growing recognition of the social determinants of health.[25, 36] Therefore, strong, integrated, community-based PHC systems are essential to accelerate progress towards global health goals and to prevent and respond to future pandemics.[40]

2.2 Community Health Worker Programs—A Strategy to Implement Primary Health Care

After the Alma-Ata Declaration, many countries made efforts to improve their health service coverage, especially for previously underserved communities.[36] Governments and

their partners at the national and global levels tried to extend health care services and interventions to better reach the whole population—particularly those segments that were poorly served by existing health services.[41] The use of community members to deliver health services appeared to be a solution because they could reach underserved populations at their doorstep in a culturally acceptable manner and have a positive effect on the quality, coverage and efficiency of PHC services.[42] Programs that use this approach are known as CHWPs, and the community members offering the health services are CHWs. A brief description of CHWs is presented below, followed by a discussion on the types, scope and benefits of CHWPs.

2.2.1 Community Health Workers

CHWs are health workers who deliver low-cost PHC services at the community and household levels.[43] They have some training but do not possess formal professional qualifications; however, they have an in-depth understanding of the community culture and language.[44] Through their interaction with the health services, CHWs can enable communities to become fully involved in the planning and implementation of health activities in a health system based on PHC.

The concept of CHWs has a history spanning nearly a century. In the 1920s in the city of Ding Xian in rural China, the Rockefeller Foundation trained 'farmer scholars'[11] who were the precursors to barefoot doctors.[5] Their tasks were to record births and deaths, provide basic vaccinations and first aid, give health education talks, and maintain clean wells.[5, 36] In 1968, the barefoot doctors program trained thousands of male and female peasants in China for three months in preventive medicine and basic health service provision.[45] They were a new kind of rural health worker proximate to the peasant communities, where infant mortality was more than 200 per 1,000 live births and average adult life expectancy was only 35 years.[46, 47] China's barefoot doctors program significantly contributed to the proposition by international actors at the Alma-Ata conference in 1978 to use CHWs to enhance health care coverage in LMICs.[13, 48] CHWs were more practical than clinic-based services because they could reach underserved communities in a more affordable way and were thought to bridge the social and cultural gaps that discouraged people from using clinics.[49]

Since 1978, CHWs have been involved in a range of service provision tasks, including: i) clinical services focusing on health assessment and remote care, ii) community resource

connections linking patients with community-based services such as referrals for transportation, and iii) health education and counselling[50] along with the promotion–prevention–treatment spectrum of care[51] and providing specific interventions.[44, 52-54] CHWs in high-income settings mostly deliver services related to noncommunicable diseases and to hard-to-reach populations, whereas CHWs in LMICs focus on communicable diseases and maternal and child health (MCH)–related services.[44] As the scope of practice of CHWs evolved over the years, research has shown their importance as a 'trusted bridge' to facilitate communities' access to needed care.[4, 52, 55-57] CHWs work within programs, and there has been a proliferation of such programs since the 1950s. The next section provides an overview of the types of CHWPs.

2.2.2 Types of Community Health Worker Programs

CHWPs use the services of CHWs to provide health education and help extend or provide a bridge to PHC services.[58] CHWPs range from small-scale programs to large-scale and national-level CHWPs.

Small-scale CHWPs often implement specific interventions over a short period by local or international non-government organisations (NGOs) or university-based groups—in most instances with external funding.[58] The WHO's publication of a book titled *Health by the People* in 1975 provided a critical viewpoint on the utility of hospital-based approaches in LMICs and included examples of various small-scale CHWPs from China, Cuba, Iran and India.[10, 47] Based on the notable health outcomes achieved by some of these smaller-scale CHWPs,[43] the Alma-Ata Declaration in 1978 proposed the development of national CHWPs as an important policy for promoting PHC.[4]

National CHWPs are authorised and supported by the national health system. They are deployed nationally and tend to be government-sponsored. There are examples of national CHWPs in Brazil, Ethiopia, Iran, Nepal and Pakistan.

Large-scale CHWPs recognise national borders as an outer boundary for deploying CHWs in a country, but they are not funded or operated by government bodies.[43] The Bangladesh Rural Advancement Committee, which has more than 100,000 CHWs, is an example of a nationwide large-scale CHWP run by an NGO. The next section outlines the emergence of CHWPs in LMICs.

2.2.3 Evolution of Community Health Worker Programs in Low- and Middle-Income Countries

Since their beginning in China in the 1920s, CHWPs have been established in many countries.[5, 36, 41, 46] Table 2.2 summarises the evolution of CHWPs that emerged between the 1950s and 2015.

Table 2.2: Evolution of community health worker programs

S. No.	Evolution Era	Community Health Worker Programs
1.	1950s	Beginning of China's national-level barefoot doctors program and Malawi's Health Surveillance Assistants Program.
2.	1960s	Emergence of small-scale CHWPs in India, Indonesia, Tanzania and Latin America (Guatemala, Honduras and Venezuela).
3.	1975	WHO book: *Health for All* Conceptual foundation for international conference on PHC at Alma-Ata, USSR (now Kazakhstan).
4.	1978	Alma-Ata Declaration Mozambique's CHWP inception.
5.	1970s	Beginning of smaller CHWPs in LMICs operated by NGOs (India, Iran and Nigeria).
6.	1980s	Worldwide proliferation of national-level government CHWPs in LMICs. Examples include Bangladesh, Brazil, India, Indonesia, Iran, Malawi, Nepal, Nicaragua, Peru, Tanzania, Zimbabwe, South Africa and Latin American countries.
7.	Late 1980s and early 1990s	Many programs discontinued in LMICs as a result of poor planning and underestimation of resources (human, time and financial) and also because of the beginning of disease-specific programs (e.g., Mozambique's CHWP suspended in 1989).
8.	1990s	Reinvestment in large-scale national CHWPs (e.g., Pakistan).
9.	2000s	Introduction of Millennium Development Goals, and renewed interest in CHWs. Key examples include initiation of CHWPs in Uganda (2003), Ethiopia (2004) and Zambia (2011). Relaunch in Mozambique (2010).
10.	2015	SDGs—renewed focus on the contribution of CHWs.

Sources: Maher et al. (2017),[59] Mariano et al. (2015),[60] Perry et al. (2014),[5] Perry et al. (2013)[47]

Notes: CHW: community health worker, CHWP: community health worker program, LMICs: low- and middle-income countries, NGO: non-government organisation, PHC: primary health care, SDGs: Sustainable Development Goals, WHO: World Health Organization

Given that the 1978 Alma-Ata Declaration marked a global-level recognition of the potential of national CHWPs to serve as a foundation for PHC, this thesis is focused on national CHWPs.[41] After the Alma-Ata Declaration, many governments launched national-level CHWPs to introduce PHC to their health systems.[36, 56, 61] By the late 1990s, national-level CHWPs had been developed and implemented in Bangladesh, Brazil, India, Indonesia, Iran, Nepal, Pakistan, Tanzania, Ethiopia, Uganda, Mozambique, South Africa, Latin America and many other countries.[5]

The evolution of national-level CHWPs in LMICs faced various challenges in the late 1980s and early 1990s, which led to the suspension of many CHWPs.[22, 47, 49] These challenges are outlined in Section 2.2.3. However, in 2000, the Millennium Development Goals (MDGs) were introduced, which revitalised interest in CHWPs as an avenue for meeting these goals—particularly for reducing maternal and child mortality and expanding services to the poorest segments of the population.[47] The 2015 SDGs also recommended the expansion and institutionalisation of CHWPs by national governments to achieve these updated goals.[22] The Kampala Statement from the First International Symposium on CHWs in 2017 highlighted the potential of CHWPs to achieve SDGs, stating that:

> *through systematic planning and multi-sectoral collaboration, CHWPs can be a huge driving force to attain at least seven SDGs namely: SDG 1 (ending poverty), 2 (ending hunger and food security), 3 (health and wellbeing), 5 (gender equality), 6 (clean water and sanitation), 10 (reduce inequalities), and 17 (partnerships for global health).*[62]

Therefore, CHWPs founded on the principles of PHC can still be considered a significant element for any health system to achieve its full potential and contribute to global health development agendas.[41] At present, major national-level CHWPs in LMICs have more than eight million CHWs, which gives an idea of the magnitude of these programs.[58] Table 2.3 presents an overview of selected national-level CHWPs across Asia, Africa and South America over the past 40 years. In the majority of these countries, CHWPs have focused on health promotion, prevention and referral services mainly for MCH, family planning and communicable diseases.

Table 2.3: Overview of selected national community health worker programs in Asia, Africa and South America

No.	Country/ Start Year	Name of CHWP	No. of CHWs	Service Provision by CHWP	Key Contribution of CHWP
Asian Programs					
1.	Bangladesh	Government program for family welfare assistants (1976), health assistants (1960s) and community health care providers (2010)	70,000 government CHWs Salaried	Family welfare assistants: Family planning and referral for antenatal and postnatal care. Health assistants: immunisations; Vitamin A supplements; and detection and treatment of pneumonia, diarrhoea, malaria and TB. Community health care providers: Staff community health clinics for antenatal and postnatal care; treat pneumonia, diarrhoea and anaemia; and give injectable contraceptives.	Key highlights: Management of childhood pneumonia and use of WHO protocol as physicians. Increased identification of suspected TB cases and provision of directly observed treatment, short-course for diagnosed TB cases. Impact: No available evaluations; however, studies involving these CHWs suggest that Bangladesh's remarkable progress in reducing under-five and maternal mortality, and in expanding the use of contraceptives, may be attributed to, among other factors, the strong CHW presence.
2.	India	Auxiliary Nurse-Midwife, Anganwadi Worker and Accredited Social Health Activists Programs (2006)	219,000 auxiliary nurse-midwives 1.3 million Anganwadi workers 971,000 accredited	Auxiliary nurse-midwives: support workers for Anganwadi Workers and Accredited Social Health Activists. Now multipurpose workers officially. Anganwadi workers: nutritional supplementation for young children, adolescent girls and lactating women.	No impact evaluations of the Auxiliary Nurse-Midwives program have been published. Widespread geographic coverage of the Anganwadi Workers Program as noted in the assessment of the integrated child development services. The Accredited Social Health Activists program has been associated with

No.	Country/ Start Year	Name of CHWP	No. of CHWs	Service Provision by CHWP	Key Contribution of CHWP
			social health activists Paid workers	Accredited social health activists: Focus on facilitating institutional deliveries, immunisations, provision of basic medicines (including oral contraceptives) and referral of patients to the sub centre.	improvements in neonatal health, increased institutional deliveries, some aspects of care seeking, and increased immunisation and health-related awareness in certain areas.
3.	Indonesia/ mid-1980s	Posyandu Program	More than 250,000 CHWs Volunteers	Monthly sessions to register and record on mother–infant cards, weighing, growth monitoring, providing nutrition advice and counselling on family planning. Follow-up visits in the community, attend community committee meetings, and update program target and utilisation data.	Impact varies by region. Decrease in maternal and child mortality and increase in life expectancy in Indonesia are partly attributable to the work of the CHWs.
4.	Iran/early 1980s	Village health workers program	34,000 CHWs called Behvarz Salaried government employees	MCH care, communicable and noncommunicable disease management. Oral health care, health care in schools, care of the elderly, environmental and occupational health, annual population census, completion of reports and forms, attendance at in-service training sessions, and membership on the Behvarz Council.	Significant progress in major health indicators specifically narrowing the urban–rural gap regarding various morbidity and mortality indicators. The WHO concluded that health houses are responsible for a sharp drop in mortality as well as increased life expectancy over the past four decades.
5.	Nepal/1988	Female community health volunteers program	52,000 female community	Health promotion: Family planning, sanitation, nutrition, HIV and MCH. Health service delivery: Family planning, deworming, polio	Backbone of Nepal's health system for the last three decades. Instrumental contribution in reducing under-five mortality rate, maternal

No.	Country/ Start Year	Name of CHWP	No. of CHWs	Service Provision by CHWP	Key Contribution of CHWP
			health volunteers	campaigns and integrated community case management. Data collection and reporting of demographic data to an intermediary in the community.	mortality ratio and fertility rate. There is widespread agreement that CHWs in Nepal—particularly female community health volunteers—have played an important role in achieving these goals. Significant role of CHWs in polio eradication, measles elimination, nutrition programs and responding to emergencies (e.g., cholera outbreaks, pandemic influenza and earthquakes).
6.	Pakistan/ 1994	National Program for Family Planning and Primary Health Care	100,000 CHWs Salaried	MCH services and participation in large health campaigns, newborn care, community management of TB and health education on HIV/AIDS.	Improved tetanus toxoid coverage, percentage of children fully immunised, levels of exclusive breastfeeding, increased likelihood of using FP methods. The program has undergone four external evaluations, most recently in 2019.
African Programs					
7.	Ethiopia/ 2004	Health Extension Program	40,000 health extension workers Salaried 3 million Women Develop-	Health promotion, disease prevention and treatment of uncomplicated and non-severe illnesses such as cases of malaria, pneumonia, diarrhoea and malnutrition in the community. HDA volunteers work part time (less than 2 hours per week) to increase utilisation of PHC services in their communities.	44% increase in the use of insecticide-treated bed nets by pregnant women and under-five children in malarial regions. Under-five mortality has declined from one of the highest in the world, from 204 per 1,000 live births in 1990 to 67 in 2016.

No.	Country/ Start Year	Name of CHWP	No. of CHWs	Service Provision by CHWP	Key Contribution of CHWP
			ment Army Volunteers		Contraceptive prevalence rate increased from 8.2% in 2000 to 35% in 2016. Improved child vaccination uptake, increased utilisation of antenatal care in early pregnancy, increased institutional deliveries in some regions. The CHWP is widely seen as one of the major reasons for these results.
8.	Niger/2000	Niger's program of Agents de Santé Communautaire and Relais Volunteers	7,500 CHWs Paid and volunteers	Agents de Santé Communautaire: Provision of basic PHC interventions at health posts such as iCCM (treating fever, pneumonia and diarrhoea), immunisations, vitamin A supplements and bed nets, nutrition support and acute malnutrition screening. Relais Volunteers: Work primarily in communities to conduct home visits, demonstrate key family practices, develop community awareness and encourage parents of sick children to seek care.	Reduced under-five mortality from 328 per 1,000 live births in 1990 to 84 in 2019 following the introduction of the CHWP. 50% decline in wasting.
9.	Rwanda/ 1995	CHW program	45,000 CHWs Volunteers	Three CHWs, with clearly defined roles and responsibilities, operate in each village. A male–female CHW pair (called binômes) provides basic care and integrated community case management of childhood illness,	Increased facility-based deliveries (from 45% to 69%). Significant contribution in expanding community-based family planning services and treatment of childhood malaria and pneumonia. Increased vaccination coverage.

No.	Country/ Start Year	Name of CHWP	No. of CHWs	Service Provision by CHWP	Key Contribution of CHWP
				and a CHW is in charge of maternal health.	There is a general consensus that Rwanda's CHWP has contributed to remarkable progress in MCH, malaria, undernutrition and other key areas.
10.	Zambia/ 2010	Community Health Assistant Program	Approx. 5,000 CHWs Salaried	Health promotion, disease prevention and control, environmental health, basic curative services (reproductive health/safe motherhood, child health) and referral services.	The CHWP has been successfully scaled up nationwide and is firmly established in the Zambian health system and recognised for its wide-ranging benefits to PHC.
11.	Zimbabwe/ 1982	Village Health Worker Program	7,000 by 1987 (current number is unknown) Paid quarterly	Health promotion and prevention, treating common conditions (diarrhoea and malaria), and identifying and referring complicated cases to higher levels of the health system.	No formal impact evaluation of the CHWP. Evaluations of health projects in Zimbabwe have shown consistently strong evidence of the contributions of the CHWP to improving accessibility to health care, as the program provides a major portion of PHC services and is becoming recognised as an important contributor to the improvement of several health indicators in the country.
South American Program					
12.	Brazil/1994	Programa Saúde da Família (Family Health Program, now called the Family Health Strategy)	265,000 Community health agents Salaried	Provision of comprehensive promotive, preventive, curative and rehabilitative services. Community empowerment and linking to formal health system. Key services: Promotion of breastfeeding; provision of prenatal, neonatal and child care; immunisations; management of	Marked increases in access to MCH interventions and significant reductions in maternal, infant and child mortality, as well as childhood stunting. 10% increase in program coverage was associated with a 4.6% decrease in the IMR.

No.	Country/ Start Year	Name of CHWP	No. of CHWs	Service Provision by CHWP	Key Contribution of CHWP
				infectious diseases, such as screening and treatment for HIV/AIDs, TB and chronic noncommunicable diseases such as hypertension and diabetes.	During 1999–2002, when the CHWP expanded and the national coverage increased by 36.1%, the IMR decreased from 49.7 per 1,000 live births to 28.9. The programmatic impact was largest in the poorest municipalities and in the more rural regions in the country where baseline health indicators were worse. The greatest benefits have been for MCH outcomes (resulting in more frequent child growth monitoring, greater duration of exclusive and total breastfeeding, and later introduction of bottle feeding).

Sources: Perry et al. (2020)[63], Perry et al. (2017)[64]

Notes: CHW: community health worker, CHWP: community health worker program, HIV/AIDS: Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome, IMR: infant mortality rate, MCH: maternal and child health, PHC: primary health care, TB: tuberculosis

2.2.4 Benefits of Community Health Worker Programs in Low- and Middle-Income Countries

National CHWPs in many countries have generally been effective in improving health outcomes.[4, 65] Many are credited with contributing to the reduction in under-five child mortality across various LMICs in South America, Asia and Africa,[5, 22, 66] including Brazil,[53] Ethiopia,[63] Indonesia,[53] Nepal and Niger.[63]

The benefits of national CHWPs are outlined below:

Enhanced access and coverage to health services: In 2019, the United Nations estimated that half of the world's population (3.8 billion people) lacks access to essential health services.[41] National CHWPs have been shown to be effective in rapidly increasing the coverage of home-based preventive and curative services and reducing neonatal and child mortality by providing simple community-based interventions at the household level.[41] Because of their geographic and cultural proximity to the populations they serve, CHWs are uniquely positioned to extend care to poor, hard-to-access and underserved groups in a cost-effective way, which is beyond the reach of institution-based services.[41, 67, 68] For example, Nepal has a high level of coverage of basic MCH services given the challenging mountainous terrain and long-term political instability in the country.[69] Ethiopia was able to increase PHC coverage from 77% in 2005 to 90% in 2010 after introducing its national CHWP in 2004. After the inception of the national CHWP of Ethiopia in 2003, access to health services increased from 64% to 92% in 2011.[69] Therefore, national CHWPs have contributed to reducing the number of people with inadequate access. Moreover, national CHWPs can play a critical role in preventing, detecting and responding to pandemics around the world.[70] National CHWPs have been instrumental in providing a frontline response to the COVID-19 pandemic by raising community awareness, engagement and sensitisation (including countering stigma) and through contact tracing.[71]

Reducing health disparities: CHWPs reduce inequities in access to services and promote the inclusion of marginalised and vulnerable groups.[72] CHWPs have been effective in reaching disadvantaged populations by extending health care access to those in rural areas, those with limited formal education and those with lower socioeconomic status.[67] CHWPs have been found to promote equity of access and utilisation for community health by reducing inequities relating to place of residence, gender, education and socioeconomic position.[73] Factors promoting greater equity of CHW services include

proximity of services to households, pre-existing social relationship of community members and CHWs, provision of home-based services, free service delivery, targeting of poor households, strengthened referrals to facilities, and sensitisation and mobilisation of communities.[73] For example, Brazil has one of the most equitable MCH services as assessed by comparing the coverage of services among the lowest income quintile with that of the highest quintiles.[69] Wealth inequalities for MCH interventions have diminished over the past three decades in Brazil.[69]

Availability of lifesaving interventions to whole populations: National CHWPs have significantly contributed to providing lifesaving interventions such as immunisations, malaria prevention and treatment, micro-nutrient supplementation, antenatal and postnatal care, family planning services, and management of childhood illnesses (e.g., diarrhoea and pneumonia) in various LMICs, including Bangladesh, Ethiopia, Nepal and Pakistan (see Table 2.3). Hence, they have contributed to reducing many conditions, including malaria, postpartum haemorrhage, childhood pneumonia, diarrhoea and acute malnutrition.[63]

Improved health outcomes: Countries that have prioritised and invested in well-planned and properly supported national CHWPs (e.g., Bangladesh, Brazil, Iran, Ethiopia and Nepal) have been leaders in improving population health.[68] The national CHWPs in Brazil, Ethiopia and Nepal are among the strongest such programs in the world. They are widely viewed as making strong contributions to expanding access to basic health services, linking communities and health systems, and improving population health—in particular, reducing maternal and child mortality.[69] However, evidence of the precise association of national CHWPs to improved health outcomes is significantly limited.[43, 74]

Based on the growing evidence of the potential of national CHWPs to contribute to attaining local, national and global health goals,[68] there is rapidly growing global recognition of such programs in improving population health and accelerating progress towards universal health coverage.[40]

2.2.5 Challenges Faced by Community Health Worker Programs in Low- and Middle-Income Countries

Operating at the interface between communities and local health systems, national CHWPs in LMICs face considerable challenges.[36, 43, 47, 49, 56, 65, 75-78] After the Alma-Ata Declaration, various national-level CHWPs were initiated across LMICs, often with

minimal policy and organisational commitment, resulting in disease-specific programs rather than integrated and comprehensive programs.[56] In these programs, a wide range of functions were expected to be performed by CHWs. In the early years, there were poor selection processes for CHWs, inadequate training and a lack of continuing education. There was also insufficient logistic support for supplies and medicines, and a lack of supervision for CHWs in many countries.[56] A lack of acceptance of the CHW role by higher-level health care providers was another challenge facing CHWPs, along with poor integration of CHWs into health systems and communities across and within countries.[79] A lack of attractive salary, along with poor supervisory and logistic support and no in-built career path, affected the long-term career retention and motivation of CHWs.[63] In addition, monitoring and evaluation mechanisms for CHWPs were not planned accurately, and the cost of training and maintaining CHWs and the sources of finance of the programs were not stable.[56]

These challenges faced by national CHWPs in the 1980s persist in the current CHWPs of LMICs.[5, 36, 43, 61, 63, 80-82]

2.2.6 Significance of Applying Primary Health Care Principles in Community Health Worker Programs

Evidence suggests that countries that have explicitly organised their health systems around PHC principles have contributed to strengthening health systems and improving health outcomes.[83] National CHWPs serve as a community-centred strategy to adopt PHC and its principles for the development of health systems.[7] Therefore, the application of PHC principles in these programs can enable them to achieve significant health benefits. A successful example of a PHC-oriented national CHWP is Ethiopia's Health Extension Program. Since its inception in 2003, the national CHWP has enabled Ethiopia to achieve improvements in MCH, communicable diseases, hygiene and sanitation, and knowledge and health care seeking.[80] In its first five years of implementation, the program successfully improved family planning, immunisation, malaria, tuberculosis, HIV and antenatal care in the country.[9] This Ethiopian CHWP demonstrates that if national CHWPs are planned and implemented based on PHC principles, they can accelerate national progress in improving health outcomes and provide a strong foundation to help countries achieve 'Health for All' through PHC, as envisioned by the world community at the international conference on PHC in 1978.[43, 74] Another example of a national CHWP in which a focus on PHC principles has led to improved service utilisation

contributing to better health outcomes is the Accredited Social Health Activist (ASHA) program of India. A recent evaluation of this program identified that the program, which was built on 'community engagement', 'universal coverage' and 'reaching out to marginalised community [equity]', has achieved success in terms of improved service utilisation and quality of MCH services.[84]

However, there are examples from Botswana, Colombia, India and Sri Lanka where a lack of focus on PHC principles has contributed to implementation problems.[22, 85, 86] An example is the Village Health Guide (VHG) program India by initiated in 1977 to provide preventive, promotive and basic curative care to rural populations.[85] This national CHWP faced significant challenges after its inception and was abandoned in 2002.[85] A lack of community engagement and intersectoral coordination were the key factors that contributed to the gradual closure of the program.[63] The planning of the program was carried out exclusively at the central level in order to gain immediate political benefits with no involvement of the community or the state and district workers.[63] This lack of community involvement in the program's design and deployment hampered its acceptability and sustainability at the rural community level.[63] The government failed to integrate the community health efforts of the VHGs with responses to other public health problems, such as water supply, and with economic growth opportunities such as agricultural inputs and land reclamation.[63] Recruitment and selection of CHWs was conducted by a select group of community leaders and district-level officials, which contributed to an imbalance in the number of male and female CHWs. As a result, the communities that were intended to be central participants in VHG selection were sidelined, and 75–94% of VHGs selected were males based on political considerations.[85] Moreover, there was no formal mechanism to conduct ongoing monitoring and evaluation of the CHWP, and to adjust the program once it had been implemented.[63] Therefore, deficiencies in implementing a grassroots program through a top–down approach directed by a central government bureaucracy began to appear soon after the program's implementation.[85] Ultimately, these factors significantly undermined the effectiveness of the VHG program, which led to the formal termination of this national CHWP.

These examples demonstrate a strong link and need to incorporate PHC principles when implementing national CHWPs, especially now that these programs are recognised as an important strategy for achieving global health goals.[41] However, to achieve these goals, national CHWPs need to incorporate PHC principles in all parts of the program from

implementation to evaluation.[36] Thus, research is needed to explore how the principles of PHC can be applied by CHWPs to achieve improved health outcomes.[87]

2.3 Gaps in Empirical Evidence

To date, few studies have assessed the application of PHC principles in LMICs.[18, 88] One study in South Africa found that PHC principles were not implemented successfully in rural and remote settings, and gaps were identified in the application of community participation and comprehensive care provision, along with the lack of an adequate referral system.[88] The community was not involved in health care management, services were curative and preventive in nature but lacked health promotion, and although the need for rehabilitation was acknowledged, it was not provided.[88]

Limited application of PHC principles has also been identified as a significant challenge in several child health initiatives implemented through the PHC system in India.[18] The initiatives include essential newborn care, home-based newborn care, facility-based newborn care, integrated management of neonatal and childhood illnesses, immunisation, infant and young child feeding, and cash incentives for institutional deliveries.[18] The study found that the principles of community participation, intersectoral coordination (including public–private partnerships and the health workforce) and the use of appropriate technology in health were not applied to strengthen the country's PHC systems.[18]

The state of limited research on the application of PHC principles is also evident for CHWPs in LMICs. The integration of such programs into health systems has been identified as one of the main limitations to the efficacy of these programs in LMICs.[6] Most of the available literature focuses on CHWP management such as recruitment, training and supervision of CHWs, as well as supply-chain management.[43] Robust evaluations of national CHWPs—either by the program implementers themselves or by independent evaluators—are not common and, when undertaken, the results are often not made publicly available.[63] This complements the fact that it is difficult to access detailed information on national CHWPs in LMICs.[41] Therefore, there is no widespread evidence of the extent to which PHC principles are systematically applied across national-level CHWPs in LMICs. This lack of evidence of the application of PHC principles in CHWPs points to the need to explore this area to facilitate the application of PHC principles in national CHWPs. Moreover, because these programs are an important 'community-

centred' health systems strategy for the long-term uptake of the PHC approach, particularly in LMICs,[42, 89] there is a need to examine how PHC principles are applied in order to maximise the benefits of these programs.[87]

Therefore, this research aims to generate evidence of the application of PHC principles by national CHWPs in LMICs.

2.4 Research Aims

The overall aim of this doctoral research is to investigate and generate evidence to guide the application of PHC principles by CHWPs in LMICs. To achieve this aim, three studies were designed to address the following objectives:

Study 1: Application of primary healthcare principles in national community health worker programs in low-income and middle-income countries: a scoping review

Objective: To identify which PHC principles are reflected in the implementation of national CHWPs in LMICs

Study 2: Indicator-Activities to apply primary health care principles in national or large-scale community health worker programs: a Delphi exercise

Objective: To identify the Indicator-Activities that reflect the application of PHC principles by CHWPs in LMICs

Study 3: Assessing the utility of primary health care Indicator-Activities in the context of low- and middle-income countries: a document analysis

Objective: To assess the utility of Indicator-Activities for the application of PHC principles and recommend a set of activities for their potential use in the planning and implementation of CHWPs in LMICs.

Chapter 3

Chapter 3: Study Setting, Design and Methods

Chapter 2 presented a review of the literature, research justification and the aims of this thesis. This chapter presents the study setting, design and methods for this thesis. It also reports the ethical approval obtained.

3.1 Study Setting: Low- and Middle-Income Countries

Although CHWPs are being implemented around the world, this research is focused on national CHWPs in LMICs because the health systems in LMICs face comparatively more challenges than those faced by systems in high-income countries. These health system challenges occur at the delivery and policy levels and include: (i) a lack of cooperative action and partnership for health between government and civic organisations; (ii) physical, social and financial barriers to the use of services; (iii) inadequate supplies of medicine; (iv) a lack of equipment and infrastructure, which limits accessibility to health services; (v) shortage and/or inappropriate distribution of qualified staff, especially at the primary care level; (vi) weak technical guidance, program management and supervision; (vii) weak and overly centralised systems for planning and management; (viii) fragmented funding, which reduces flexibility and ownership; and (ix) low priority given to systems support.[90] Political instability and insecurity also present challenges for health care systems in LMICs.[90]

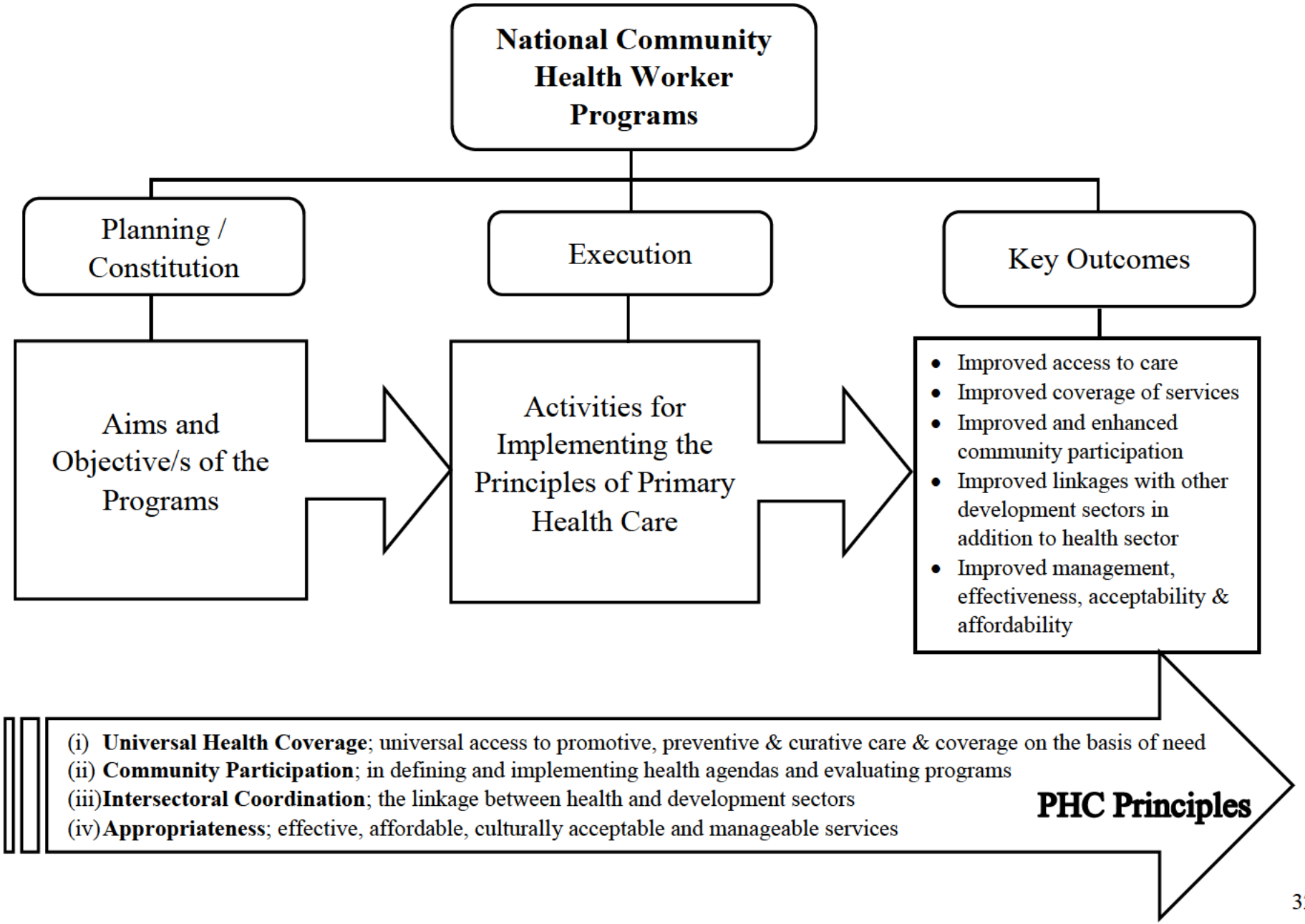
National CHWPs can address some of the challenges faced by the health systems of LMICs, such as education to improve demand for quality care, partnerships between health services and communities, and enhanced access to and coverage of health services. Therefore, most of the national CHWPs are in LMICs.[63] Given the presence of the majority of national CHWPs in LMICs and their potential to address health systems' challenges in these countries, this thesis focuses on national CHWPs in LMICs. It defines national CHWPs as those that are sponsored by the government, authorised and supported by the national health system, and deployed nationally.

3.2 Conceptual Framework

Given that CHWPs should be based on PHC principles for strengthening health systems and improving health outcomes, PHC and its principles provide the overall conceptual framework for this thesis. Figure 3.1 presents the conceptual framework used in this research, along with operational definitions of the four PHC principles. The conceptual

framework shows the relationship between the planning and implementation of national CHWPs and their outcomes, and the principles of PHC. Incorporation of the PHC principles at all stages of CHWPs can lead to significant improvements in terms of enhanced access, coverage, equity, community participation, intersectoral coordination and appropriateness of health services.

Figure 3.1: Conceptual Framework



3.3 Study Design—Mixed Methods

This thesis used a mixed-methods design. The methods included a scoping review for Study 1, a Delphi exercise (qualitative and quantitative) for Study 2 and a qualitative document analysis for Study 3. These methods facilitate an understanding of how the CHWPs can be aligned with PHC principles. Table 3.1 presents an overview of the designs, aims and methods of each study in this thesis.

Table 3.1: Design, aims and methods of each study in this thesis

Study	Research Question	Aim	Research Approach	Study Design	Methods
1.	Which principles of PHC are reflected in the implementation of national-level CHWPs in the context of LMICs?	Map evidence to understand the extent of application of PHC principles by CHWPs in LMICs	Qualitative	Scoping review	Review of published literature
2.	What are the activities reflecting the application of PHC principles in CHWPs?	Identify Indicator-Activities reflecting the application of PHC principles by CHWPs	Mixed methods	Delphi exercise	Online survey
3.	What is the utility of PHC Indicator-Activities for the application of PHC principles in national CHWPs in LMICs?	Assess the use of Indicator-Activities for the application of PHC principles in national CHWPs	Qualitative	Document analysis	Desk review

Notes: CHWP: community health worker program, LMICs: low- and middle-income countries, PHC: primary health care

3.3.1 The Scoping Review

To understand the application of PHC principles in national CHWPs in LMICs, it was important to map the available published literature. An assessment of the available quantitative and qualitative research in peer-reviewed articles provided evidence of the extent to which PHC principles are reflected in the objectives, implementation and outcomes of these programs.

The detailed method of the scoping review is included in the published article[91] (see Chapter 4). In summary, the scoping review focused on national-level CHWPs in LMICs where there had been the greatest growth of these programs following the Alma-Ata Declaration in 1978. The scoping review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) guidelines,[92] that was pre-specified in a published protocol.[91]

3.3.2 The Delphi Exercise

Based on the findings of the scoping review, a two-round modified Delphi study was undertaken to establish expert consensus on the activities reflecting the application of PHC principles in national or large-scale CHWPs in LMICs, and to confirm the importance of PHC principles in CHWPs. The survey design and analysis was guided by the four PHC principles: UHC, community participation, intersectoral coordination and appropriateness. Responses were collected using a secure online survey program (SurveyMonkey). In round one, participants were asked to rate and rank the importance of incorporating each PHC principle in the implementation of national or large-scale CHWPs in LMICs. Participants were also asked to list the core activities that would reflect the application of each PHC principle and its sub-attributes, as well as challenges to applying these principles in CHWPs. In round two, participants were provided with a summary of their responses from the first round and asked whether they agreed or disagreed with each of the activities and challenges. Consensus was set a priori at 70% agreement of experts for each question. The list of activities agreed by participants was then synthesised further to develop a set of Indicator-Activities for each PHC principle and their sub-attributes, with examples of types of activities for each Indicator-Activity. A comprehensive description of the methods for Study 2 is provided in the publication (see Chapter 5).

3.3.3 Document Analysis

The third study aimed to assess the utility of PHC Indicator-Activities (developed as an outcome of the Delphi exercise) for national CHWPs in LMICs. The study used a document analysis design whereby CHWPs served as an example to assess the utility of PHC Indicator-Activities. The study included two CHWPs from Pakistan and Ethiopia: (i) the National Program for Family Planning and Primary Health Care (NPFPPHC),

commonly known as the Lady Health Worker Program, which was initiated in 1994; and (ii) the national Health Extension Program (HEP), which was initiated in 2003.

A desk review of all publicly available documents for the two CHWPs included program planning documents, reports, evaluations and policy briefs.

The document analysis used the READ approach to gain in-depth insights into the available documents in a systematic way, and to ensure rigor in the document analysis.[93] The READ approach provides stepwise practical guidance on gaining the most out of the documents reviewed[93] via four steps: (1) ready your materials, (2) extract data, (3) analyse data and (4) distil your findings.

The details of the methods used for Study 3 are provided in the manuscript submitted for publication (see Chapter 6).

3.4 Ethics Approval

All of the information used in the scoping review (Study 1) was derived from publicly available data sources (i.e., published peer-reviewed journal articles); therefore, formal ethics approval was not required.

Ethics approval for the Delphi exercise (Study 2) was obtained from the University of Adelaide Human Research Ethics Committee (approval number H-2020-179).

For the document analysis (Study 3), ethics approval was not sought because all of the reports used were available online or shared by program officials. There was no human subject involvement in the data collection process.

In Chapters 4–6, the results of the three studies that comprise this thesis are presented as publications accepted by or currently under review in peer-reviewed journals.

Chapter 4

Chapter 4: Study 1: Application of PHC Principles in Community Health Worker Programs in LMICs—A Scoping Review of Mixed Evidence

4.1 Preface

This chapter contains the first of the three articles contributing to this thesis. The article has been published in the *BMJ Open* journal. With reference to the first aim of this thesis, this article maps the available peer-reviewed literature on the application of PHC principles in national CHWPs. Based on the scarcity of evidence about the extent to which PHC principles are systematically applied in CHWPs across various LMICs, a scoping review was undertaken to identify which PHC principles are incorporated into the implementation of CHWPs and to understand their contribution to the outcomes of these programs.

The scoping review included primary studies published in peer-reviewed journals on programs, projects or initiatives using the services of CHWs in LMICs. To set the scope of the review, we examined national-level CHWPs with a focus on MCH because it is a national priority in the majority of LMICs. We reviewed the application of four PHC principles (UHC, community participation, intersectoral coordination and appropriateness) in the CHWPs' objectives, implementation and stated outcomes. The scoping review was guided by a scoping review protocol published in the *JBI Evidence Synthesis* journal (see Appendix A). Overall, 26 studies (12 qualitative and 14 quantitative) meeting the inclusion criteria were presented. These 26 studies covered 14 CHWPs from 13 LMICs.

Supplementary materials to guide the methodology of the scoping review (logic grid and data charting form) and support the results of Chapter 4, such as tables summarising the results, are provided at the end of the manuscript in this chapter.

4.2 Publication

Perveen S, Lassi ZS, Mahmood MA, Perry HB, Laurence C. Application of primary healthcare principles in national community health worker programs in low-income and middle-income countries: a scoping review. BMJ Open 2022 Feb. https://bmjopen.bmj.com/content/12/2/e051940

Statement of Authorship

Title of Paper	Application of primary healthcare principles in national community health worker programs in low-income and middle-income countries: a scoping review
Publication Status	☒ Published ☐Accepted for Publication ☐Submitted for Publication ☐Unpublished and unsubmitted work written in manuscript style
Publication Details	Perveen S, Lassi ZS, Mahmood MA, Perry HB, Laurence C. Application of primary healthcare principles in national community health worker programs in low-income and middle-income countries: a scoping review. BMJ Open 2022 Feb. https://bmjopen.bmj.com/content/12/2/e051940

Principal Author

Name of Principal Author (Candidate)	Shagufta Perveen		
Contribution to the Paper	Conceived and designed the study, conducted the search, adjudicated and appraised studies, charted, analysed and interpreted data, wrote the manuscript and acted as corresponding author.		
Overall percentage (%)	70%		
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research Candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	19 August 2022

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);

ii. permission is granted for the candidate to include the publication in the thesis; and

iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Zohra S Lassi		
Contribution to the Paper	Contributed to the screening, data charting and review of the manuscript		
Signature		Date	19 August 2022
Name of Co-Author	Dr Mohammad Afzal Mahmood		
Contribution to the Paper	Contributed to the design of the study, interpretation of findings and review of the manuscript		
Signature		Date	22 August 2022
Name of Co-Author	Henry B Perry		
Contribution to the Paper	Contributed to the evaluate and edit the manuscript		
Signature		Date	19 August 2022
Name of Co-Author	Prof Caroline Laurence		
Contribution to the Paper	Supervised development of work, helped in data interpretation of findings and reviewed manuscript drafts.		
Signature		Date	22 August 2022

BMJ Open

Application of primary healthcare principles in national community health worker programmes in low-income and middle-income countries: a scoping review

Shagufta Perveen [1], Zohra S Lassi [2], Mohammad Afzal Mahmood [1], Henry B Perry [3], Caroline Laurence [1]

To cite: Perveen S, Lassi ZS, Mahmood MA, *et al*. Application of primary healthcare principles in national community health worker programmes in low-income and middle-income countries: a scoping review. *BMJ Open* 2022;**12**:e051940. doi:10.1136/bmjopen-2021-051940

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2021-051940).

Received 06 April 2021
Accepted 05 January 2022

For numbered affiliations see end of article.

Correspondence to
Shagufta Perveen; shagufta.perveen@adelaide.edu.au

ABSTRACT

Objective To identify which primary healthcare (PHC) principles are reflected in the implementation of national community health worker (CHW) programmes and how they may contribute to the outcomes of these programmes in the context of low-income 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 programmes, projects or initiatives using the services of CHWs in LMICs focused on maternal and child health. We included only English language studies. Excluded were programmes 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 programme'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 1280 papers published between 1983 and 2019, 26 met the inclusion criteria. These 26 papers included 14 CHW programmes 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 programmes as these programmes select CHWs from within the communities. Other aspects, particularly effectiveness, were not evident.

Conclusion The implementation of PHC principles across national CHW programmes in LMICs is patchy. For comprehensiveness and improved health outcomes, programmes 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 programmes in LMICs. Better documentation and publications of CHW programme implementation are also needed.

Strengths and limitations of this study

- ► Community health worker programmes 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 programmes in low-income and middle-income countries applying the lens of primary healthcare 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 healthcare principles.
- ► The generalisability of the results of this study is limited to larger national-level programmes in developing and lower-income and middle-income countries only.

BACKGROUND

Primary healthcare (PHC), as an approach to a reorientation of health services and provision of universal healthcare, has remained the benchmark for most countries' discourse on health since the PHC approach was mobilised 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]

'HFA' 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-income, middle-income 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 healthcare.[1] These principles that is, '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 healthcare systems in low-income and middle-income countries (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, community health worker (CHW) programmes were envisioned as a way to reach a wider population for essential health needs and to achieve HFA. National CHW programmes 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 programmes were expected to encompass and promote them and in doing so achieve improvements in health outcomes.[11]

National CHW programmes, as vehicles to incorporate PHC principles into healthcare provision, have contributed significantly in reducing under-5 child mortality in Brazil,[12] Indonesia[12] and Nepal.[13] In Indonesia, immunisation coverage also improved many-fold with an increase in CHWs. These examples demonstrate a clear link and need for incorporating PHC principles when implementing CHW programmes. Over decades of implementation CHW programmes have also faced various challenges including the loss of the PHC movement.[14 15] Though, the PHC principles are evident in the programme design and policies of the CHW programmes 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 programmes. This study aims to identify the PHC principles in the implementation of these programmes in LMICs and to understand their contribution to the outcomes of those programmes.

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 programmes, projects or initiatives utilising the services of CHWs in LMICs. We focused on the national level CHW programmes defined as any CHW programme 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 3 years. We considered national CHW programmes 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 programmes 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 programmes operated by a non-government organisations. 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 (online supplemental appendix 1—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 programme, objective and reflection of PHC principle/s in programme objective, implementation activities, and stated outcomes along with the selection process of CHWs (online supplemental appendix 2). 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. UHC: 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 programmes.[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 subattribute 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 summarising 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 1280 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 1 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 programmes 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] Online supplemental table 1 provides an overview of the included studies outlining the key objective/s, methods and findings as reported by the authors.

Application of PHC principles

The PHC principles were applied to a varied extent in the objective/s, implementation and outcome of the national CHW programmes 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 online supplemental table 2.

'Universal health coverage' and 'community participation' were the two commonly reflected PHC principles in the national CHW programmes across their objective/s, implementation and outcomes. 'Intersectoral coordination' was only mentioned in the outcome of Iran's Women Health Volunteers programme.[17] The objective of two CHW programmes 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 programmes.

Universal health coverage

We reviewed the national CHW programmes 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 programmes[18–20 26 27 32 34–37 39] and in the implementation of 14[17–20 26–29 32 34–37 39] programmes through the service provision by CHWs in the MCH and family planning domain. These 14 programmes reported improvements in the scope (population coverage) and range (comprehensiveness) of health services provided. For example, an outcome of the CHW programme in Iran

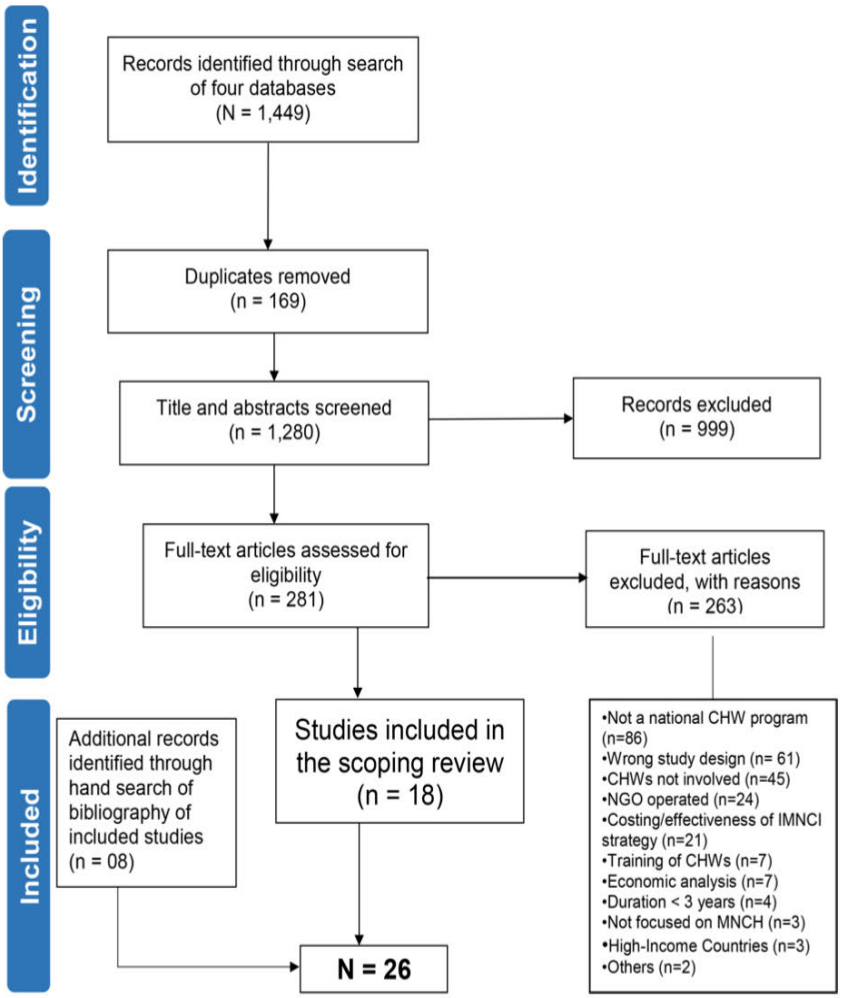


Figure 1 PRISMA flow chart for study selection and inclusion process. CHW, community health worker; IMNCI, integrated management of newborn and childhood illness; MNCH, maternal newborn and child health; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-analyses.

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 programme was claimed to be contributing to the increasing utilisation of antenatal care and family planning services.[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 programme 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 programme.[18]

Community participation

Only three[17–19] of the 14 CHW programmes included in this review incorporated community participation in their programme objective. In terms of implementation, 10 programmes[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 programmes[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

Table 1 Application of primary healthcare principles as reflected in the National community health worker programmes

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 Programme/1992[17]	Community participation	▶ Universal health coverage ▶ Community participation*	▶ Universal health coverage ▶ Community participation ▶ Intersectoral coordination
2.	**Iran**/Primary Healthcare Network —Expanded Programme on Immunisation/1983[35]	Universal health coverage	▶ Universal health coverage ▶ Community participation*	▶ Universal health coverage ▶ Appropriateness
3.	**Pakistan**/National Programme for Family Planning and Primary Healthcare/1994[27 33]	Universal health coverage	▶ Universal health coverage ▶ Community participation*	▶ Universal health coverage ▶ Community participation
4.	**India**/Accredited Social Health Activist Programme/2005[31 37 38]	▶ Universal health coverage ▶ Appropriateness	▶ Universal health coverage ▶ Community participation	▶ Universal health coverage
5.	**Bangladesh**/National MCH and Family Planning Programme/1976[29]	Not reported	▶ Universal health coverage ▶ Community participation*	Not reported
6.	**Nepal**/Female Community Health Volunteer Programme/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 Programme/2001[28]	Not reported	▶ Universal health coverage ▶ Community participation*	▶ Universal health coverage
8.	**Ethiopia**/Health Extension Programme/2003[19 30]	▶ Universal health coverage ▶ Community participation	▶ Universal health coverage ▶ Community participation	▶ Universal health coverage ▶ Community participation ▶ Appropriateness
9.	**Rwanda**/RapidSMS programme/2013[20]	▶ Universal health coverage ▶ Appropriateness	▶ Universal health coverage ▶ Community participation* ▶ Appropriateness	▶ Appropriateness (use of technology, acceptability)
10.	**Niger**/Rural Health Improvement Programme/1970s[32]	▶ Universal health coverage	▶ Universal health coverage	Not reported
11.	**South Africa**/ward-based outreach teams-national CHW programme/2011[39]	▶ Universal health coverage	▶ Universal health coverage ▶ Community participation	▶ Appropriateness
12.	**Brazil**/Family Health Programme (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 Programme/1976[36]	▶ Universal health coverage	▶ Universal health coverage ▶ Community participation*	▶ Universal health coverage
14.	**Jamaica**/Community Health Aide programme/1978[26]	▶ Universal health coverage	▶ Universal health coverage ▶ Community participation	▶ Universal health coverage

*Community participation consisted of only selection of community health workers from the local community in these programmes.
CHWP, Community Health Worker Programme; MCH, maternal and child health; PHC, primary healthcare.

CHWs were reported only in Ethiopia's Health Extension Programme.[30] In this programme 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 programme and only in the outcome of one[17] programme. The WHV Programme 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) programme 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, that is, 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 programme (to provide affordable and quality healthcare) but did not mention cultural appropriateness.[31] The RapidSMS programme 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 programmes. PHC principles do not appear to be applied with the rigour 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 programmes. In contrast, intersectoral coordination was stated in the outcome of only 1 of the 14 CHW programs[17] while none of the studies described the programmes 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 programmes. There is limited evidence in the reviewed 26 papers on the implementation of other two attributes, that is, 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 programmes 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 programmes are linked. Therefore, achieving UHC requires strengthening of health systems with effective integration of comprehensive CHW programmes 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 programmes 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 programme.[30] A successful CHW programme 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 programme, as well as establishing a supportive social and policy environment for community participation at national, district and local levels.[52] CHW programmes 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 mobilise 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 programmes and evaluation may indicate that invoking community participation is a challenge for these programmes.[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 programme evaluations of community participation activities that measure long-term outcomes and provide support for the CHW programmes to broaden their scope of community participation. Moreover, CHW programmes 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 programmes 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 CHW programmes 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 programmes 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 among 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 programmes ought to view these principles as two pillars that help achieve the UHC 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 programmes need to incorporate 'appropriateness' more explicitly in their objectives and then diligently pursue this in programme implementation and outcomes, which may contribute to addressing the current lack of evidence on the effectiveness of these programmes.[58]

Based on the findings of this scoping review, it can also be inferred that if the CHW programmes 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 mobilisation, completing surveillance activities and reducing the burden of formal healthcare system.[59]

The review has a number of limitations. First, it relied solely on the information reported in the papers to assess the application of PHC principles within the programmes. Many papers did not clearly articulate these principles or provide sufficient descriptions of the programme to allow an assessment to be made. As such the authors needed to interpret the evidence about principles in how the programme was implemented. These principles may be delineated elsewhere, for example, programme reports or funding agreements. Therefore, it is likely that we underestimated the application of PHC principles in these programmes. 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 programmes.

Second, we reviewed the CHW programmes identified only through the search of peer-reviewed published journal articles and there may be CHW programmes 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 programmes 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 programmes in LMICs is patchy. For comprehensiveness and improved health outcomes, programmes 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 programme 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 programmes. Future research may also focus on how to incorporate more attributes of the PHC principles while implementing national CHW programmes in LMICs.

Author affiliations
[1]School of Public Health, Faculty of Health and Medical Sciences, The University of Adelaide, Adelaide, South Australia, Australia
[2]Robinson Research Institute, Adelaide Medical School, Faculty of Health and Medical Sciences, The University of Adelaide, Adelaide, South Australia, Australia
[3]Department of International Health, Johns Hopkins University Bloomberg School of Public Health, Baltimore, Maryland, USA

Acknowledgements The authors would like to acknowledge the support of University of Adelaide's librarian Vikki Lington during the process of search strategy development for all included databases.

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. ZSL was involved in the screening and data charting of the articles and review of the manuscript. CL and MAM 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. HBP also reviewed the drafts critically and provided feedback. All authors approved the final version. SP is responsible for the overall content of the article.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval The information used in our scoping review was derived from publicly available data sources therefore, a formal ethics approval was not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information.

ORCID iDs
Shagufta Perveen http://orcid.org/0000-0001-8804-3635
Zohra S Lassi http://orcid.org/0000-0002-5350-6334
Mohammad Afzal Mahmood http://orcid.org/0000-0002-9395-8693

Henry B Perry http://orcid.org/0000-0003-0561-0492
Caroline Laurence http://orcid.org/0000-0002-8506-5238

REFERENCES

1 World Health Organization and the United Nations Children's Fund (UNICEF). *A vision for primary health care in the 21st century: towards universal health coverage and the sustainable development goals*. Geneva, 2018.
2 Bryant JH. *Ten years after Alma-Ata*. World Health, 1988.
3 UNICEF WHO. Declaration of Astana global conference on primary health care, Astana, Kazakhstan 2018 October 25-26. Available: https://www.who.int/primary-health/conference-phc [Accessed 02 Feb 2020].
4 Rifkin SB. Alma Ata after 40 years: primary health care and health for All-from consensus to complexity. *BMJ Glob Health* 2018;3:e001188.
5 World Health Organization. *The world health report 2008: primary health care now more than ever*. Geneva, 2008.
6 World Health Organization. *Strengthening the performance of community health workers in primary health care. Report of a WHO Study Group [meeting held in Geneva from Dec 2-9, 1987]. Tech Rep Ser*. Geneva, 1989: 1–46.
7 Rifkin SB. Paradigms lost: toward a new understanding of community participation in health programmes. *Acta Trop* 1996;61:79–92.
8 Lewin S, Babigumira S, Bosch-Capblanch X. *Lay health workers in primary and community health care: a systematic review of trials*. Geneva: World Health Organization, 2006.
9 Rifkin SB. Community health workers. In: Heggenhougen K, Quah S, eds. *International encyclopedia of public health*. San Diego Academic Press, 2008: 773–82.
10 Christopher JB, Le May A, Lewin S, *et al*. Thirty years after Alma-Ata: a systematic review of the impact of community health workers delivering curative interventions against malaria, pneumonia and diarrhoea on child mortality and morbidity in sub-Saharan Africa. *Hum Resour Health* 2011;9:27.
11 Kahssay HM, Taylor ME, Berman P. *Community health workers: the way forward*. United Kingdom: World Health Organization, 1998.
12 Lehmann U, Sanders D. *Community health workers: what do we know about them. The state of the evidence on programmes, activities, costs and impact on health outcomes of using community health workers*. Geneva: World Health Organization, 2007: 1–42.
13 Perry H. *Health for the people: national community health worker programs from Afghanistan to Zimbabwe: maternal and child survival program*, 2020.
14 Perry H. *A brief history of community health worker programs. Encyclopedia of public health Berlim*. Springer, 2013: 1–12.
15 Rifkin SB. *Health for All and Primary Health Care, 1978 - 2018: a historical perspective on policies and programs over 40 years*. Oxford Research Encyclopedia of Global Public Health USA: Oxford University Press, 2019.
16 Health Department Government of Sindh. Lady health worker program for family planning and primary health care Pakistan. Available: https://www.sindhhealth.gov.pk/LHW-Program [Accessed 13 Sep 2021].
17 Damari B, Riazi-Isfahani S. Evaluating the women health volunteers program in Iran- a quarter century experience (1992-2016). *Arch Iran Med* 2018;21:566–71.
18 Panday S, Bissell P, Teijlingen Evan, *et al*. Perceived barriers to accessing female community health volunteers' (FCHV) services among ethnic minority women in Nepal: a qualitative study. *PLoS One* 2019;14:e0217070.
19 Negussie A, Girma G. Is the role of health extension workers in the delivery of maternal and child health care services a significant attribute? The case of Dale district, southern Ethiopia. *BMC Health Serv Res* 2017;17:641.
20 Musabyimana A, Ruton H, Gaju E, *et al*. Assessing the perspectives of users and beneficiaries of a community health worker mHealth tracking system for mothers and children in Rwanda. *PLoS One* 2018;13:e0198725.
21 Perveen S, Mahmood MA, Lassi ZS, *et al*. Application of primary health care principles in national community health worker programs in low- and middle-income countries: a scoping review protocol. *JBI Evid Synth* 2021;19:270–83.
22 Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
23 Covidence systematic review software. Veritas Health Innovation, Melbourne, Australia. Available: www.covidence.org
24 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;8:19–32.
25 World Health Organization. *World Health organization and international bank for reconstruction and development / the world bank. tracking universal health coverage: 2017 global monitoring report*. Geneva, Switzerland, 2017.
26 Ennever O, McFarquhar E, White S, *et al*. Survey of community health aides in Jamaica (1987-1988). *West Indian Med J* 1990;39:100–8.
27 Hafeez A, Mohamud BK, Shiekh MR, *et al*. Lady health workers programme in Pakistan: challenges, achievements and the way forward. *J Pak Med Assoc* 2011;61:210.
28 Hasegawa A, Yasuoka J, Ly P, *et al*. Integrating child health services into malaria control services of village malaria workers in remote Cambodia: service utilization and knowledge of malaria management of caregivers. *Malar J* 2013;12:292.
29 Koblinsky MA, Brechin SJ, Clark SD, *et al*. Helping managers to manage: work schedules of field-workers in rural Bangladesh. *Stud Fam Plann* 1989;20:225–34.
30 Kok MC, Kea AZ, Datiko DG, *et al*. A qualitative assessment of health extension workers' relationships with the community and health sector in Ethiopia: opportunities for enhancing maternal health performance. *Hum Resour Health* 2015;13:80.
31 Kosec K, Avula R, Holtemeyer B, *et al*. Predictors of essential health and nutrition service delivery in Bihar, India: results from household and frontline worker surveys. *Glob Health Sci Pract* 2015;3:255–73.
32 Magnani RJ, Rice JC, Mock NB, *et al*. The impact of primary health care services on under-five mortality in rural niger. *Int J Epidemiol* 1996;25:568–77.
33 Memon Z, Zaidi S, Riaz A. Residual barriers for utilization of maternal and child health services: community perceptions from rural Pakistan. *Glob J Health Sci* 2015;8:47–57.
34 Mues KE, Resende JC, Santos OCdos, *et al*. User satisfaction with the family health program in Vespasiano, Minas Gerais, Brazil. *Rev Panam Salud Publica* 2012;31:454–60.
35 Nasseri K, Sadrizadeh B, Malek-Afzali H, *et al*. Primary health care and immunisation in Iran. *Public Health* 1991;105:229–38.
36 Rubin G, Chen C, de Herrera Y, *et al*. Primary health care workers: the rural health aide program in El Salvador. *Bull Pan Am Health Organ* 1983;17:42–50.
37 Saprii L, Richards E, Kokho P, *et al*. Community health workers in rural India: analysing the opportunities and challenges accredited social health activists (ASHAs) face in realising their multiple roles. *Hum Resour Health* 2015;13:95.
38 Ved R, Scott K, Gupta G, *et al*. How are gender inequalities facing India's one million ASHAs being addressed? policy origins and adaptations for the world's largest all-female community health worker programme. *Hum Resour Health* 2019;17:3.
39 Wilford A, Phakathi S, Haskins L, *et al*. Exploring the care provided to mothers and children by community health workers in South Africa: missed opportunities to provide comprehensive care. *BMC Public Health* 2018;18:171.
40 Afsar HA, Qureshi AF, Younus M, *et al*. Factors affecting unsuccessful referral by the lady health workers in Karachi, Pakistan. *J Pak Med Assoc* 2003;53:521–8.
41 Afsar HA, Younus M. Recommendations to strengthen the role of lady health workers in the National program for family planning and primary health care in Pakistan: the health workers perspective. *J Ayub M*
42 Douth an evaluation of the lady health worker programme. *Health Policy Plan* 2005;20:117–23.
43 Kohli C, Kishore J, Sharma S, *et al*. Knowledge and practice of accredited social health activists for maternal healthcare delivery in Delhi. *J Family Med Prim Care* 2015;4:359–63.
44 Panday S, Bissell P, van Teijlingen E, *et al*. The contribution of female community health volunteers (FCHVs) to maternity care in Nepal: a qualitative study. *BMC Health Serv Res* 2017;17:623.
45 Medhanyie A, Spigt M, Kifle Y, *et al*. The role of health extension workers in improving utilization of maternal health services in rural areas in Ethiopia: a cross sectional study. *BMC Health Serv Res* 2012;12:352.
46 Admassie A, Abebaw D, Woldemichael AD. Impact evaluation of the Ethiopian health services extension programme. *J Dev Effect* 2009;1:430–49.
47 Aquino R, de Oliveira NF, Barreto ML. Impact of the family health program on infant mortality in Brazilian municipalities. *Am J Public Health* 2009;99:87–93.
48 Primary health care: report of the International Conference on primary health care, Alma-Ata, USSR, 6-12 September 1978: WHO, UNICEF 1978:61–3.

49 Cueto M. The origins of primary health care and selective primary health care. *Am J Public Health* 2004;94:1864–74.
50 Walsh JA, Warren KS. Selective primary health care: an interim strategy for disease control in developing countries. *N Engl J Med* 1979;301:967–74.
51 Tulenko K, Møgedal S, Afzal MM, *et al*. Community health workers for universal health-care coverage: from fragmentation to synergy. *Bull World Health Organ* 2013;91:847–52.
52 Perry H, Crigler L. *Developing and strengthening community health worker programs at scale: a reference guide for program managers and policy makers*. Dhaka, Bangladesh: University Press Ltd, 2013.
53 World Health Organization. *WHO guideline on health policy and systems support to optimize community health worker programmes*. Geneva: World Health Organiztion, 2018.
54 Lawn JE, Rohde J, Rifkin S, *et al*. Alma-Ata 30 years on: revolutionary, relevant, and time to revitalise. *Lancet* 2008;372:917–27.
55 Kane S, Kok M, Ormel H, *et al*. Limits and opportunities to community health worker empowerment: a multi-country comparative study. *Soc Sci Med* 2016;164:27–34.
56 Low A, Ithindi T. Adding value and equity to primary healthcare through partnership working to establish a viable community health workers' programme in Namibia. *Crit Public Health* 2003;13:331–46.
57 Kane S, Radkar A, Gadgil M. Community health workers as influential health system actors and not "just another pair of hands". *Int J Health Policy Manag* 2021;10:465–74.
58 Gilmore B, McAuliffe E. Effectiveness of community health workers delivering preventive interventions for maternal and child health in low- and middle-income countries: a systematic review. *BMC Public Health* 2013;13:847.
59 Boyce MR, Katz R. Community health workers and pandemic preparedness: current and prospective roles. *Front Public Health* 2019;7:62.

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:	

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

Chapter 5

Chapter 5: Study 2: Indicator-Activities to Apply Primary Health Care Principles in National or Large-Scale Community Health Worker Programs—A Delphi Exercise

5.1 Preface

This chapter contains the second article that contributes to this thesis. The article has been published in *BMC Public Health* journal. In the scoping review presented in the previous chapter, the limited evidence of the application of PHC principles in CHWPs indicated the need to determine the relative importance of the application of these principles in CHWPs, and to identify what type of evidence would reflect their application. Therefore, a Delphi exercise (Study 2) was conducted to reach consensus on the importance of the application of PHC principles in CHWPs, and to develop a set of activities that can indicate their application in national or large-scale CHWPs.

A two-round modified Delphi study was undertaken with participants who have extensive experience in the planning, implementation or evaluation of CHWPs. Survey design and analysis was guided by the four PHC principles: UHC, community participation, intersectoral coordination and appropriateness. Responses were collected using a secure online survey program (SurveyMonkey). In round one, participants were asked to list 'core activities' that would reflect the application of each PHC principle and its sub-attributes and challenges in applying these principles in CHWPs. In round two, for the activities and challenges, participants were asked to select whether they agreed or disagreed with each activity and challenge. Consensus was set a priori at 70% agreement among experts for each question.

Seventeen participants from 15 countries participated in the study. Based on participants' responses, a set of 29 Indicator-Activities for the four PHC principles was developed with examples for each Indicator-Activity.

Supplementary material of the published article consists of the survey questionnaires for round one and round two of the Delphi exercise, provided as see Appendix B.

The Ethics approval letter for this study is provided as Appendix C.

5.2 Publication

Perveen S, Laurence C, Mahmood MA. Indicator-Activities to apply primary health care principles in national or large-scale community health worker programs: a Delphi exercise. BMC Public Health Aug 2022. https://doi.org/10.1186/s12889-022-13996-y

Statement of Authorship

Title of Paper	Indicator-Activities to apply primary health care principles in national or large-scale community health worker programs in low- and middle-income countries: a Delphi exercise.
Publication Status	☒ Published ☐Accepted for Publication ☐Submitted for Publication ☐Unpublished and unsubmitted work written in manuscript style
Publication Details	Perveen S, Laurence C, Mahmood MA. Indicator-Activities to apply primary health care principles in national or large-scale community health worker programs: a Delphi exercise. BMC Public Health, August 2022. . https://doi.org/10.1186/s12889-022-13996-y

Principal Author

Name of Principal Author (Candidate)	Shagufta Perveen		
Contribution to the Paper	Conceived and designed the study, conducted the surveys, analysed data and drafted the manuscript		
Overall percentage (%)	70%		
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research Candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	19 August 2022

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);
ii. permission is granted for the candidate to include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Prof Caroline Laurence		
Contribution to the Paper	Contributed to the design of the study, interpretation of findings and review of the manuscript		
Signature		Date	22 August 2022
Name of Co-Author	Dr Mohammad Afzal Mahmood		
Contribution to the Paper	Contributed to the design of the study, interpretation of findings and review of the manuscript		
Signature		Date	22 August 2022

Perveen *et al. BMC Public Health* (2022) 22:1599
https://doi.org/10.1186/s12889-022-13996-y

BMC Public Health

RESEARCH Open Access

Indicator-activities to apply primary health care principles in national or large-scale community health worker programs in low-and middle-income countries: a Delphi exercise

Shagufta Perveen[1*], Caroline Laurence[1] and Mohammad Afzal Mahmood[1,2]

Abstract

Introduction: Primary Health Care (PHC) gained considerable momentum in the past four decades and led to improved health outcomes across a wide variety of settings. In low-and middle-income countries (LMICs), national or large-scale Community Health Worker Programs (CHWPs) are considered as vehicles to incorporate PHC principles into healthcare provision and are an essential aspect of the PHC approach to achieve health for all and sustainable development goals. The success of CHWPs is rooted in the application of PHC principles. However, there is evidence that shows patchy implementation of PHC principles across national CHWPs in LMICs. This may reflect the lack of information on what activities would illustrate the application of these principles in CHWPs. This study aimed to identify a set of core/indicator-activities that reflect the application of PHC principles by CHWPs in LMICs.

Methods: A two-round modified Delphi study was undertaken with participants who have extensive experience in planning, implementation and evaluation of CHWPs. Survey design and analysis was guided by the four PHC principles namely Universal Health Coverage, Community Participation, Intersectoral Coordination and Appropriateness. Responses were collected using a secure online survey program (survey monkey). In round one, participants were asked to list 'core activities' that would reflect the application of each PHC principle and its sub-attributes and challenges to apply these principles in CHWPs. In round two, participants were asked to select whether they agree or disagree with each of the activities and challenges. Consensus was set a priori at 70% agreement of participants for each question.

Results: Seventeen participants from 15 countries participated in the study. Consensus was reached on 59 activities reflecting the application of PHC principles by CHWPs. Based on participants' responses, a set of 29 indicator-activities for the four PHC principles was developed with examples for each indicator-activity.

Conclusion: These indicator-activities may provide guidance on how PHC principles can be implemented in CHWPs. They can be used in the development and evaluation of CHWPs, particularly in their application of PHC principles. Future research may focus on testing the utility of indicator-activities on CHWPs in LMICs.

*Correspondence: shagufta.perveen@adelaide.edu.au

[1] School of Public Health, Faculty of Health and Medical Sciences, The University of Adelaide, Level 5 Rundle Mall Plaza, 50 Rundle Mall, Adelaide, South Australia 5000, Australia
Full list of author information is available at the end of the article

Keywords: Primary health care principles, Community health worker programs, Low-and middle-income countries, Delphi

Background

Primary Health Care (PHC) as an approach to achieve 'health for all' implies that all people, everywhere, deserve the right care [1]. In the context of many low- and middle-income countries (LMICs), the health systems are fragile and not adequately strengthened in terms of infrastructure and resources, limiting their capacity to reach out to the whole population to achieve 'health for all'. Therefore, Community Health Worker Programs (CHWPs) are considered as an essential aspect of the PHC approach to achieve health for all and sustainable development goals in LMICs [2]. As part of the PHC approach, CHWPs aim to reach wider population at their doorstep [3, 4]. The foundation of CHWPs was based on PHC principles in order to achieve improvements in health outcomes [5–8]. However, the process of implementing PHC principles in general has been challenging [9]. Lack of PHC integration has been identified as one of the main limits to programs' efficacy in LMICs [10]. Lack of uniformity in the application of PHC principles is also evident in national CHWPs in LMICs particularly for the principles of intersectoral coordination and appropriateness [11, 12]. This may be because it is difficult to define what the application of the PHC principles in a CHWP would look like, and that may be due to the lack of well-defined indicators or the types of activities that may represent the application of PHC principles.

There are various frameworks and indicators available which are focused on assessing the practice and performance of CHWs [13]. Some examples include the CHW Common Indicators Project (CIP), CHW Assessment and Improvement Matrix (AIM), Accompanimeter 1.0' tool and 5-SPICE framework.

The CHW-CIP proposes a set of common process and outcome constructs and indicators, such as workers' roles, support and supervision for workers, health and social needs and self-reported health status of participants to assess CHW practice and program implementation [14]. The 'Accompanimeter 1.0' tool and 5-SPICE framework developed by Partners in Health (PIH) in the United States focus on programmatic aspects such as workers skill development, incentives, supervision and partnering [15, 16]. The CHW-AIM developed by the USAID-funded Health Care Improvement (HCI) project encompasses various programmatic components which are critical to support CHWs and functionality indicators such as accreditation, supervision and how a community supports a program [17]. Another example is a framework for monitoring the performance of CHWs in LMICs developed by the Frontline Health project [18]. These examples indicate that majority of the frameworks are about processes and functions of the CHWPs and not about the application of PHC principles [13].

With reference to PHC, important initiatives also exist such as the Primary Health Care Performance Initiative (PHCPI), partnership that brings together country policymakers, health system managers, advocates and other development partners to catalyze PHC improvements in LMICs through better measurement, knowledge-sharing, and deploying data for improvement [19]. The measurement, however, focusses on inputs such as facilities and staff, service delivery such as perceived barriers to cost and treatment success rates and outputs such as antenatal care and immunization coverage. The above description highlights that there are important and useful tools to measure programmatic inputs and functionality, however they do not focus on the application of PHC principles.

The 2020 WHO's operational framework for PHC targets national government leaders in order to strengthen health systems and support countries in scaling up national implementation efforts on PHC [20]. It mentions that a commitment to PHC is founded on the principles of Declaration of Alma Ata and that the approach to PHC includes integrated services, community empowerment and intersectoral policy. The framework is about strategic and operational levers such as political commitment, funding, workforce etc. It encompasses all PHC principles but focuses on PHC implementation efforts at a high level than program level.

In order to address this gap, clear and carefully chosen indicator-activities are needed that reflect the application PHC principles and will contribute further to the success of CHWPs. Hence, this study aims to identify a set of indicator-activities that reflect the application of the PHC principles by national or large-scale CHWPs in LMICs.

Methods

Study design

A two-round modified Delphi study was undertaken to establish consensus on the importance of PHC principles and the core activities reflecting their application in the CHWPs in LMICs. The Delphi technique is an iterative multistage research method where sequential surveys or questionnaires are used to gather individual expert opinion via a number of rounds, as a means of establishing consensus opinion across the group of participants [21,

22]. The benefits of Delphi include the ability to gain the perspectives of a broadly experienced group of individuals and build consensus in an area where relevant literature or evidence may be lacking [21].

Recruitment of study participants

Participants were recruited using purposive sampling which focused on the recruitment of experts with multilevel perspectives and real-life implementation and evaluation experience rather than a large sample size. This was to ensure that consensus would be grounded in an applied understanding of CHWP implementation and evaluation in LMICs. Selection criteria included: five or more years of experience with national or large-scale CHWPs, in planning, implementation and/or evaluation in LMICs; and also fluent in reading and writing of English language. The selection criteria was not based on the participant's country of residence. A list of potential participants was devised based on the professional contacts of the research team and a review of the authors of reports and publications related to CHWPs. Recruitment emails were then sent to these potential participants, which included short introductory letter outlining the study's background and selection criteria, and the 'informed consent' form. Overall, 48 potential participants from Afghanistan, Bangladesh, Brazil, Canada, Ethiopia, Ghana, India, Iran, Jordan, Kenya, Malawi, Mozambique, Myanmar, Nepal, Pakistan, Rwanda, South Africa, United Kingdom, Uganda, USA and Zambia were contacted. Twenty-eight individuals responded out of which 20 consented to participate in the study.

Survey design and development

In this study, survey development, data collection, analysis and reporting of results were guided by the four foundational PHC principles namely universal health coverage (UHC), community participation, intersectoral coordination and appropriateness [5, 23].

Operational definition of UHC

It is important to note here that the concept of UHC combines the two early concepts of equity and access for all (universal coverage) and comprehensiveness [5] in its recent definition as "all individuals and communities receive the health services they need – including promotive, protective, preventive, curative, rehabilitative and palliative – of sufficient quality, without experiencing financial hardships [24]."

Use of the PHC principles for the survey structure aimed to facilitate greater participant understanding and a systemic approach to analysis across both survey rounds. National or large-scale CHWPs have been selected for the purpose of understanding the application of PHC principles however, the application is not confined to these programs alone.

Round one

A semi-structured qualitative questionnaire was designed for round one. Participants were asked to rate and rank the importance of incorporating each PHC principle in the implementation of national or large-scale CHWPs in LMICs. Participants were also asked to list core activities that would reflect the application of each PHC principle and its sub-attributes (Table 1) and challenges to apply these principles in CHWPs.

Round two

In the subsequent second round of the Delphi survey, participants were provided with a summary of the responses from the first round for the purpose of rating, ranking and identifying the core activities that may represent the application of each PHC principle and its sub-attributes along with the challenges for implementing these principles. For the activities and challenges, participants were asked to select whether they 'agree' or 'disagree' with each of the activities and challenges for the application of PHC principles in CHWPs. An open text box allowing for additional comments was also included with each question. To maintain the privacy and confidentiality of the participants, all responses were de-identified.

Data collection

Participants' responses were collected using a secure online survey program (survey monkey). For round one, participants accessed the survey by a link provided in the email and were required to agree to a statement of consent before commencing the survey. For round two, a separate survey link was provided by email to the study participants. Participants were given two weeks to complete each survey round. One reminder was sent at the end of the first week to maximise the number of responses. The round one survey was closed to allow

Table 1 Primary health care principles and their sub-attributes

PHC Principle	Sub-Attributes
Universal Health Coverage	Equity Access Comprehensiveness
Community Participation	-
Intersectoral Coordination	-
Appropriateness	Effectiveness Cultural acceptability Affordability Manageability

analysis before the opening of the second survey round. Each survey round questionnaire took approximately 20–30 min to complete. Figure 1 outlines the step-wise process for undertaking this Delphi survey.

Data analysis

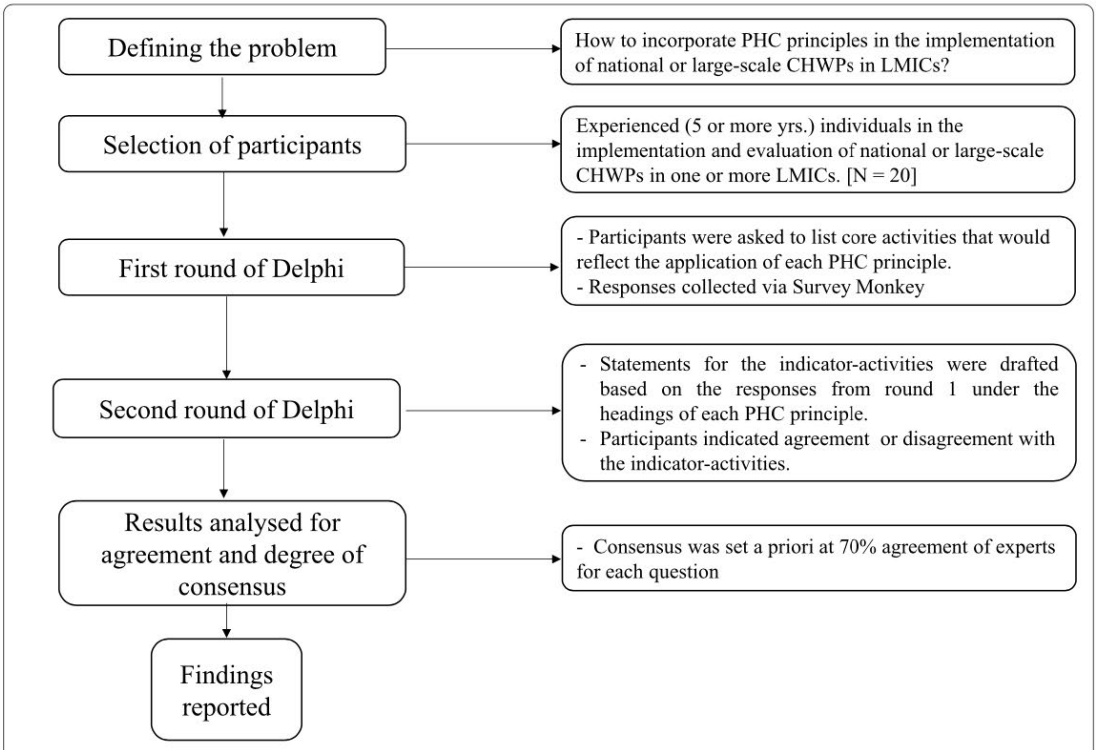
An analysis of responses was performed at the completion of each survey round and before the final analysis was undertaken. For the qualitative data from the first round, thematic content analysis [25] of the open text was used to identify the activities for applying PHC principles in national or large-scale CHWPs in LMICs. Statements for round two were developed based on the common themes which emerged from the round one data analysis. Consensus was set a priori at 70% agreement of experts for each question [21]. Consensus was considered as 'not met' if the agreement was <70% for each question. The list of agreed activities by participants was then synthesised further to develop a set of indicator-activities for each PHC principle and their sub-attributes with examples of types of activities for each indicator-activity.

Participants and public involvement

The summary results of the Delphi round one have been shared with the participants. Upon publication the final article will also be shared with the participants.

Positionality statement

Considering our combined work experiences and perspectives, as the authors we acknowledge that there is a possibility that this could impact our analysis and interpretation of the data. Thus, we have been reflexive of our positions and perspectives, and watchful, both individually and collectively, for any potential bias. Reflexive practice has helped us to achieve more objective research, including the design, data collection methods, analysis and interpretations. All authors are researcher-academicians in the field of public health. All authors are currently based in Australia, however one is a Pakistani national and two are Australian nationals, one of whom is of Pakistani origin.



CHWPs =Community Health Worker Programs; LMICs = Low-and Middle-Income Countries; PHC = Primary Health Care

Fig. 1 Step-wise process for undertaking Delphi survey

Results

Round one

Seventeen of the 20 participants (response rate = 85%) responded to the first survey round. These participants represented a range of professional expertise including program managers, researcher-academics, community engagement advisors, research project managers and advisors for monitoring and evaluation. Their demographics are presented in Table 2 below.

Consensus was reached on the importance of all the PHC principles in the implementation of national or large-scale CHWP in LMICs. The ranking of these principles in terms of their importance was more difficult for participants; however, consensus was reached on the point that community participation was the most important PHC principle to apply to achieve successful CHWPs in LMICs. Intersectoral coordination was reported as the most challenging PHC principle to implement in round one.

Analysis of open text qualitative data from round one identified the activities reflecting the application of each principle by the national or large-scale CHWPs. Participants also listed a number of challenges involved in applying PHC principles by CHWPs in LMICs.

Round two

Sixteen participants (response rate = 80%) who initially completed the first survey round completed the second round of the survey. A list of all the activities reported by the participants in round one is presented in Table 3 along with the level of agreement reached in round two of the Delphi exercise. Table 4 illustrates the level of agreement reached among participants for each of the identified challenges that they reported in relation to applying PHC principles in CHWPs.

Based on participant responses for the activities that reached consensus (Table 3), a set of 29 PHC indicator-activities for the four PHC principles, 1) UHC; 2) community participation; 3) intersectoral coordination; and 4) appropriateness; and their subsequent sub-attributes was developed with examples of types of activities for each indicator-activity (Table 5).

PHC Indicator-Activities for Universal Health Coverage

Five overarching indicator-activities for the principle of UHC were identified along with eight indicator-activities for the sub-attributes of 'equity', 'access' and 'comprehensiveness'. In the application of UHC, the indicator- activities encompass: service provision such as provision of medical care, outreach services and targeted services such as maternal and child care; defined catchment areas for the population being served; needs assessments being undertaken to ensure services meet community needs; appropriate selection of placement for CHWs; and community sensitisation where programs undertake activities that inform the community of services and their rights to care. The sub-attribute indicator-activities for 'equity' are planning and implementation for the provision of services according to need and taking

Table 2 Participant characteristics ($n = 17$)

Characteristic	Frequency	Percentage
Country of residence (WHO Regions)		
Region of the Americas	3	17.6
Brazil		
Canada		
Unites States of America		
African Region	8	47.1
Ethiopia		
Ghana		
Kenya—3 participants		
Mozambique		
Rwanda		
Zambia		
South-East Asia Region	4	23.5
Bangladesh		
India		
Indonesia		
Myanmar		
Eastern Mediterranean Region	1	5.9
Pakistan		
Western Pacific Region	1	5.9
Philippines		
Gender		
Male	8	47.1
Female	9	52.9
Age		
< 40 years	5	29.4
> 40 years	12	70.6
Qualification		
Doctoral Scientists	9	52.9
Master's degree	6	35.3
Others	2	11.8
CHW Program Experience		
Evaluation and Implementation	11	64.7
Research and Evaluation	2	11.8
Research and Implementation	2	11.8
Research	1	5.9
Others	1	5.9
Years of Experience		
5–10 years	8	47.1
10–20 years	6	35.3
20 + years	3	17.6

Table 3 Activities and agreement reported by the experts for the implementation of primary health care principles in Delphi rounds one and two

Principles	Activities	Level of agreement (%)
UNIVERSAL HEALTH COVERAGE	Provision of basic maternal, newborn and child health services	93.8
	Medical care services for physical and mental health	93.3
	Appropriate distribution of resources (Staff and material)	87.5
	Defining the catchment area	86.7
	Community sensitization	86.7
	Transparent distribution of resources	86.7
	Outreach services to remote areas	81.3
	Evaluation of the program implementation	69.2
	Annual [re]planning for implementation	57.1
Equity	Equity-based planning from the beginning	100
	Identification of groups that are discriminated against	100
	Removing financial and geographic barriers to health care	100
	Implementation focused on vulnerable sub-populations	93.8
	Service packages are adapted to the particular needs of disadvantaged groups	93.8
	Provision of services in hard to reach areas	87.5
	Gender mainstreaming	85.7
	Broadening of selection criteria of CHWs e.g. low literacy groups and women	78.6
	Bottleneck analyses	68.8
	Program cost discussion with the community representatives	50
Access	Identification of the causes of low demand and utilization	100
	Ensuring all community members can access the program	100
	Distribution of CHWs across a population	93.8
	Addressing privacy and confidentiality	81.3
	Ensuring financial protection	68.8
	Training and mentorship of CHWs	56.3
	Remuneration arrangements for CHWs in case of emergency	56.3
	Role clarity between the community, CHWs and supervisors/program	50
Comprehensiveness	Provision of preventive, curative, and rehabilitative services	100
	Linkages with higher level service providers	87.5
	Needs assessment	81.3
	Referral for and management of endemic illnesses	80
	Skilled CHWs	66.7
	Pro-active CHWs	53.3
COMMUNITY PARTICIPATION	Engaging traditional and other community leaders	100
	Ensuring feedback by the community [and acting on it]	92.9
	Involving community members in supervision of the program activities	87.5
	A practical monitoring system incorporating data from communities and the health system	87.5
	Joint ownership and design of CHW programs	81.3
	Availability of health data to the community	80
	Community sensitization and awareness of the program activities	75
	The integration of CHWs in health care decisions	75
	A balanced package of incentives for CHWs, both financial and non-financial	62.5

Table 3 (continued)

Principles	Activities	Level of agreement (%)
INTERSECTORAL COORDINATION	Senior leadership of the program—accessible and flexible	93.8
	CHWs working with community development personal and government officials	93.3
	Addressing needs of water, sanitation, food, housing, transport	87.5
	Horizontal integration at the service delivery level	87.5
	Involvement of multiple ministries/sectors	81.3
	Collaboration in governance structures from local to national level	80
	Partner mapping: to identify all partners who are implementing CHW related interventions	66.7
	Vertical integration within the health systems	46.7
APPROPRIATENESS	Need-based and context specific program design and implementation	93.3
	Prioritization of technically sound and operationally manageable service packages with max health impact	86.7
	Competent CHWs	86.7
	Respectable CHWs	80
	CHW program follows international ethical and human rights standards	66.7
Effectiveness	Monitoring to assess outputs with reference to the stated goals	100
	Review of health outcomes and from an equity lens	93.3
	Consistent access to required training, supplies and supervision for CHWs	86.7
	Monitoring and performance systems	80
	Clear coordination	71.4
	Achievement of the target of the specific programs	66.7
Cultural acceptability	Community involvement in the selection of the CHWs	100
	CHWs are in high demand, have access to all community members	93.3
	Monitoring to make sure that people understand the messages shared by CHWs	86.7
	Community ownership	85.7
	Community working with CHWs to address needs and concerns in an acceptable way	66.7
	Situation analysis of the target population	64.3
	Relevance of the primary health care, MNCH and reproductive health services	60
Affordability	Financial assessment of chosen intervention to envision sustainability	86.7
	Assess if transport cost is a barrier and provide subsidy/transport	86.7
	Assess the ability of the local community to pay	80
	Identify the costs of alternate interventions	78.6
	Assess if the full spectrum of treatment needed is affordable	73.3
	Provision of a basic package of health services that are cost effective	66.7
	Drugs dispensed free to all people irrespective of their ability to pay	53.3
Manageability	Adequate human resource	92.9
	Regular provision of a comprehensive package of services at a high standard of quality to all in need	86.7
	Adequate supportive supervision and performance review	85.7
	Continuous adjustment of the role of CHWs as the program evolves with respect to communities' needs	85.7
	A balanced package of financial and non-financial incentives for CHWs	66.7
	Majority of people are provided the needed services at the cost they can afford	66.7

into account the financial and geographical barriers to such services. As one of the participants highlighted:

> *"Understanding inequities in service coverage and health outcomes across different types of demographics as well as dynamics of discrimination within the local context is indeed important. Service delivery approaches can and should be tailored and planned with these understandings in mind.*

Table 4 Challenges to implement primary health care principles in community health worker programs

CHALLENGES	Level of agreement
Poor leadership and Governance	93.3
Inadequate resource allocation	93.3
Poor understanding of community needs	92.9
Sustainable funding	86.7
Geographic location	80
Political commitment	80
Intersectoral collaboration	80
Inadequate human resource for health	80
Understanding of PHC by the senior decision makers	80
Top-down approach	80
Adopting national approaches with flexible context-specific strategies	78.6
Non-involvement of critical stakeholders in non-health sectors	73.3
Misunderstanding of role of CHW as "doctor"	53.3
Taking CHW programs outside the bio-medical framework	50

Community Health Programs should contribute to building inclusive health systems for people of all abilities, gender identities, ethnicities, etc." (Participant 4).

The sub-attribute indicator-activities for 'access' include identification of cause for low demand, promotion of the program to the community and maintaining privacy and confidentiality. While the sub-attribute indicator-activities for 'comprehensiveness' include activities to provide a breadth of services and linkages with secondary and tertiary care.

PHC Indicator-Activities for Community participation

Two PHC indicator-activities were identified for community participation encompassing joint ownership and design of the CHWPs and availability of health data to the community. Joint ownership and design of the CHWPs include: identification of community leaders and representatives; engaging them in the design, implementation and evaluation of the CHWPs; and involving community at all levels from planning, selecting, training and oversight of CHWs. Availability of health data to the community facilitates community feedback and contributes to the establishment of a practical monitoring system which can incorporate data from communities and the health system. As one participant noted:

"Data should indeed be available to communities in order for them to be informed, provide feedback and participate in decision-making etc., but making the data available alone does not indicate community participation" (Participant 4).

PHC Indicator-Activities for Intersectoral Coordination

For the application of intersectoral coordination, the indicator-activities need to have non-health organisations represented in the planning and governance structures of CHWPs, in order to engage different sectors in the promotion of health, in particular to address the basic needs for water, sanitation, food, housing and transport. Another indicator-activity which reflects intersectoral coordination is public private partnership which requires CHWPs to engage with other actors in the community development sector and with government officials. This would then facilitate access to services and resources that are required for community needs beyond their health care needs. Multiple sectors thus need to collaborate to create supporting approaches to both the renumeration and career opportunities for the CHWs, and also to the provision of packages that would benefit particular populations such as cash transfers for pregnant and/or lactating women or to households living below the poverty line. As indicated by one of the study participants:

"When all sectors understand their role in supporting health and well-being of the people, their actions are synergistic and implement their activities as horizontal programs and not as silo programs" (Participant 13).

PHC Indicator-Activities for Appropriateness

Two overarching PHC indicator-activities were identified for the principle of appropriateness along with 10 indicators for the sub-attributes of 'effectiveness', 'cultural acceptability', 'affordability' and 'manageability'. In

Table 5 Indicator activities to implement PHC principles in national or large-scale community health worker programs

PHC Principle	Indicator Activity	Examples of the activity
UNIVERSAL HEALTH COVERAGE	Service Provision	•Provide maternal, newborn and child health services •Provide medical care services for physical and mental health •Provide outreach services to remote areas •Horizontal integration at the service delivery level
	Selection and placement of CHWs	•Select CHWs based on a broad criteria not limited by a literacy threshold •Have CHWs in all areas of the country, even the remotest hamlets •Distribute CHWs across a population to make it feasible for the CHW workload and individual care seeking
	Defined catchment area	•Define the catchment area with reference to the population that is to be served by the CHW program. This would facilitate needs assessment, service provision and connection to the formal health system in an organised manner
	Community Sensitization	•Inform the community about the core activities of the coverage •Ensure the community is aware of their right to have access to the needed care
	Needs assessment	•Identify varying needs of sub-population groups to provide equity-based care •Assess the staff and material needs of sub-population to distribute them accordingly •Assess what could work or not in each community in a manner (sensitive to social, economic and cultural aspects) and with a social determinants of health lens – Comprehensiveness
Equity	Planning	•Plan services that address the local inequities in service coverage and health outcomes across different types of demographics •Plan services with an understanding about dynamics of discrimination within the local context
	Implementation	•Provide services according to the needs of disadvantaged groups
	Address financial and geographic barriers to health care	•No user fee especially in rural health centres •Provide PHC services close to the community through outreach
Access	Identification of the causes of low demand and utilization	•Identify physical barriers and other supply-based barriers like access to quality care and human resources for health, supplies and commodities
	Promote community access to the program	•Ensure that all community members can access the program irrespective of distance, ethnic or religious group, gender, age, social status, physical and mental state, and ability to pay
	Ensure privacy and confidentiality	•Train CHWs to provide services considering privacy and confidentiality of the community members
Comprehensiveness	Provision of health services along the spectrum of preventive, curative, and rehabilitative services	•Presence of a functional health unit within the catchment area with primary health care activities
	Linkages with secondary and tertiary level services	•Establish linkages with other service providers and referral pathways to ensure comprehensiveness of a service package, especially if very few or no curative services are being provided directly by the CHWs •Collaborate in governance structures from local to national level

Table 5 (continued)

PHC Principle	Indicator Activity	Examples of the activity
COMMUNITY PARTICIAPTION	Joint ownership and design of CHWPs	•Engage community representatives to make sure that they are aware and involved in the design, implementation and evaluation of the program •Involve community at all levels of decision making from planning, training, selecting and oversight of CHWs •Ensure feedback from the community
	Availability of health data to the community	•Ensure that the community is informed, provide feedback and participate in decision-making •Establish a practical monitoring system incorporating data from communities and the health system
INTERSECTORAL COORDINATION	Representation of non-health organisations on planning and governance structures of CHWPs	•Negotiate to promote health and addressing needs of water, sanitation, food, housing and transport
	Public private partnership	•CHW program works with [other actors] in the community development sector •CHW program works with government officials •Provide benefit packages to particular populations (e.g. cash transfers for pregnant and lactating woman or households below the poverty line)
APPROPRIATENESS	Context specific program design and implementation	•Plan and implement interventions which adhere to community culture and demand
	Evidence-based interventions	Prioritize technically sound and operationally manageable service packages with maximum health impact
Effectiveness	Monitoring health outcomes	•Assess health outcomes with reference to the stated goals and from an equity lens •Ensure that quality of care is an integral part of the monitoring systems
	Monitoring performance	•Assess the competence of CHWs regularly on to make sure that they are skilled to address poor health and confident to be pro-active in using these skills
	Well-resourced CHWs	•Provide regular training, supplies and supervision to CHWs in order to ensure intended health outcomes
Cultural acceptability	Community involvement in the selection of the CHWs	•Consider factors influencing care-seeking by underserved groups e.g. language and other cultural norms
	Health Literacy	•Monitor that messages shared by CHW program [are such] to which people [relate to] and understand
Affordability	Cost effective interventions	•Assess the chosen and alternate interventions financially and in a context-specific manner •Assess if the full spectrum of treatment needed is affordable by the CHW program
	Identify and address financial barriers to health care	•Assess if transport cost is a barrier and provide subsidy/transport if necessary

Table 5 (continued)

PHC Principle	Indicator Activity	Examples of the activity
Manageability	Adequate human resources	•Supervisors, program managers and frontline health staff must have the capacity, clear role, time and resources to provide adequate supportive supervision and performance review
	Proportionate service provision	•Consider the range and complexity of services along with the size of the population to be served
	Continuous adjustment of the role of CHWs as the program evolves with respect to communities' needs	•Full-time, salaried CHW versus part-time, voluntary CHW •Make sure that the time commitment and renumeration of the CHWs are according to service package and catchment area

the application of appropriateness, the indicator-activities encompass context specific program designs and the implementation and selection of evidence-based interventions adhering to community culture and demand. Prioritization is needed for service packages that consider interventions that are technically sound, operationally manageable and offer the maximum health impact. The sub-attribute indicator-activities for 'effectiveness' include monitoring health outcomes with reference to the stated goals and with equity in mind; well-resourced CHWs with consistent access to required training, supplies and supervision for CHWs to implement CHWPs as designed and in accordance with the expectation of communities; and being able to assess the competence of CHWs. The sub-attribute indicator-activities for 'cultural acceptability' are based around community involvement in the selection of CHWs and health literacy of the community achieved through monitoring the messages shared by CHWPs that people both relate to and understand. One of the participants pointed out that:

> *"Cultural acceptability is met when those who are defined as the objective of an intervention become the subjects and work with CHWs to address both needs and concerns in a way that is acceptable [by the community in the given context]" (Participant 9).*

Indicator-activities for the sub-attribute of 'affordability' include; the provision of cost-effective interventions such as context-specific cost estimation for chosen and alternate interventions to assess sustainability; and identify and address financial barriers to health care. As one of the study participants highlighted:

> *"It is important to look at financial barriers (including transport) and cost effectiveness of interventions as well as compare the costs of alternative interventions (i.e., alternative methods for service delivery), but it does not necessarily mean all drugs/services need to be dispensed 'free of charge' (though it should be noted that health financing evidence demonstrates that pre-payment and adequate risk-pooling reduces financial barriers)" (Participant 4).*

Indicator-activities for the sub-attribute of 'manageability' include adequate human resources; proportionate service provision considering the range and complexity of services and the size of the population to be served; and continuous adjustment of the role of CHWs as the program evolves over time with respect to communities' needs.

Challenges in the application of PHC principles by CHWPs

The study participants also reported and agreed on a number of challenges involved in applying PHC principles by CHWPs. A consensus was reached by these participants around the issues of poor leadership and governance with insufficient political commitment and inadequate resource allocation. Other key challenges in applying PHC principles by CHWPs included the lack of adoption of national approaches, difficult geographic locations and poor intersectoral coordination. Study participants highlighted the need for the incorporation of PHC as the main strategy for health services implementation.

One of the participants stated that:

> *"Some countries have very fragmented health systems – a unified health system makes the application of PHC principles more feasible. Contexts of marked social inequalities are especially challenging" (Participant 6).*

Many countries, including LMICs, are renowned for their governments' top-down approaches or one-way decision-making which ignores the voices of the community. Although some health problems do require strong coordination and government leadership, community engagement is essential for sustainable application of PHC principles.

Discussion

The study findings demonstrate that experts agreed on 59 core activities which were then used to identify a set of indicator-activities to reflect the application of the PHC principles by CHWPs in LMICs. These indicator-activities provide guidance on how PHC principles can be implemented by CHWPs and be used in the development of new CHWPs as well as assist in their evaluation. The indicator-activities can also be used as a guide to address challenges identified by the study participants in the application of PHC principles by CHWPs.

Designing new CHWPs

The PHC indicator-activities can be used in the design of new CHWPs to ensure that the principles are applied and maximise the benefits of the CHWP for the community. They can also help guide prioritisation of the area of activities in relation to PHC principles. CHWP policies need to incorporate strategies to implement PHC principles which in turn need to be translated into specific actions and activities at an operational level. To ensure effectiveness when designing CHWPs, it is necessary to begin with a clear understanding of the PHC principles and the indicators which reflect their application on the ground. Careful operational planning based on PHC

principles is more likely to result in improved health outcomes at the community level [26].

Improving CHWP implementation

Evidence suggests that application of PHC principles leads to improved health outcomes [27]; therefore, it is important that CHWPs apply these principles during their implementation. The indicator-activities suggested in this study may contribute towards improving CHWPs (current and existing) by providing guidance on how PHC principles can be applied for better health outcomes. They also provide examples of how the less used principles in CHWPs such as 'intersectoral collaboration' could be included. For example, before any implementation, determining how multiple sectors will communicate and interact during the initial planning and funding stages and then after implementation and the evaluation stage of the CHWPs has the potential to facilitate the application of intersectoral coordination and ease the challenges that often accompany the implementation of this principle [28].

Evaluating CHWPs against PHC

A set of PHC indicator-activities can also be used to evaluate the performance of CHWPs in their application of PHC principles and identify areas of improvement, especially in the presence of a significant dearth of evidence in the evaluation of large-scale or national level CHWPs in LMICs [29–33]. Furthermore, the available evidence on current evaluations of CHWPs, focuses more on the outcomes and process measures related to the program and less on the underlying principles of the program [17]. Therefore, the indicator-activities could be considered as a first step towards adapting a principle-oriented approach for CHWP evaluation. Moreover, there is a lack of standardised measures to assess CHWPs in LMICs [34, 35]. Therefore, data cannot be aggregated across programs/regions, and this also hampers any cross-country comparisons. The indicator-activities identified through this study could thus allow comparisons across CHWPs (national and international) through the use of a common set of indicator-activities [35].

There are existing strategy, function and process oriented frameworks about CHWs and the programs utilising the services of CHWs [13–18]. Some of these existing frameworks do refer to one or two PHC principles, particularly community involvement [17]. The indicator-activities identified in this study through the Delphi exercise explain in some detail that if the CHWPs are aligned with all four fundamental PHC principles and their sub-attributes (Table 1). Moreover, this study emphasises that the direction of the strategy, function and processes of the CHWPs should be based on the principles of PHC.

The results of this Delphi exercise also reaffirm the strategic and operational levers put forward in the WHO Operational framework for translating the global commitments for PHC into actions and interventions [20]. This is a high level framework which mainly targets government leaders in order to accelerate national implementation efforts on PHC. The indicator-activities identified in this Delphi exercise align with the majority of strategic and operational levers in the WHO framework. Therefore, this study is also pertinent to recent guidelines set by the WHO and applied to national or large-scale CHWPs in LMICs. For example, the engagement of community and other stakeholders is one of the four core strategic levers included in the WHO framework which aims to strengthen national health systems. This complements the findings of the Delphi exercise where the participants agreed on a number of key points, importantly including the need to engage community leaders and ensure feedback by the community as well as to establish practical monitoring systems, which feature as one of the operational levers of the WHO framework.

Strengths and limitations

Use of the modified Delphi approach in this study enabled a pragmatic exploration of the activities to reflect the application of PHC principles in national or large-scale CHWPs in LMICs. Purposive sampling enabled recruitment of participants from different countries, health systems and program development, implementation and evaluation perspectives and improved content validity. Responses from round one, and levels of consensus for each PHC principle, were provided back to the participants for the purpose of the round two of the modified Delphi survey. Each opinion was given the same degree of importance in the analysis in order to eliminate the participant bias [36].

One of the limitations was sample size, although our sample is in line with previously published Delphi survey recommendations [37]. The richness of comments and perspectives shared by participants in the first survey round suggest that this sampling approach was appropriate. Secondly, the Delphi method has potential limitations as participants' responses might not be truly independent and may not be generalizable to settings of which the participants may not have any experience [38]. Anonymity between the study participants enabled participants to be open and honest about their views as well as providing them with an equal opportunity to express an opinion without feeling pressured to conform to the views of others [36].

Conclusion

This study has identified 29 core indicator-activities which can provide guidance on how PHC principles can be implemented in CHWPs in LMICs. These indicator-activities can be used in the development of new CHWPs and assist in the evaluation of CHWPs, particularly in their application of PHC principles. Future research may focus on testing the utility and applicability of PHC indicator-activities on CHWPs and involving more stakeholders such as CHWs themselves.

Abbreviations

CHWP: Community Health Worker Programs; LMICs: Low-and Middle-Income Countries; PHC: Primary Health Care; WHO: World Health Organisation.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-022-13996-y.

Additional file 1. Primary Health Care Principles and Community Health-Worker Programs in Low and Middle Income Countries(DELPHI ROUND ONE).

Additional file 2. Primary Health Care Principles and Community Health-Worker Programs in Low and Middle Income Countries(DELPHI ROUND TWO).

Acknowledgements

The authors would like to thank all the study participants who gave their time and expertise to this Delphi exercise.

Authors' contributions

SP had the primary responsibility for writing the manuscript and making revisions. SP contributed to the design of the questionnaires for round one and round two of the Delphi exercise, designed and conducted the surveys using Survey Monkey Software, analysed data and drafted the manuscript. CL and AM were involved in the conceptualisation and design of the study, provided continuous supervision and feedback during the conduct of it and reviewed all the drafts and provided instrumental feedback to improve subsequent versions by SP. All authors approved the final version.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Availability of data and materials

All data relevant to the study are included in the article.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the University of Adelaide's office of research ethics, compliance and integrity (approval number H-2020–179). All methods were performed in accordance with the relevant guidelines and regulations. All participants provided their informed consent, including their acknowledgement of the purpose, benefits, and potential risks of this study, as well as their rights as participants prior to their participation.

Consent for publication

Not applicable.

Competing interests

None declared.

Author details

[1]School of Public Health, Faculty of Health and Medical Sciences, The University of Adelaide, Level 5 Rundle Mall Plaza, 50 Rundle Mall, Adelaide, South Australia 5000, Australia. [2]Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.

Received: 17 October 2021 Accepted: 8 August 2022
Published online: 22 August 2022

References

1. World Health Organization. Primary health care 1978 [Available from: https://www.who.int/health-topics/primary-health-care#tab=tab_1.
2. Perry HB, Hodgins S. Health for the people: past, current, and future contributions of national community health worker programs to achieving global health goals. Glob Health Sci Pract. 2021;9(1):1–9.
3. Lewin S, Babigumira S, Bosch-Capblanch X, Aja G, Van Wyk B, Glenton C, et al. Lay health workers in primary and community health care: a systematic review of trials. Geneva: World Health Organization; 2006.
4. Walt G, Perera M, Heggenhougen K. Are large-scale volunteer community health worker programmes feasible? the case of Sri Lanka. Soc Sci Med. 1989;29(5):599–608.
5. Bryant JH. Ten years after Alma-Ata. World Health. World Health Organization; 1988. Available from: https://apps.who.int/iris/bitstream/handle/10665/52699/WH-1988-Aug-Sep-p10-15-eng.pdf?sequence=1#:~:text=Professor-,John%20H.,Riga%2C%20USSR%2C%20in%20March.
6. Rifkin SB. Alma ata after 40 years: primary health care and health for all-from consensus to complexity. BMJ Glob Health. 2018;3(Suppl 3):e001188.
7. World Health Organization & United Nations Children's Fund (UNICEF). A vision for primary health care in the 21st century: towards universal health coverage and the Sustainable Development Goals. Geneva: World Health Organization; 2018. Available from: https://apps.who.int/iris/handle/10665/328065. License: CC BY-NC-SA 3.0 IGO.
8. Kahssay HM, Taylor ME, Berman P. Community health workers: the way forward. United Kingdom: World Health Organization; 1998.
9. Rifkin SB. Health for all and primary health care, 1978–2018: a historical perspective on policies and programs over 40 years. Oxford Research Encyclopedia of Global Public Health USA: Oxford University Press; 2019.
10. Druetz T. Integrated primary health care in low- and middle-income countries: a double challenge. BMC Med Ethics. 2018;19(Suppl 1):48.
11. Visagie S, Schneider M. Implementation of the principles of primary health care in a rural area of South Africa. Afr J Prm Health Care Fam Med. 2014;6(1):1–10. https://doi.org/10.4102/phcfm.v6i1.562.
12. Perveen S, Lassi ZS, Mahmood MA, Perry HB, Laurence C. Application of primary health care principles in national community health worker programs in low- and middle -income countries: a scoping review. BMJ Open. 2022;12(2):e051940.
13. Kok M, Crigler L, Musoke D, Ballard M, Hodgins S, Perry HB. Community health workers at the dawn of a new era: 10. programme performance and its assessment. Health Research Policy and Systems. 2021;19(3):1–14.
14. Rodela K, Wiggins N, Maes K, Campos-Dominguez T, Adewumi V, Jewell P, et al. The Community Health Worker (CHW) common indicators project: engaging CHWs in measurement to sustain the profession. Front Public Health. 2021;9:674858.
15. Carrasco H, Napier H, Giber D, Kang S, Aguerreberre M, Hing M, et al. Accompanimeter 1.0: creation and initial field testing of a tool to assess the extent to which the principles and building blocks of accompaniment are present in community health worker programs. Glob Health Action. 2019;12(1):1699348.
16. Palazuelos D, Ellis K, Im DD, Peckarsky M, Schwarz D, Farmer DB, et al. 5-SPICE: the application of an original framework for community health worker program design, quality improvement and research agenda setting. Glob Health Action. 2013;6:19658.
17. Ballard M, Bonds M, Burey J-A, Foth J, Fiori K, Holeman I, et al. Community health worker assessment and improvement matrix (CHW AIM): updated program functionality matrix for optimizing community health programs. Community Health Impact Coalition: Initiatives Inc., UNICEF and USAID; 2018.

18. Agarwal S, Sripad P, Johnson C, Kirk K, Bellows B, Ana J, et al. A conceptual framework for measuring community health workforce performance within primary health care systems. Hum Resour Health. 2019;17(1):86.
19. Masis L, Gichaga A, Zerayacob T, Lu C, Perry HB. Community health workers at the dawn of a new era: 4 Programme financing. Health Res Policy Sys. 2021;19(3):1–17.
20. World Health Organization and the United Nations Children's Fund (UNICEF). Operational framework for primary health care: transforming vision into action. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/337641. License: CC BY-NC-SA 3.0 IGO.
21. Havers SM, Martin E, Wilson A, Hall L. Implementation of government-directed policy in the hospital setting: a modified Delphi study. Health Res Policy Syst. 2019;17(1):91.
22. Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. J Adv Nurs. 2000;32(4):1008–15.
23. Primary Health Care: report of the International Conference on Primary Health Care, Alma-Ata, USSR, 6–12 September 1978. WHO, UNICEF; 1978. p. 4–5.
24. World Health Organization and International Bank for Reconstruction and Development / The World Bank. Tracking universal health coverage: 2017 global monitoring report. Geneva: Switzerland; 2017. Report No.: 978-92-4-151355-5.
25. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77–101.
26. Pallas SW, Minhas D, Perez-Escamilla R, Taylor L, Curry L, Bradley EH. Community health workers in low- and middle-income countries: what do we know about scaling up and sustainability? Am J Public Health. 2013;103(7):e74-82.
27. World Health Organization. The world health report 2008: primary health care now more than ever. Geneva: World Health Organization; 2008. Report No.: 9241563737. Available from: https://apps.who.int/iris/handle/10665/43949.
28. Schneider H, Nxumalo N. Leadership and governance of community health worker programmes at scale: a cross case analysis of provincial implementation in South Africa. Int J Equity Health. 2017;16(1):72.
29. Bhutta ZA, Lassi ZS, Pariyo G, Huicho L. Global experience of community health workers for delivery of health related millennium development goals: a systematic review, country case studies, and recommendations for integration into national health systems. Global health workforce Alliance. 2010;1(249):61.
30. Perry H. A brief history of community health worker programs. Encyclopedia of Public Health Berlim: Springer; 2013. p. 1–12.
31. Christopher JB, Le May A, Lewin S, Ross DA. Thirty years after Alma-Ata: a systematic review of the impact of community health workers delivering curative interventions against malaria, pneumonia and diarrhoea on child mortality and morbidity in sub-Saharan Africa. Hum Resour Health. 2011;9(1):27.
32. Perry H, Zulliger R, How effective are community health workers. An overview of current evidence with recommendations for strengthening community health worker programs to accelerate progress in achieving the health-related millennium development goals Baltimore: Johns Hopkins Bloomberg School of public health. 2012.
33. Gilmore B, McAuliffe E. Effectiveness of community health workers delivering preventive interventions for maternal and child health in low- and middle-income countries: a systematic review. BMC Public Health. 2013;13:847.
34. Scott K, Beckham S, Gross M, Pariyo G, Rao KD, Cometto G, et al. What do we know about community-based health worker programs? a systematic review of existing reviews on community health workers. Hum Resour Health. 2018;16(1):39.
35. Michigan Community Health Worker Alliance (MiCHWA). CHW Common Indicator Project 2020 [Available from: https://www.michwa.org/news/common-indicators-project.
36. Keeney S, Hasson F, McKenna HP. A critical review of the Delphi technique as a research methodology for nursing. Int J Nurs Stud. 2001;38(2):195–200.
37. Hsu C-C, Sandford BA. The Delphi technique: making sense of consensus. Pract Assess Res Eval. 2007;12(10):1–8.
38. Fink-Hafner D, Dagen T, Doušak M, Novak M, Hafner-Fink M. Delphi method: strengths and weaknesses. Adv Methodol Stat. 2019;16(2):1–9.

Publisher's Note

Chapter 6

Chapter 6: Study 3: Assessing the Utility of Indicator-Activities to Apply Primary Health Care Principles in Community Health Worker Programs in LMICs

6.1 Preface

This chapter contains the third article that contributes to this thesis. The article is submitted in the Journal of Primary Care and Community Health. In Study 2, a set of 29 Indicator-Activities was developed through the Delphi exercise to reflect the application of PHC principles in CHWPs. However, these indicators have not been tested or piloted on CHWPs. Therefore, Study 3 was conducted to assess the utility of the Indicator-Activities on CHWPs and to refine the indicator descriptors.

The study included two CHWPs from Pakistan and Ethiopia, namely: (i) the NPFPPHC, commonly known as the Lady Health Worker Program, which was initiated in 1994 in Pakistan; and (ii) the national HEP, which was initiated in 2003 in Ethiopia. A desk review using the READ approach was conducted for all publicly available documents for the two CHWPs. The documents consisted of program reports, evaluations, planning documents and policy briefs.

In total, 20 documents were obtained from both CHWPs. Evidence was found for 12 Indicator-Activities in both CHWPs, and partial evidence was noted for 12 Indicator-Activities in one or both CHWPs. No documentary evidence was available for two Indicator-Activities (ensure privacy and confidentiality, and health literacy) across the planning, implementation and evaluation documents of both CHWPs.

6.2 Publication

Perveen S, Mahmood MA, Laurence C. Assessing the utility of primary health care Indicator-Activities in the context of low- and middle-income countries: a document analysis

Statement of Authorship

Title of Paper	Assessing the utility of primary health care Indicator-Activities in the context of low- and middle-income countries: a document analysis
Publication Status	☐ Published ☐Accepted for Publication ☒Submitted for Publication ☐Unpublished and unsubmitted work written in manuscript style
Publication Details	Submitted to Journal of Primary Care and Community Health

Principal Author

Name of Principal Author (Candidate)	Shagufta Perveen		
Contribution to the Paper	Conceived and designed the study, conducted data extraction and synthesis, drafted the manuscript.		
Overall percentage (%)	80%		
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research Candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	19 August 2022

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);
ii. permission is granted for the candidate to include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr Mohammad Afzal Mahmood		
Contribution to the Paper	Contributed to the design of the study, interpretation of findings and review of the manuscript		
Signature		Date	22 August 2022
Name of Co-Author	Prof Caroline Laurence		
Contribution to the Paper	Contributed to the design of the study, interpretation of findings and review of the manuscript		
Signature		Date	22 August 2022

Assessing the Utility of Primary Health Care Indicator-Activities in the Context of Low- and Middle-Income Countries: A Document Analysis

Shagufta Perveen,[1*] Mohammad Afzal Mahmood,[1, 2] Caroline Laurence[1]

[1]School of Public Health, Faculty of Health and Medical Sciences, University of Adelaide, Adelaide, South Australia, Australia

[2]Faculty of Medicine, Universitas Airlangga, Indonesia

*Corresponding author
Email: shagufta.perveen@adelaide.edu.au (SP)

6.3 Abstract

CHWPs have the potential to contribute to global health goals if their activities are aligned with the principles of PHC. The limited research and advice on how PHC principles can be applied by CHWPs in LMICs highlights the need for a set of Indicator-Activities that can guide the application of these principles by CHWPs. A recent study identified a core set of 29 PHC Indicator-Activities that CHWPs can use to guide their application of PHC principles.[94] The aim of this study is to assess the utility of those Indicator-Activities. A desk review using the READ approach was conducted of publicly available documents of two CHWPs: the NPFPPHC, commonly known as the Lady Health Worker Program of Pakistan; and the national HEP of Ethiopia. The documents that were collated consisted of programmatic materials such as evaluation reports, case studies, policy briefs, planning documents and working papers produced outside of formal publication channels. In total, 20 documents were reviewed. Overall, out of 29 Indicator-Activities, strong evidence was available for 22 Indicator-Activities in both CHWPs, partial evidence was observed for four Indicator-Activities and there was no evidence for two Indicator-Activities across both CHWPs reviewed in this study. One activity was found to be overlapping with the Indicator-Activity of 'joint ownership and design of the CHWP' so it was merged with it. The findings confirm that the PHC Indicator-Activities identified are likely to be applicable to CHWPs in LMICs. These indicators can be used to assess the application of PHC principles, which can inform the design and monitoring of CHWPs in the context of LMICs. Future research should focus on assessing the Indicator-Activities in the field and applying them to a broad range of CHWPs.

KEY WORDS: Indicator-Activities, Primary Health Care Principles, Document Analysis, Community Health Worker Programs

6.4 Introduction

For more than four decades, PHC has remained a key approach for strengthening the health system and improving access to locally relevant essential health services for all.[9] PHC as an approach to organise health care was agreed upon by the member states at the World Health Assembly in 1977 and the subsequent international conference in 1978 on PHC held in Alma-Ata with the slogan of 'Health for All'.[13] More recent discourse, such as the 2018 Astana Declaration, has reaffirmed the significance of PHC and its principles in strengthening health systems and achieving health-related SDGs.[38] As an approach to health system development, PHC has demonstrated links to better health outcomes, improved equity and increased health security.[3, 7, 14, 34, 35]

CHWPs are an important 'community-centred' health systems strengthening strategy that supports the uptake of the PHC approach.[7, 42, 89] In LMICs in particular, many CHWPs have been implemented as part of the PHC approach to enhance access to essential health care services close to communities and as a means of achieving 'Health for All'.[63] The 2015 SDGs recommended the expansion and institutionalisation of CHWPs by national governments to achieve these updated goals.[22] This recommendation further enhances global interest in CHWPs as a strategy to increase access to basic health services and strengthen health systems.[22, 69, 72]

CHWPs range from small-scale programs, which often implement specific interventions over a short period, to large-scale programs implemented by NGOs and national-level government-sponsored CHWPs.[43, 95] Regardless of the size of the CHWPs, to be effective they need to incorporate PHC principles, including community participation, UHC, intersectoral collaboration and appropriateness, and to align their design, implementation and evaluation activities with those principles.[3, 4, 16, 66, 96]

Because of the importance of CHWPs in strengthening health systems, a number of frameworks and indicators are available to assess their performance.[72] Examples include the CHW Common Indicators Project (CIP), the CHW Assessment and Improvement Matrix (AIM) toolkit, the Accompanimeter 1.0 tool, the 5-SPICE framework, the PHC Performance Initiative (PHCPI) and the WHO's guidelines on health policy and system support to optimise CHWPs.[40, 72, 79, 97-100] These frameworks and indicators mainly focus on national-level governance, strategies and funding, and local-level functionality and processes (i.e., how to

implement and monitor CHWPs). However, these frameworks do not explicitly assess the application of PHC principles in CHWPs.

A recent study identified a core set of indicators that provides a potential guide for the application of PHC principles in CHWPs.[94] This set of indicators defines 29 activities that point to whether a CHWP is aligned with PHC principles (see Table 6.1). However, these indicators have not been tested or piloted on CHWPs. The aim of this study is to assess the utility of those Indicator-Activities in national CHWPs and to refine the indicator descriptors.

Table 6.1: Indicator-activities from Delphi exercise to apply primary health care principles in community health worker programs

PHC Principles and Sub-Attributes	Indicator-Activities
Universal health coverage	Service provision
	Selection and placement of CHWs
	Defined catchment area
	Community sensitisation
	Needs assessment
Equity	Planning
	Implementation
	Address financial and geographic barriers to health care
Access	Identification of the causes of low demand and utilisation
	Promote community access to the program
	Ensure privacy and confidentiality
Comprehensiveness	Provision of health services along the spectrum of preventive, curative and rehabilitative services
	Linkages with secondary and tertiary-level services
Community participation	Joint ownership and design of CHWPs
	Availability of health data to the community
Intersectoral coordination	Representation of non-health organisations on planning and governance structures of CHWPs
	Public–private partnership
Appropriateness	Context-specific program design and implementation
	Evidence-based interventions
Effectiveness	Monitoring health outcomes
	Monitoring performance
	Well-resourced CHWs
Cultural acceptability	Community involvement in the selection of CHWs
	Health literacy

PHC Principles and Sub-Attributes	Indicator-Activities
Affordability	Cost-effective interventions
	Identify and address financial barriers to health care
Manageability	Adequate human resources
	Proportionate service provision
	Continuous adjustment of the role of CHWs as the program evolves with respect to communities' needs

Notes: CHW: community health worker, CHWP: community health worker program, PHC: primary health care

6.5 Materials and Methods

Study design: A systematic qualitative document analysis was conducted to assess the utility of PHC Indicator-Activities developed recently.[101]

Study setting: The study included two national-level CHWPs from Ethiopia and Pakistan. The formal name of the Ethiopian CHWP is the national 'Health Extension Program' (HEP) and Pakistan's CHWP is the NPFPPHC, commonly known as the 'Lady Health Worker Program'. The selection criteria for choosing these CHWPs included: (i) national coverage, (ii) CHWPs as part of the well-established health infrastructure, (iii) contributions to improvements in health outcomes such as MCH, immunisation, family planning and communicable diseases,[102-105] and (iv) availability of documents informing the planning, implementation and evaluation of these programs. The two CHWPs have been implemented differently: Pakistan's program administration has devolved to provincial levels, whereas Ethiopia's program is managed centrally at the national level.

Ethiopia's HEP: This flagship program of the government of Ethiopia was launched by the Federal Ministry of Health in 2003.[106] It aimed to improve access to health care services in rural areas in order to improve health outcomes by targeting households and communities.[107] The program focuses on health promotion, disease prevention including immunisation, provision of family planning services, treatment of selected illnesses, documentation of community health status, and mobilisation of the community for health campaigns. The program also provides ongoing support to people with a chronic illness such as HIV/AIDS.[63, 108] The HEP provides health services at the household, community and health post levels. CHWs are deployed in pairs—two for every village serving a population of 3,000–5,000 people—and affiliated with each village's health post.[63]

Pakistan's NPFPPHC: In 1994, Pakistan's Ministry of Health launched its CHWP as part of a national strategy to improve health by bringing health services to the doorsteps of underserved communities. The program has been running for 24 years and has undergone various administrative changes during this time, ranging from federal management to post-devolution provincial management and regularisation of CHWs as government employees. The program plays a major role in providing primary care services and reducing the burden of disease via preventive strategies and health education for communities, especially in rural areas.[52] The prime role of the program is to provide basic primary care services to communities and organise them by developing women groups and health committees. Each CHW is responsible for approximately 1,000 people within a catchment area of 200 houses.[109]

Data collection and analysis: Document analysis of the two CHWPs was conducted using publicly available documents since the inception of the CHWPs. We used the READ approach as a stepwise guide for a systematic and thorough review of the documents.[93] The steps of this approach are (1) ready your materials, (2) extract data, (3) analyse data and (4) distil the findings.[93] For the first step, all of the relevant material was collected by searching grey literature using Google Search and contacting CHWP officials in Pakistan and Ethiopia. The search terms consisted of related terms for CHWPs combined with the name of each of the two countries included in the document analysis. The search strategy was designed to be broad to minimise the possibility of missing relevant documents, and it included all types of descriptive, explanatory and evaluation evidence. The search was conducted during January and February 2022. The documents collated consisted of programmatic materials such as case studies, policy briefs, planning documents, evaluation reports and working papers produced outside of formal publication channels. The documents were then categorised based on their focus as either planning, implementation or evaluation. The document analysis did not include any peer-reviewed published articles. The second step consisted of data extraction into a Microsoft Excel spreadsheet where each row was a document and each column was a category of information such as document title, type of document, author, date, and evidence for each of the PHC Indicator-Activities. The data extraction form is provided in the S1 Appendix. In the third step, we followed a thematic content analysis approach for qualitative synthesis of information extracted from the documents.[110] The themes were developed a priori from the PHC principles and Indicator-Activities. The thematic content analysis approach is the most appropriate for application on descriptive data from program/project documents for aggregate synthesis of information.[110] The level of evidence found for an Indicator-Activity in a CHWP was classified

as ‘evidence available’ if it was found across two or more types of documents (planning, implementation or evaluation) of a CHWP. ‘Partial evidence available’ reflected that the information was found only in one type of document in a CHWP. ‘No evidence available’ meant no information was found in any type of document reviewed for that program in relation to an Indicator-Activity. The document review was continued until all available documents had been reviewed. In the fourth and last step of the READ approach, the distillation process led to the synthesis of findings in tabular and narrative form, as reported in the results section of this paper. The overall understanding of the utility of each particular PHC Indicator-Activity was developed by considering the collective evidence from the two CHWPs that was classified as ‘overall level of evidence’ (Table 6.2).

Table 6.2: Classification of overall level of evidence for Indicator-Activities

Overall Level of Evidence	CHWP 1	CHWP 2
Strong evidence	Evidence available	Evidence available
	Evidence available	Partial evidence
Partial evidence	Partial evidence	Partial evidence
	Partial evidence	No evidence
No evidence	No evidence	No evidence

Note: CHWP: community health worker program

6.6 Results

In total, 20 documents were reviewed from both CHWPs. The S2 Appendix illustrates the types of documents included in this analysis. The ‘overall level of evidence’ was strong for 22 of 29 Indicator-Activities and partial for four Indicator-Activities, while no evidence was found for two Indicator-Activities. One activity was found to be overlapping with the Indicator-Activity of ‘joint ownership and design of the CHWP’ so it was merged with it. The level of evidence found for each Indicator-Activity in and across the two CHWPs is presented in Table 6.3.

Table 6.3: Summary of evidence for primary health care Indicator-Activities in the two community health worker programs

PHC Principles and Sub-Attributes	Indicator-Activities	Evidence in HEP of Ethiopia	Source of Evidence	Evidence in NPFPPHC of Pakistan	Source of Evidence	Overall Level of Evidence for the Indicator-Activity Across the Two CHWPs
Universal health coverage	Service provision	Evidence available	Planning, implementation and evaluation	Evidence available	Planning, implementation and evaluation	Strong evidence
	Defined catchment area	Evidence available	Planning, Implementation and evaluation	Evidence available	Planning, implementation and evaluation	Strong evidence
	Selection and placement of CHWs	Evidence available	Planning, implementation and evaluation	Evidence available	Planning, implementation and evaluation	Strong evidence
	Community sensitisation	*Partial evidence available*	Evaluation	Evidence available	Planning and implementation	Strong evidence
	Needs assessment	Evidence available	Planning and implementation	*Partial evidence available*	Evaluation	Strong evidence
Equity	Planning	Evidence available	Planning	Evidence available	Planning and evaluation	Strong evidence
	Implementation	Evidence available	Implementation	Evidence available	Implementation and evaluation	Strong evidence
	Address financial and geographic barriers to health care	Evidence available	Planning, implementation and evaluation	Evidence available	Planning, implementation and evaluation	Strong evidence

PHC Principles and Sub-Attributes	Indicator-Activities	Evidence in HEP of Ethiopia	Source of Evidence	Evidence in NPFPPHC of Pakistan	Source of Evidence	Overall Level of Evidence for the Indicator-Activity Across the Two CHWPs
Access	Identification of the causes of low demand and utilisation	Evidence available	Implementation and evaluation	*Partial evidence available*	Planning	Strong evidence
	Promote community access to the program	Evidence available	Planning, implementation and evaluation	Evidence available	Planning and implementation	Strong evidence
	Ensure privacy and confidentiality	No evidence available	—	No evidence available	—	No evidence
Comprehensiveness	Provision of health services along the spectrum of preventive, curative and rehabilitative services	Evidence available	Planning, implementation and evaluation	Evidence available	Planning, implementation and evaluation	Strong evidence
	Linkages with secondary and tertiary-level services	Evidence available	Planning and implementation	Evidence available	Planning and implementation	Strong evidence
Community participation	Joint ownership and design of community health worker programs	Evidence available	Planning, implementation and evaluation	Evidence available	Planning, implementation and evaluation	Strong evidence
	Availability of health data to the community	*Overlaps with the Indicator-Activities of joint ownership and design of the CHWP and effectiveness*.				
Intersectoral coordination	Representation of non-health organisations on planning and governance structures of CHWPs	Evidence available	Planning and implementation	Evidence available	Planning and evaluation	Strong evidence

PHC Principles and Sub-Attributes	Indicator-Activities	Evidence in HEP of Ethiopia	Source of Evidence	Evidence in NPFPPHC of Pakistan	Source of Evidence	Overall Level of Evidence for the Indicator-Activity Across the Two CHWPs
	Public–private partnership	Evidence available	Implementation and evaluation	*Partial evidence available*	Planning	Strong evidence
Appropriateness	Context-specific program design and implementation	Evidence available	Implementation and evaluation	*Partial evidence available*	Evaluation	Strong evidence
	Evidence-based interventions	Evidence available	Planning and evaluation	*Partial evidence available*	Planning	Strong evidence
Effectiveness	Monitoring health outcomes	Evidence available	Planning, implementation and evaluation	Evidence available	Planning, implementation and evaluation	Strong evidence
	Monitoring performance of CHWs	Evidence available	Planning, implementation and evaluation	*Partial evidence available*	Evaluation	Strong evidence
	Well-resourced CHWs	Evidence available	Planning, implementation and evaluation	Evidence available	Planning, implementation and evaluation	Strong evidence
Cultural acceptability	Community involvement in the selection of CHWs	Evidence available	Implementation and evaluation	Evidence available	Implementation and evaluation	Strong evidence
	Health literacy	No evidence available	—	No evidence available	—	No evidence

PHC Principles and Sub-Attributes	Indicator-Activities	Evidence in HEP of Ethiopia	Source of Evidence	Evidence in NPFPPHC of Pakistan	Source of Evidence	Overall Level of Evidence for the Indicator-Activity Across the Two CHWPs
Affordability	Cost-effective interventions	*Partial evidence available*	Planning	No evidence available	—	Partial evidence
	Identify and address financial barriers to health care	*Partial evidence available*	Planning	No evidence available	—	Partial evidence
Manageability	Adequate human resources	Evidence available	Planning implementation and evaluation	Evidence available	Planning implementation and evaluation	Strong evidence
	Proportionate service provision	*Partial evidence available*	Implementation	*Partial evidence available*	Evaluation	Partial evidence
	CHWs' role adjustment: *Continuous adjustment of the role of CHWs as the program evolves with respect to communities' needs*	*Partial evidence available*	Evaluation	*Partial evidence available*	Evaluation	Partial evidence

Notes: CHW: community health worker, HEP: Health Extension Program, NPFPPHC: National Program for Family Planning and Primary Health Care

Details of the evidence found in the documents for each Indicator-Activity are shown in Table 6.4. The 'overall level of evidence' is summarised in the following paragraphs.

Strong evidence: Strong evidence was available for most of the Indicator-Activities (22 of 29) across both CHWPs.

There are 13 Indicator-Activities for the principle of UHC and its sub-attributes, and strong evidence was found for 12 of those 13 activities (see Table 6.3). As an example, the Indicator-Activity of service provision and defined catchment area encompasses whether a program clearly defines a population subset to which a CHW is tasked with providing a set of locally relevant services. Both CHWPs stated a distinct number of individuals for whom each CHW is responsible for providing a definitive set of health services such as maternal health, basic treatment, contraceptives and referrals[96, 105, 108] (see Table 6.4).

There are two Indicator-Activities related to the principle of intersectoral coordination, and strong evidence was found for both of them. For example, evidence was available for the 'representation of non-health organisations on planning and governance structures' in the HEP, with documents reporting a multisectoral, inter-ministerial partnership involving the ministries of health, finance, education and labour.[106] This program also showed evidence of collaborations with other subnational health authorities and finance bureaus for the provision of training and salaries of CHWs via a payroll system. Conversely, for the NPFPPHC, partial evidence was found for this Indicator-Activity under the principle of intersectoral coordination[96] (see Table 6.4). The overall level of evidence was therefore classified as 'strong evidence' for this Indicator-Activity. Similarly, for the Indicator-Activity 'public–private partnership', evidence was reported in two types of documents from the HEP but only one planning document of the NPFPPHC (see Table 6.3).

Strong evidence was noted for the Indicator-Activity of 'joint ownership and design of the CHWP' under the principle of community participation (see Table 6.3). For example, community organisation for health promotion activities and the selection of CHWs from within the area reflects this principle in the NPFPPHC.[52, 109] The HEP documents revealed a well-defined stepwise strategy for including the community in all stages of program planning and implementation, from decision-making to evaluating the CHWP in Ethiopia[, 63, 106, 111] (see Table 6.4).

Strong evidence was found for the majority (9 of 12) of the Indicator-Activities related to the principle of appropriateness and its sub-attributes (effectiveness, cultural acceptability, affordability and manageability). For example, evidence related to the Indicator-Activity 'monitoring health outcomes', which reflects effectiveness under the principle of appropriateness, was identified across all types of documents for both CHWPs. Both programs have designed and implemented health information systems to improve the continuous monitoring and evaluation of the CHWP (see Table 6.4). In contrast, evidence for the Indicator-Activity 'context-specific program design and implementation' was only noted in an evaluation report of the NPFPPHC. The partial evidence for this Indicator-Activity suggests that the NPFPPHC focuses on the needs of marginalised populations in general, but may not be specifically targeting subpopulation groups with specific concerns such as remoteness, nutritional deficiencies and relatively higher health education needs.[96] In contrast, evidence was found in two types of documents for the HEP (strong evidence).[111, 112] The overall level of evidence was therefore classified as 'strong evidence' for this Indicator-Activity.

Partial evidence: Partial evidence was noted for four Indicator-Activities (see Table 6.3). The evidence was partial in both CHWPs for the Indicator-Activities 'proportionate service provision' and 'CHWs' role adjustment as the program evolves with respect to communities' needs' under the principle of appropriateness. No information was found in relation to the Indicator-Activities 'cost-effective interventions' and 'addressing financial barriers to health care' in the NPFPPHC under the principle of appropriateness, but partial evidence was found for these activities in the HEP. The overall level of evidence was therefore classified as 'partial' for these Indicator-Activities.

For example, evidence for 'proportionate service provision' was only noted in an implementation document of the HEP and in an evaluation report of the NPFPPHC.[96, 108] Evidence for 'CHWs' role adjustment' was only noted in an evaluation report of the HEP, indicating that the program incorporates additional services that were not part of the original HEP packages and includes high-impact curative services such as integrated community case management, community-based newborn care and treatment of common childhood illnesses. Similarly, evidence for this activity was only noted in an evaluation report of the NPFPPHC (see Table 6.4).

No evidence: There was no evidence available in any types of documents for two Indicator-Activities: 'ensure privacy and confidentiality' and 'health literacy' (see Table 6.3).

The descriptors for the Indicator-Activities developed through the Delphi research were refined by merging and appropriate placement of the Indicator-Activities under a specific PHC principle or a sub-attribute of the principle based on the evidence found in this document analysis. The resultant list of Indicator-Activities and a description of the activities are provided in Table 6.5.

Table 6.4: Example of evidence from Ethiopia and Pakistan's community health worker programs

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
Universal health coverage	Service provision	Service provision at the health post and outreach, including health promotion; disease prevention; family planning and mental health services; diagnosis and treatment of uncomplicated, common illnesses including malaria, pneumonia, diarrhoea and malnutrition in the community; and documentation of community health status. Referral of severe cases.	Provision of health promotion, prevention and curative services. Basic MCH services that they provide include reproductive health education, promotion of healthy behaviours, family planning and HIV/AIDS care. CHWs provide regular treatment for diarrhoea, malaria, acute respiratory tract infections and intestinal worms. Contraceptives are provided as part of family planning.
	Defined catchment area	Two CHWs are deployed for each health post serving 3,000 to 5,000 population. Each kebele (village) has two CHWs; thus, at any given moment, one is present in the community and one at the health post.	Each CHW is responsible for approximately 1,000 people within a catchment area of 200 houses.
	Selection and placement of CHWs	Nationally agreed criteria for the selection of CHWs: residence in the village, capacity to speak the local language, graduation from 10th grade and willingness to remain in the village and serve communities.	Criteria for selection of CHWs includes a literacy threshold of a minimum of 8 years of education, between 18 and 50 years old, and reside in, be accepted by and be recommended by the communities they serve.
	Community sensitisation	The community's awareness of available CHWP service packages was only 58.8% in 2019.	Communities being served by CHWs have a reasonably high awareness of family planning and where to obtain family planning methods.
Equity	Needs assessment	After analysis of the socioeconomic, cultural and environmental diversities of the Ethiopian	CHWP facilitates pro-poor access to health in some provinces, whereas in others, the

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
		population, three versions of the CHWP were designed and implemented to suit agrarian, pastoralist and urban populations.	program appears to be heavily targeted at higher wealth quintiles, which strongly suggests that the program is not targeting the most vulnerable and marginalised groups.
	Equity-based planning and implementation	Planning strategy 2020–2035: CHWP service packages will be expanded to align interventions with changes in disease epidemiology and to meet the needs and expectations of communities. Evaluation 2019: The CHWP packages are relevant in addressing the current health needs of the rural community.	The CHWP provides more services to low-income and poor households than any alternative service provider in the public sector. However, there is scope to further increase the level and quality of services and to increase coverage to the underserved and the poor. There appear to be no mechanisms to ensure that CHWs ask women about their family planning needs. The limited time spent on family planning, the few women seen per week and the level of stockouts are likely to have contributed to the limited progress the program has made during the past decade in family planning.
	Address financial and geographic barriers to health care	During 2020–2035, construction of health posts for communities with sedentary lifestyles will be supplemented by the expansion of mobile health services for communities with semi-sedentary and mobile lifestyles. Women receive care from nearby health posts or the associated CHWs; since the inception of the CHWP, the proportion of health posts	CHWs provide family planning and PHC services to rural areas and urban slums at the doorstep of the community. The incomplete and unsystematic geographic coverage of the program means that significant numbers of high priority areas are not served in regions of Pakistan.

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
		that are capable of providing antenatal care has increased to 83%.	
Access	Identification of the causes of low demand and utilisation	The absence of curative services has been a source of dissatisfaction and limits the acceptance of services provided at health posts. This is evidenced by bypassing health posts to visit higher-level health facilities for services that can be provided at the health post level. Delivery services were the most recommended by women to be included as part of CHWP packages in addition to the demand for treatment of sick adults and children.	Research on effective utilisation of CHWs was part of planning in 2016.
	Promote community access to the program	Health posts are almost universally available in Ethiopia. However, a substantial number of health posts (35%) have access to roads that only function during dry seasons, and 6% of health posts have no access to a paved road connecting them to the referral health centres.	CHWs facilitate timely access to services because they reside in the same community. They work directly out of their homes, which are commonly called 'health houses'.
	Ensure privacy and confidentiality	*Lack of evidence noted*	*Lack of evidence noted*
Comprehensiveness	Provision of health services along the spectrum of preventive, curative and rehabilitative services	CHWs provide promotive, preventive and selected curative health services to the community of their origin. The services are categorised into four major programmatic areas including non-communicable diseases and mental health services: (i) family health,	CHWs provide preventive, promotive and deliver some of the basic curative care in their communities as mentioned under service provision.

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
		(ii) disease prevention and control, (ii) hygiene and environmental sanitation, and (iv) health education and communication.	
	Linkages with secondary and tertiary-level services	There are clear national policies and guidelines for supervision, referral and linkage with the formal health care delivery system, which carries out regular supervision. Referral care is good because most health centres have an ambulance that can travel to the health post or to a village to transport mothers in labour and emergency cases to the health centre or primary hospital.	CHWs act as liaisons between formal health systems and the community, and ensure coordinated support from NGOs and other departments. They coordinate with local traditional birth attendants/midwives or other skilled birth attendants and local health facilities for appropriate antenatal, natal and postnatal services.
Community participation	Joint ownership and design of CHWPs	In the operationalisation of the CHWP, community engagement and ownership is realised through participation in and contribution to the resourcing of the CHWP, the selection of candidates for CHWs, the monitoring of the CHWP services and CHWs themselves, and participation in the governance of the health services.	CHWs are expected to establish a village health committee for men and women in order to organise the community to participate in health promotion activities (e.g., family planning, immunisation, improved sanitation and nutrition). CHWs also provide a range of community development services and participate in community meetings.
Intersectoral coordination	Representation of non-health organisations on planning and governance structures of CHWPs	The ministries of health and education collaborated to implement the cycles of recruiting, training and deployment of CHWs. The Ministry of Health also worked with the subnational health authorities to ensure that HEWs received practical training in health centres under the supervision of health	Significant coordination problems were noted in all regions except one. In regions where the CHWP remained a standalone program and had not been integrated, government stakeholders consistently reported a lack of mechanisms for coordination between key stakeholders,

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
		workers. The subnational finance bureaus routed salaries to the deployed CHWs through the payroll system for regular employees.	particularly the Health Department, the Population Welfare Department and the People's Primary Healthcare Initiative.
	Public–private partnership	Development partners have aligned around the national health strategy during CHWP implementation. Significant resources have been channelled from the partners to pay for medical equipment, drugs, supplies, and pre- and in-service training and teaching materials. These partners have also contributed technically and financially to the distribution of commodities and continuous evaluation of CHWPs to provide evidence for improving program implementation.	2010 planning commission form intends to partner with NGOs and community-based organisations in selected areas to mutually benefit from each other's experience and resources, and to promote strategies for sharing all resources available at the grassroots level.
Appropriateness	Context-specific program design and implementation	Upon deployment, CHWs assess the village to understand the context, resources, population structure and priority health problems. They select 'model families' in collaboration with the village administration. CHWs train these families for 96 hours. The training is not limited to theoretical aspects of health promotion and disease prevention. The criteria for certification of a household include visible changes in behaviour (for example, owning and using a latrine, proper hand washing, completing immunisation schedules, and accessing antenatal care by pregnant mothers).	Where the CHWP is operating, it generally addresses the needs of marginalised and vulnerable women and children. However, the extent to which it does so has been compromised across all regions by: (i) the lack of an explicit focus on geographical areas and socioeconomic groups with the greatest need; (ii) an increasing focus on immunisation relative to other health, health education and nutrition needs; and (iii) management and resourcing problems.

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
	Evidence-based interventions	The design of the package of CHW-provided health interventions was based on an analysis of major disease burdens for most of the population. As a result of the rise in non-communicable diseases, non-communicable disease prevention and other priority communicable and neglected tropical diseases were recently incorporated in the CHWP.	2016 planning strategy includes research on issues such as malnutrition, effective utilisation of maternal, newborn and child health services, anaemia, newborn care, community midwives, CHWs services and utilisation to assist in evidence-based decision-making, policy formulation, planning and consequent advocacy.
Effectiveness	Monitoring health outcomes	To improve the continuous monitoring and evaluation of the CHWP and measure its effect over time, the federal ministry of health designed a community health information system (CHIS) that includes a central family folder. This folder is retained at the health post and is a medical record of an entire household in relation to the CHWP package of interventions. Further strengthening and digitalisation of CHIS is included in the 2020–2035 planning of the CHWP.	The CHWP has a management information system (MIS) that informs quarterly review meetings and provides analytical feedback on CHWs' health records. The MIS records and transmits all CHW PHC activities to the district, provincial and federal management levels. This allows CHWs to keep track of the health status and needs of their catchment population, and it informs performance evaluation processes. However, integration of the MIS into the national health system is a challenge.
	Monitoring performance	CHWs are accountable to and supervised by environmental health professionals and public health nurses. CHWs attend integrated refresher training (IRT) to address the skill and knowledge gaps identified during the supervisory visit.	CHWs' knowledge assessments are routinely conducted by their supervisors using scorecards. There is a need to re-emphasise information about family planning commodities and management of side effects in CHWs' training was highlighted. These low levels of knowledge occur against the backdrop where CHWs do

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
			not counsel for side effects or contraindications, thus compounding the problem of appropriate use of contraceptives by their clients or what happens if their clients encounter side effects. No evidence of CHWs' skills assessment was observed.
	Well-resourced CHWs	All selected CHWs receive one year of didactic and practical training in 16 health care packages. Through regular evaluation of their performance and identification of gaps, CHWs receive in-service training to strengthen their capacity. Stockouts of drugs for long periods have been common. CHWs are mainly supervised and supported by the health centre staff, with whom they work closely.	The training of CHWs is conducted in two phases for a total of 15 months using program training manuals and a curriculum. The 2019 evaluation reported that consistent issues with the CHWP logistics management system have resulted in significant gaps in the provision of basic supplies and equipment, leaving CHWs seriously under-supplied with drugs and contraceptives. The supervision of CHWs takes place in the community at least once a month, at which time the CHW's supervisor meets with clients and with the CHW, reviews the CHW's work using a standardised designed checklist, and makes a work plan for the next month.
Cultural acceptability	Community involvement in the selection of the CHWs	CHWs are selected by the community in which they live (in collaboration with village administration). In the household survey, more than 70% of respondents said that the CHWP has been accepted by the community	The selection committee of a CHW includes a medical officer of the area (chair), a female medical officer, a lady health visitor, a dispenser and a community member (all from the same community for which the CHW is being selected).

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
		and that the community trusts the CHWs and considers them a model for good behaviour.	
	Health literacy	*Lack of evidence noted*	*Lack of evidence noted*
Affordability	Cost-effective interventions	The Ethiopian CHWP intends to introduce an earmarked budget for the CHWP at all levels and enhance resource mobilisation from nongovernment sources in order to make the CHWP cost-effective and affordable for the community.	*Lack of evidence noted*
	Identify and address financial barriers to health care	The CHWP aims to ensure sustainable funding and eliminate financial hardship from the CHWP services by prioritising government spending at the primary health care unit level and covering the cost of curative health services at health posts through user fees and community-based health insurance.	*Lack of evidence noted*
Manageability	Adequate human resources	In 2019, there were 39,878 CHWs staffing 17,587 health posts throughout the country, as per the projected estimates. Currently, on average 2.4 CHWs are available per health post, and 87% of health posts meet the minimum requirement of 2 CHWs per health post.	All regions of Pakistan have encountered significant human resource problems post-devolution.
	Proportionate service provision	Once deployed to their respective communities, CHWs divide their time between providing services at health posts	In response to the shortage of human resources, all provinces have increased the caseload of CHWs from a maximum of a population of 1,000 residents to 1,500,

PHC Principles and Sub-Attributes	Indicator-Activity	Example of the Evidence from the Available Documents of Community Health Worker Programs	
		Health Extension Program of Ethiopia	National Program for Family Planning and Primary Health Care of Pakistan
		and undertaking community promotion programs at the household level.	although this was done without full consideration of the ability of an LHW to provide the same level of service to a larger population. Moreover, there has been a significant expansion in the expectation of the involvement of LHWs in programming that is outside their core responsibilities—in particular, involvement in polio campaigns—although LHWs are often expected to be involved in other campaigns, such as relating to dengue or malaria.
	Continuous adjustment of the role of CHWs as the program evolves with respect to communities' needs	Currently, the Ethiopian CHWP incorporates additional services that were not part of the original CHWP package. They include high-impact curative services, such as integrated community case management, community-based newborn care, and treatment of common childhood illnesses.	Six innovations (out of 13 pilot innovations) were rolled out in 2008 to become part of the CHWs' scope of services.

Notes: CHW: community health worker, CHWP: community health worker program, PHC: primary health care, NGO: non-government organisation

Table 6.5: Indicator-Activities reflecting the application of primary health care principles in a community health worker program

PHC Principle	Indicator-Activity	Example Description
Universal health coverage	Service provision	Provision of (i) maternal, newborn and child health services, (ii) physical and mental health care services, (iii) outreach services to remote areas and (iv) horizontal integration at the service delivery level.
	Defined catchment area	Define the catchment area with reference to the population that is to be served by the CHW program. This would facilitate a needs assessment, service provision and connection to the formal health system in an organised manner.
	Selection and placement of CHWs	Select CHWs based on a broad criterion not limited by a literacy threshold; universal placement of CHWs in all areas of the country, even the remotest hamlets; appropriate distribution of CHWs across a population to make it feasible for the CHW workload and individual care seeking.
	Community sensitisation	Inform the community about the core activities of the coverage and ensure that the community is aware of their right to have access to the needed care.
Equity	Needs assessment	Identify varying needs of subpopulation groups to provide equity-based care; assess the staff and material needs of subpopulations to meet these needs accordingly; assess what could work, or not, in each community in a way that is sensitive to social, economic and cultural aspects, and with a social determinants of health lens—comprehensiveness.
	Equity-based planning and implementation	Plan and provide services that address the local inequities in service coverage and health outcomes across different types of demographics with an understanding of the dynamics of discrimination within the local context and according to the needs of disadvantaged groups.
	Address financial and geographic barriers to health care	Provide PHC services close to the community through outreach and no user fees, especially in rural health centres.
Access	Identification of the causes of low demand and utilisation	Identify physical barriers and other supply-based barriers like access to quality care and human resources for health, supplies and commodities.
	Promote community access to the program	Ensure that all community members can access the program irrespective of their distance, ethnic or religious group, gender, age, social status, physical and mental state, and ability to pay.

PHC Principle	Indicator-Activity	Example Description
	Ensure privacy and confidentiality	Train CHWs to provide services considering the privacy and confidentiality of the community members.
Comprehensiveness	Provision of health services along the spectrum of preventive, curative and rehabilitative services	Presence of a functional health unit within the catchment area with primary health care activities.
	Linkages with secondary and tertiary-level services	Establish linkages with other service providers and referral pathways to ensure comprehensiveness of a service package (especially if few or no curative services are being provided directly by CHWs) and collaborate with governance structures from the local to the national level.
Community participation	Joint ownership and design of CHWPs	• Engage community representatives to ensure they are aware of and involved in the design, implementation and evaluation of the program • Involve community at all levels of decision-making, including planning, training, selecting and oversight of CHWs • Obtain feedback from the community • Ensure that the community is informed, provide feedback and participate in decision-making • Establish a practical monitoring system incorporating data from communities and the health system.
Intersectoral coordination	Representation of non-health organisations on planning and governance structures of CHWPs	Negotiate to promote health and address the needs of water, sanitation, food, housing and transport.
	Public–private partnership	The CHWP works with government officials and (other actors) in the community development sector to provide benefit packages to particular populations (e.g., cash transfers for pregnant and lactating woman or households below the poverty line).
Appropriateness	Context-specific program design and implementation	Plan and implement interventions that adhere to community culture and demand.
	Evidence-based interventions	Prioritise technically sound and operationally manageable service packages with maximum health impact.

PHC Principle	Indicator-Activity	Example Description
Effectiveness	Monitoring health outcomes	Assess health outcomes with reference to the stated goals and from an equity lens; Ensure that quality of care is an integral part of the monitoring systems.
	Monitoring performance	Assess the competence of CHWs regularly to ensure that they are skilled to address poor health and confident in being proactive in using these skills.
	Well-resourced CHWs	Provide regular training, supplies and supervision to CHWs to ensure intended health outcomes.
Cultural acceptability	Community involvement in the selection of CHWs	Consider factors influencing care seeking by underserved groups (e.g., language and other cultural norms).
	Health literacy	Monitor messages shared by the CHWP to ensure that people relate to and understand them.
Affordability	Cost-effective interventions	Assess the chosen and alternative interventions financially and in a context-specific manner; assess whether the full spectrum of treatment needed is affordable by the CHWP.
	Identify and address financial barriers to health care	Assess whether transport cost is a barrier and provide subsidy/transport if necessary.
Manageability	Adequate human resources	Supervisors, program managers and frontline health staff must have the capacity, clear role, time and resources to provide adequate supportive supervision and performance review.
	Proportionate service provision	Consider the range and complexity of services along with the size of the population to be served.
	Continuous adjustment of the role of CHWs as the program evolves with respect to communities' needs	Full-time, salaried CHWs versus part-time, voluntary CHWs; ensure that the time commitment and salary of the CHWs are according to the service package and catchment area.

Notes: CHW: community health worker, CHWP: community health worker program, PHC: primary health care

6.7 Discussion

To the best of our knowledge, this is the first study that has assessed the utility of a set of Indicator-Activities for the application of PHC principles by CHWPs in LMICs. The findings of the document analysis confirm that PHC Indicator-Activities are applicable to CHWPs, because most (22 of 29) of these Indicator-Activities are evident in the two national-level CHWPs. The results also highlight areas that CHWPs need to focus on to improve community engagement to increase program acceptance, access and utility.

CHWPs' success is founded on the PHC approach, and Indicator-Activities can be used as descriptors to optimise the application of PHC principles by these programs. It is often difficult to evaluate CHWPs because of the variability in their defining characteristics and their emphasis on certain particular roles and responsibilities of CHWs.[81] The roles and responsibilities of CHWs may also vary according to the national context (e.g., morbidity, national priorities, fiscal situation); however, despite varying roles and responsibilities, CHWPs should still focus on PHC principles.

Because CHWPs are complex entities, their assessment needs to be based on data derived from a mix of reliable sources and obtained through the use of mixed methods. There are numerous existing tools to measure the performance of individual CHWs, programmatic determinants of CHWs' performance, community-level outcomes and contextual factors that influence CHWPs.[72] However, these tools tend to focus more on governance, managerial, administration and fiscal aspects of CHWPs. The set of Indicator-Activities identified through a Delphi process and assessed for its utility through this document analysis is added to this toolbox and fills the gap in the method to assess the application of PHC principles by CHWPs. Used in combination with the existing tools, Indicator-Activities can provide a complete picture of CHWPs' performance from the PHC perspective. Therefore, these Indicator-Activities can be used to plan and monitor national-level CHWPs in LMICs, track outcomes and assess whether these programs are meeting their intended objectives related to PHC principles.

Evidence could not be found for the Indicator-Activities 'ensuring privacy and confidentiality of the clients' for the principle of UHC and 'health literacy' for the principle of appropriateness in the documents reviewed in this study. However, we have not removed these Indicator-Activities from the final list because of their relevance to improving access and cultural acceptability. Health literacy is the ability to engage with health information and services.[113] It helps individuals to make effective use of available health services.[114] Low health literacy is a

significant problem in many LMICs because of the low levels of general literacy and poorly resourced and functioning health systems with inadequate investment in health education programs.[115] There is evidence that effective health literacy interventions improve health outcomes in LMICs.[114, 115] With reference to 'ensuring privacy and confidentiality', CHWs have been shown to be keen to observe ethical principles while carrying out their roles.[116] However, there is a need to equip them with training and relevant guidelines.[116]

The first limitation of this study is that the assessment of the utility of Indicator-Activities relied on program documents only. The assessment will be more rigorous if document analysis is combined with discussions and interviews with CHWP staff and observations of CHWPs' activities in the field. The COVID-19 pandemic did not allow visits to program sites. Therefore, on ground interaction with the key informants such as CHWP planners and implementers was not possible which could have taken us to other relevant stakeholders who may have provided more factual insights about CHWP implementation. Hence, a future study could ensure additional methodological rigor by visiting program sites.

Second, this study has reported a lack of evidence for the Indicator-Activities 'ensuring privacy and confidentiality of the clients' and 'health literacy'. It is possible that these activities are part of CHWPs but were not described in the documents that were available for the review. This may be a limitation of this study because the evidence may exist in other documents that we could not obtain.

Third, the evidence was assessed by one reviewer, and the individual subjective view may have affected the decision of whether a document had evidence related to a specific Indicator-Activity. Future assessments of the Indicator-Activities should use two independent reviewers for verification. Moreover, we did not place any weighting on the quality of evidence that was found for the Indicator-Activities assessed in this study. The Indicator-Activities need further validation through their application to a broader range of CHWPs in different countries, and also through a more in-depth assessment of the quality of evidence.

6.8 Conclusion

The findings of this document analysis indicate that PHC Indicator-Activities are useful to CHWPs across LMICs. These Indicator-Activities can be used to assess the application of PHC principles, which can inform the planning, implementation and evaluation of CHWPs. Future research could focus on assessing the Indicator-Activities in the field and applying them to a broad range of CHWPs.

6.9 Supporting Information

S1 Appendix: Data Extraction Form for the Document Analysis

Title of the Document:				
Type of the Document:				
Year Published/ Prepared				
Author/s				
PHC Principles	**Indicator-Activities**	**Related Activity Present in the CHWP**		**Description of the Evidence from the CHWP Documents**
		Yes	**No**	
Universal health coverage	Service provision			
	Selection and placement of CHWs			
	Defined catchment area			
	Community sensitisation			
	Needs assessment			
Equity	Planning			
	Implementation			
	Address financial and geographic barriers to health care			
Access	Identification of the causes of low demand and utilisation			
	Promote community access to the program			
	Ensure privacy and confidentiality			
Comprehensiveness	Provision of health services along the spectrum of preventive, curative, and rehabilitative services			
	Linkages with secondary and tertiary level-services			
	Joint ownership and design of CHWPs			

Community participation	Availability of health data to the community			
Intersectoral coordination	Representation of non-health organisations on planning and governance structures of CHWPs			
	Public–private partnership			
Appropriateness	Context-specific program design and implementation			
	Evidence-based interventions			
Effectiveness	Monitoring health outcomes			
	Monitoring performance			
	Well-resourced CHWs			
Cultural acceptability	Community involvement in the selection of the CHWs			
	Health literacy			
Affordability	Cost-effective interventions			
	Identify and address financial barriers to health care			
Manageability	Adequate human resources			
	Proportionate service provision			
	Continuous adjustment of the role of CHWs as the program evolves with respect to communities' needs			

Notes: CHW: community health worker, CHWP: community health worker program, PHC: primary health care

S2 Appendix: Documents included in the analysis

Title of the Document	Type	Year	Author
Health Extension Program of Ethiopia			
Planning documents			
Realizing Universal Health Coverage Through Primary Health Care—A Roadmap for Optimizing the Ethiopian Health Extension Program 2020–2035	Planning document	2020	Ministry of Health Ethiopia
Implementation documents			
Health for the People: National Community Health Worker Programs from Afghanistan to Zimbabwe	Case studies	2020	Henry B. Perry, Editor
Ethiopia and the Health Extension Program: Learning for Action Across Health Systems	Case study	2017	Oxford Policy Management
Ethiopia Health Extension Program: An Institutionalized Community Approach for Universal Health Coverage	Case study	2016	World Bank Group
Health Extension Workers in Ethiopia: Delivering Community-Based Antenatal and Postnatal Care	Project working paper	2014	Harvard School of Public Health
The Health Extension Program in Ethiopia	Case study	2013	The universal health coverage study series — World Bank
Health Extension Program: An Innovative Solution to Public Health Challenges of Ethiopia: A Case Study	Case study	2012	USAID
Global Experience of CHWs for Delivery of Health-Related MDGs: A Systematic Review, Country Case Studies and Recommendations for Integration into National Health Systems	Country case study	2010	Global Health Workforce Alliance—WHO
Ethiopia's Human Resources for Health Programme	Country case study	2008	WHO-GHWA Task Force on Scaling Up Education and Training for Health Workers
Evaluation documents			
National Assessment—2019	Evaluation report	2020	MERQ Consultancy

Title of the Document	Type	Year	Author
National Program for Family Planning and Primary Health Care of Pakistan			
Planning documents			
Integrated Reproductive, Maternal, Newborn, Child & Adolescent Health, and Nutrition (IRMNCAH&N) Strategy	Planning document	2016	Provincial Ministry of Health
PC-1 from January 2010 to June 2015	Planning Commission form	2010	Ministry of Health, Government of Pakistan
Implementation documents			
Health for the People: National Community Health Worker Programs from Afghanistan to Zimbabwe	Case studies	2020	Henry B. Perry, Editor
Lady Health Workers in Pakistan—Improving Access to Health Care for Rural Women and Families	Project working paper	2014	Harvard School of Public Health
The Contribution of Lady Health Workers Towards Family Planning in Pakistan	Policy brief	2012	USAID
Global Experience of CHWs for Delivery of Health-Related MDGs: A Systematic Review, Country Case Studies and Recommendations for Integration into National Health Systems	Country case study	2010	WHO—Global Health Workforce Alliance
Pakistan's Lady Health Worker Program	Country case study	2008	WHO—Global Health Workforce Alliance
Pakistan's Experience in Lady Health Worker Program	Meeting report	2004	Ministry of Health, Government of Pakistan
Evaluation documents			
Lady Health Worker Program, Pakistan; Performance Evaluation	Evaluation report	2019	Oxford Policy Management
External Evaluation of the National Program for Family Planning and Primary Health Care	Evaluation report	2009	Oxford Policy Management

Notes: GHWA: Global Health Workforce Alliance, WHO: World Health Organization, USAID: United States Agency for International Development

The next chapter discusses key findings and provides the conclusion of this research.

Chapter 7

Chapter 7: Discussion and Conclusion

The overall aim of this thesis was to investigate the application of PHC principles in national CHWPs and generate evidence to guide their application in such programs. Using a mix of study methods, including a scoping review, a Delphi exercise and document analysis, the thesis reviewed evidence of the application of PHC principles in CHWPs, developed a consensus on activities that reflect the application of these principles, and defined a set of Indicator-Activities. In this final chapter, the key findings are summarised, the significance of this research is highlighted, strengths and limitations are discussed, potential areas for future research are outlined, and a conclusion is provided.

7.1 Key Findings of the Studies

This thesis contributes to the literature related to the planning, implementation and evaluation of national CHWPs with reference to PHC principles. The findings on using PHC principles in CHWPs and assessing their application are summarised below.

7.1.1 Evidence of Primary Health Care Principles in National Community Health Worker Programs

There is no prior synthesis of literature on the application of PHC principles in national CHWPs. The scoping review (Study 1) found limited evidence in published peer-reviewed literature for the application of PHC principles in national CHWPs in LMICs. The review of both qualitative and quantitative studies showed that UHC and community participation were the two most commonly applied PHC principles in national CHWPs. Limited evidence was found for the principles of intersectoral coordination and appropriateness. Therefore, it was concluded that all PHC principles were not uniformly applied in national CHWPs. The findings highlighted the need for better documentation of CHWPs in peer-reviewed academic literature with reference to PHC principles, and for more research on how to incorporate PHC principles in CHWPs.

7.1.2 Application of Primary Health Care Principles in Community Health Worker Programs

Based on the need identified in Study 1, a set of Indicator-Activities was developed to reflect the application of PHC principles in CHWPs. These Indicator-Activities were assessed across two programs. The Delphi exercise (Study 2) helped to develop a consensus on the importance of incorporating PHC principles in CHWPs, and to identify a set of Indicator-

Activities that would demonstrate the application of these principles. However, the utility of these Indicator-Activities needed to be assessed. The document analysis (Study 3) identified strong evidence for 22 of 29 Indicator-Activities, partial evidence for four Indicator-Activities and no evidence for two Indicator-Activities. One activity was found to be overlapping with the Indicator-Activity of 'joint ownership and design of the CHWP' so it was merged with it. The findings confirmed that the PHC Indicator-Activities are likely to be applicable to the CHWPs in LMICs.

7.2 Significance of Thesis

The significance of this thesis lies in the ongoing relevance of PHC principles and their application in CHWPs, as well as the development and potential use of the Indicator-Activities to promote these principles in conjunction with other existing tools used to evaluate CHWPs.

As an approach to strengthen health systems, PHC has been associated with improved health outcomes globally, and particularly in resource-constrained settings.[39] The importance of national CHWPs as an integral part of health systems in LMICs is increasingly recognised because of the growing evidence of the effectiveness of trained and well-supported CHWs in providing quality health services through these programs. The Astana Declaration also reaffirmed their importance in contributing to improved health outcomes. Moreover, the COVID-19 pandemic has highlighted the importance of robust national-level CHWPs to ensure continued delivery of key PHC services and contribute to the pandemic response.[72, 117] Therefore, national CHWPs are considered the key strategy for introducing PHC principles into health care provision to achieve 'Health for All'.[41] However, the diligent application of PHC principles has not been apparent in these CHWPs.[101] This might be because of the rising and declining periods of the PHC approach during the past 40 years, and the challenge of translating PHC principles into practice.[22] Following the Astana Declaration, there was renewed interest in PHC; thus, assessing the application of PHC principles is important at this time.[38]

The existing frameworks and indicators for planning and evaluating CHWPs do not explicitly focus on the application of PHC principles in CHWPs.[72] Examples of existing tools that are used to evaluate CHWPs are presented in Table 7.1, which shows that most of them focus on measuring individual-level CHW performance traits such as their selection, roles, supervisory systems, training and incentives, governance, and support from

community-based groups.[72] Some of the tools also assess programmatic determinants of CHW performance, ommunity-level outcomes and contextual factors influencing CHWP performance.[72] Although some of these existing tools refer to one or two PHC principles—particularly community involvement—they do not focus on the systematic application of 'all' PHC principles.[100]

Table 7.1: Examples of tools used to assess CHWP performance

Focus areas of existing CHWP performance assessment tools	Examples of tools
Individual-level CHW performance	Conceptual framework for measuring CHW performance within PHC systems developed by the Frontline Health project: *Input process-output-outcome logic model approach* (Agarwal et al., 2019)
	CHW logic model: towards a theory of enhanced performance in LMICs (Naimoli et al., 2014)
	Conceptual framework of intervention design factors influencing CHW performance in LMICs (Kok et al., 2014)
	Intervention components for improving the performance of CHWs in LMICs (Ballard & Montgomery, 2017)
	CHW Common Indicators Project (CIP) to assess CHW practice and program implementation in the United States (Rodela et al., 2021)
	Accompanimeter 1.0 tool and 5-SPICE framework developed by Partners in Health in the United States (Carrasco et al., 2019; Palazuelos et al., 2013)
	Lot Quality Assurance Sampling methodology to evaluate CHW performance in terms of household visitation rate (Mwanza et al., 2017)
	CUBES: a toolkit to measure contextual and perceptual drivers of CHW behaviours (Engl & Saiger, 2019)
	CHW empowerment assessment based on Lee and Koh's analytical framework of empowerment (Kane et al., 2016)
	CHW Motivation Scale: 12 items related to job satisfaction, organizational commitment, community commitment and work conscientiousness (Vallieres et al., 2020)
Community-level outcomes	Community scorecards and the frameworks by Agarwal et al., Naimoli et al. and Kok et al. cover community-level outcomes as indicators of CHWP performance
Programmatic determinants of CHW performance	WHO guideline on health policy and system support to optimise CHWPs provides recommendations on 15 programmatic determinants of CHW performance (WHO, 2018)
	The CHW-AIM Toolkit developed by the USAID-funded Health Care Improvement project *encompasses various programmatic components that are critical to support CHWs and functionality indicators such as accreditation, supervision*

Focus areas of existing CHWP performance assessment tools	Examples of tools
	and how a community supports a program (Ballard et al., 2018)
	Validated scale on perceived CHW supervision (Vallieres et al., 2018)
Contextual factors influencing CHWP performance	Context Assessment for Community Health tool *based on PARHIS framework to map and measure aspects of the local health care context that can influence the implementation of evidence-based interventions, including CHWPs in LMICs* (Bergstrom et al., 2015)

Sources: Kok et al. (2021),[72] Rodela et al. (2021),[97] Carrasco et al. (2019),[98] Palazuelos et al. (2013)[99]
Notes: CHWP: community health worker program, LMICs: low- and middle-income countries

There are a few PHC-focused frameworks. The PHCPI and the WHO's Operational Framework for PHC are examples. The PHCPI framework focuses on service delivery as its key domain and offers 25 performance indicators to assess the current state of PHC delivery systems at the national level.[9] The WHO's framework for PHC proposes core strategic and operational levers as part of the national health strategy to strengthen health systems and support countries in scaling up national implementation efforts on PHC.[39] The key audience is governments and policy-makers. The framework encompasses all PHC principles but focuses on PHC implementation efforts at a high level rather than a program level.

Existing tools tend to focus more on governance, workforce, funding and local-level functionality of CHWPs.[9, 39, 40, 72] The Indicator-Activities developed via this research add 'principles focus' to the existing tools and allow the review and evaluation of CHWPs from the PHC perspective. They provide a programmatic approach based on the principles of PHC and can be used in conjunction with the existing tools to provide a complete picture of CHWPs. Hence, the Indicator-Activities add value to the existing tools and fill an important gap.

The Indicator-Activities developed in this thesis can be used as a guiding tool to implement PHC principles in CHWPs, and can be used in the development of new CHWPs, as well as assist in their evaluation.

Designing new CHWPs: Well-designed CHWPs based on PHC principles can be a key element in contributing to health systems' strengthening and community resilience.[118]

Improving CHWP implementation: Evidence suggests that the application of PHC principles leads to improved health outcomes;[7] therefore, it is important that CHWPs apply these principles during their implementation.

Evaluating CHWPs: Health systems are complex, and CHWPs are complex entities within health systems; therefore, their assessment is also complex and needs to be based on data derived from a mix of reliable sources and obtained through the use of mixed methods.[72] Indicator-Activities can be used in combination with the existing tools to evaluate CHWPs.

7.3 Strengths and Limitations of This Research

7.3.1 Strengths

This doctoral research has a number of strengths.

Methodological rigor and triangulation of information: A strength of this research is the coherent group of studies with strong methodologies that add to the existing knowledge through literature (scoping review), expert opinions (Delphi exercise) and a review of CHWPs (document analysis). The results were triangulated across these three studies to understand the application of PHC principles in CHWPs and develop a tool to facilitate the systematic application of these principles.

Adding value to existing tools: The list of Indicator-Activities developed as an outcome of this research adds to the existing tools by providing a method to assess the application of PHC principles in CHWPs, thereby strengthening the measures available to assess these programs.

Current relevance: At a time when health systems in LMICs are facing a challenge to address double and triple burdens of disease, the focus on PHC and CHWPs is important because the PHC principles are still applicable, and CHWPs are increasingly considered to contribute to addressing health systems' challenges.[95] CHWPs are the most common community-based programs found in LMICs to expand patients' access to primary care services and reduce health disparities.[41] They are also an integral part of health care initiatives for marginalised communities.[67] This research adds to the knowledge and tools that can contribute to strengthening the application of PHC principles in CHWPs and improving health outcomes.

7.3.2 Limitations

While the limitations of each study were presented in Chapters 4–6, this section presents the overall limitations of this research.

This research assessed Indicator-Activities only for national CHWPs. It is unclear whether they would apply to other types of programs, such as small-scale, disease-specific programs or large-scale CHWPs not operated by governments. It is likely that the Indicator-Activities are applicable to these CHWPs as well; however, they need to be applied and tested on these programs.

In addition, the research only focused on CHWPs and did not investigate other types of primary care programs not using CHWs, such as midwives or traditional birth attendants, or programs focusing on one area of health, such as maternal health services or vaccination and nutrition services, where the application of PHC principles is also relevant.

This research used document reviews and a survey of experts to develop the Indicator-Activities (Study 2) and assess their utility (Study 3), but these approaches may not have captured all aspects of CHWPs and the application of PHC principles. Thus, we may have underestimated the amount of evidence that may exist on the application of PHC principles. Observing CHWPs in the field or undertaking interviews with program implementers may have provided a more complete picture of how PHC principles are applied. Unfortunately, the advent of the COVID-19 pandemic made these approaches unfeasible.

7.4 Implications for Future Research

The thesis suggests two key areas for future research:

1. Further testing of the utility of the Indicator-Activities tool: Validating the list of Indicator-Activities in the field is an important next step via the use of additional methods such as interviews and observational studies to provide additional evidence on their utility.
2. Expanding the application of the tool: Future research can be undertaken to assess the applicability of Indicator-Activities on a broad range of CHWPs from different countries, including small-scale CHWPs, large-scale CHWPs that are not operated by the government, and non-CHWPs.

7.5 Policy Recommendations

Based on the findings of this research, use of Indicator-Activities is suggested to facilitate systematic and diligent application of PHC principles in CHWPs. The Indicator-Activities can be used for a PHC-oriented design, continuous quality improvement and evaluation of the CHWPs in conjunction with existing tools and frameworks. The use of Indicator-Activities would also enhance the visibility of PHC principles while implementing CHWPs in LMICs. It is recommended that the indicators are included as part of a toolkit to guide CHWPs and they be built into the monitoring and reporting processes for CHWPs.

7.6 Concluding Remarks

In light of the resurgence of interest in PHC in recent years, there is an opportunity to design, implement and evaluate CHWPs based on the principles of PHC. This thesis identified a lack of uniformity in the application of PHC principles in national CHWPs. While the PHC principles were found to still be important for CHWPs to improve their performance and contribute to better health outcomes, there was no tool to facilitate the application of these principles. A set of Indicator-Activities that was developed to fill this gap can be used to assess the application of PHC principles, which can inform CHWP designing and monitoring in the context of LMICs.

Appendices

Appendix A: Scoping Review Protocol

Application of PHC principles in national CHWPs in LMICs: Protocol for the scoping review

Perveen S, Mahmood MA, Lassi ZS, Perry HB, Laurence C. Application of primary health care principles in national community health worker programs in low- and middle-income countries: a scoping review protocol. *JBI Evid Synth*. 2021 Jan; 19(1):270–283. https://doi.org/10.11124/jbisrir-d-19-00315

Statement of Authorship

Title of Paper	Application of primary health care principles in national community health worker programs in low- and middle-income countries: a scoping review protocol
Publication Status	☒ Published ☐Accepted for Publication ☐Submitted for Publication ☐Unpublished and unsubmitted work written in manuscript style
Publication Details	Perveen S, Mahmood MA, Lassi ZS, Perry HB, Laurence C. Application of primary health care principles in national community health worker programs in low- and middle-income countries: a scoping review protocol. *JBI Evid Synth*. 2021 Jan; 19(1):270–283. https://doi.org/10.11124/jbisrir-d-19-00315

Principal Author

Name of Principal Author (Candidate)	Shagufta Perveen		
Contribution to the Paper	Conceived and designed the study, conducted data extraction and synthesis, drafted the manuscript.		
Overall percentage (%)	80%		
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research Candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	19 August 2022

Co-author Contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);

ii. permission is granted for the candidate to include the publication in the thesis; and

iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr Mohammad Afzal Mahmood		
Contribution to the Paper	Contributed to the design of the study and review of the manuscript		
Signature		Date	22 August 2022
Name of Co-Author	Zohra S Lassi		
Contribution to the Paper	Contributed to the review of the manuscript		
Signature		Date	19 August 2022
Name of Co-Author	Henry B Perry		
Contribution to the Paper	Contributed to the critical review of the manuscript		
Signature		Date	19 August 2022
Name of Co-Author	Prof Caroline Laurence		
Contribution to the Paper	Contributed to the design of the study and review of the manuscript		
Signature		Date	22 August 2022

SYSTEMATIC REVIEW PROTOCOL

Application of primary health care principles in national community health worker programs in low- and middle-income countries: a scoping review protocol

Shagufta Perveen[1] • Mohammad Afzal Mahmood[1] • Zohra S. Lassi[2] • Henry B. Perry[3] • Caroline Laurence[1]

[1]School of Public Health, Faculty of Health and Medical Sciences, The University of Adelaide, Adelaide, SA, Australia, [2]Robinson Research Institute, Adelaide Medical School, Faculty of Health and Medical Sciences, The University of Adelaide, Adelaide, SA, Australia, and [3]Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, United States

ABSTRACT

Objective: This scoping review aims to map the available literature on the application of primary health care principles as reflected in the implementation of national-level community health worker programs in low- and middle-income countries.

Introduction: There is extensive literature on how community health workers have been used to improve the health status of disadvantaged populations, especially in low- and middle-income countries. Established under the primary health care principles, national community health worker programs were expected to adopt and promote these principles to achieve improvements in health outcomes. However, there is limited evidence of the extent to which primary health care principles have been applied in the implementation of national community health worker programs.

Inclusion criteria: The concept to be mapped is the application of primary health care principles in the implementation of national community health worker programs in low- and middle-income countries. Quantitative, qualitative, and mixed methods study designs will be included. Only English-language articles published from September 1978 to the present will be included. Study protocols, narrative reviews, systematic and scoping reviews, commentaries, text and opinion papers, viewpoints, editorials, and conference proceedings/abstracts and correspondences will be excluded. The programs operated by non-governmental organizations and articles not involving community health workers will also be excluded.

Methods: Key information sources to be searched include MEDLINE, CINAHL, Embase, and Scopus. Two reviewers will independently screen the titles and abstracts against the inclusion criteria. The data charting will include specific details about the concept, context, study methods, and key findings relevant to the review question. Data will be presented in diagrammatic or tabular form accompanied by a narrative summary.

Keywords: community health program; community health worker; low and middle income countries; maternal and child health; primary health care

JBI Evid Synth 2021; 19(1):270–283.

Introduction

The global context of primary health care (PHC) builds on the PHC definition included in the Declaration of Alma-Ata[1] at the first international conference on PHC in 1978. PHC has gained credibility as a means to improve health status and health care for large populations[2] as it responds to patient-defined needs for illness and also proactively addresses local epidemiological priorities in the community.[3]

PHC 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.[4,5] Underpinning these principles was support for preventive and promotive health services, appropriate technology, and intersectoral collaboration.[4,5] In 1988, Bryant highlighted PHC as the key to achieve "Health for All" and should include five key

Correspondence: Shagufta Perveen, shagufta.perveen@adelaide.edu.au

The authors declare no conflict of interest.

DOI: 10.11124/JBISRIR-D-19-00315

Table 1: Principles of primary health care[6]

No.	Concept	Description
1.	Universal coverage based on need	This concept refers to ***equity***. No person should be left out, no matter how poor or how remote. If all cannot be served, those most in need should have priority. This emphasizes the "all" in Health for *All*.
2.	Services should be promotive, preventive, curative and rehabilitative [Comprehensiveness]	Services should not only be curative, but should also promote the population's understanding of health and healthy styles of life, and reach toward the root causes of disease with preventive emphasis. Treatment of illness and rehabilitation are important as well.
3.	Communities should be involved so as to promote self-reliance [Community participation]	The community's role must be more than that of responding to services planned and designed from the outside. The community should be actively involved in the entire process of defining health problems and needs, developing solutions, and implementing and evaluating programs.
4.	Approaches to health should relate to other sectors of development [Inter-sectoral coordination]	The causes of ill health are not limited to factors that relate directly to health. Other sectors may have a substantial impact on health, in particular education for literacy, clean water and sanitation, agriculture, improved housing and transportation infrastructure, communication, women and youth groups, religious bodies and others.
5.	Services should be effective, culturally acceptable, affordable, and manageable [Appropriateness]	Effectiveness and acceptability are mutually dependent. Services must also be affordable in local terms due to limited governmental resources and because the community will often have to share in the costs.

concepts (Table 1).[6(p.10)] Since these concepts were first reported, the terminology regarding principles of PHC has evolved. For example, universal health coverage is now a commonly used term in describing core PHC principles along with community participation and intersectoral coordination.[7-9] In the literature, it appears that now the concept of universal health coverage combines the two original concepts: equity and access for all and comprehensiveness. Universal health coverage is now defined as when "all people receive the health services they need, including public health services designed to promote better health (such as anti-tobacco information campaigns and taxes), prevent illness (such as vaccinations), and to provide treatment, rehabilitation and palliative care (such as end-of-life 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."[10(p.xii)]

The process of implementing PHC principles, however, has been challenging and variably implemented. Some of the critical challenges include defining and translating PHC into practice, developing frameworks to translate equity into action, experiencing the limitations of community participation in helping to achieve health for all, and obtaining the financing to support the transformation of health systems.[4] Despite these challenges, the concept of PHC is still valid and considered to make the greatest contribution to health systems in improving population health, particularly in resource-constrained settings.[3] The 2018 Astana Declaration also reiterated the importance of PHC for achieving universal health coverage, the health-related Sustainable Developments Goals, and "Health for All."[11]

The Alma-Ata declaration proposed the development of national community health worker (CHW) programs as an important policy for promoting PHC

and achieving better health outcomes.[12] The core of CHW programs are "paraprofessionals or lay individuals with an in-depth understanding of the community culture and language, have received standardised job related training of a shorter duration than health professionals, and their primary goal is to provide culturally appropriate health services to the community."[13(p.1)] China's barefoot doctors program led to a proposal at the 1978 PHC conference to use CHWs as the most realistic solution for enhancing health care coverage in low- and middle-income countries (LMICs).[1,14] Consequently, national CHW programs were implemented by numerous governments as a popular way to incorporate PHC principles into health policies and programs.[15-18]

From the 1960s to late 1990s, there has been a proliferation of national-level CHW programs developed and implemented in LMICs.[19] Despite problems with implementing these programs, such as cost, logistics, acceptance, integration, the impact of the 1983 global economic crisis, and a lack of evidence of effectiveness,[4,20-22] the Millennium Development Goals and Sustainable Development Goals revitalized interest in CHW programs as an avenue for meeting these goals. In 2015, the World Health Organization and the United Nations Children's Fund (UNICEF) recommended the expansion and institutionalization of CHW programs by national governments, particularly for reducing maternal and child mortality rates and expanding services to the poorest segments of the population to achieve Sustainable Development Goals[4,20] and universal health coverage.[23]

The major impetus behind the emergence of national-level CHW programs was to provide outreach services to under-served communities in order to address the unmet preventive, curative, and promotive needs.[2,12] Established under the PHC principles, CHW programs were expected to adopt and promote these principles, and in doing so, achieve improvements in health outcomes.[12] CHW programs that adhere to the PHC principles are more likely to achieve better health outcomes. Countries choose and develop CHW programs that best suit their context and needs, and although they vary in structure and focus, they should have PHC principles at their core if they are to be successful.[2] National CHW programs with a PHC focus have been successful in Brazil, Bangladesh, and Nepal, and have contributed significantly in reducing under-five child mortality (number of deaths in children younger than five years) in these countries since 1990.[2,4,19] These national CHW programs have incorporated PHC principles in their implementation, which led to improved health outcomes.[24] For example, the active follow-up by CHWs increased utilization of health services contributing to universal health coverage in Iran's Women Health Volunteers Program.[25] The CHW network in Iran connects the Ministry of Health, medical universities, and health centers to the people reflecting the PHC principle of intersectoral coordination.[25] On the other hand, there are examples where a lack of focus on these principles has contributed to CHW program failure.[4,21]

The national-level CHW programs were established under the PHC principles and endorsed internationally in the Alma-Ata Declaration, and they are contributing to important global goals such as Millennium Development Goals and Sustainable Development Goals. It is worth considering if the national-level CHW programs still adhere to original principles or whether there are new ideas and concepts that have emerged over time and are evident in the implementation of national CHW programs. A scoping review that aims to identify which PHC principles are incorporated into the implementation of national-level CHW programs is needed. This review intends to map the available evidence from implemented programs across various LMICs.[26-28]

A preliminary search of PROSPERO, MEDLINE, the Cochrane Database of Systematic Reviews, and the *JBI Database of Systematic Reviews and Implementation Reports* was conducted and no current or in-progress scoping review or systematic review on the topic was identified.

Review question

What principles of PHC are reflected in the implementation of national-level CHW programs in the context of LMICs?

Inclusion criteria

Concept

The concept of interest for this scoping review is the application of PHC principles in the implementation of national CHW programs in LMICs. The PHC principles the authors will identify include i) universal health coverage encompassing access, equity, and comprehensiveness; ii) community participation; iii)

intersectoral coordination; and iv) appropriateness. The review will consider articles on the programs, projects, and initiatives utilizing the services of CHWs. The review is focused only on the national-level CHW programs as there was a sharp increase in national CHW programs after the Alma-Ata Declaration. For the purpose of this review, a national-level CHW program comprises any CHW program that is operated or implemented by the government of a specific country, on multiple sites (jurisdictions, provinces, or regions) within a country. The program must be operating for a minimum of three years, and be focused on maternal and child health, which is a national priority in majority of LMICs.

Context

This review will include literature only from LMICs based on the stated country of origin in the article. The 2012 Cochrane filter will be used to define LMICs, as this is the most updated filter available to search information sources for LMICs.[29] The Cochrane filter is based on the World Bank list of countries, classified as low-income, lower-middle-income, or upper-middle-income economies in 2009 (Appendix I).[29] If an article has no identifiable country of origin in the initial screening of the title and abstract, a full-text review will be undertaken.

Types of sources

This review will consider all quantitative, qualitative, and mixed methods study designs for inclusion. Articles and reports published in English after the Alma-Ata Declaration (October 1, 1978 onwards) will be included, as the national-level CHW programs were established under the PHC principles. Articles will not be excluded on the basis of unavailability of the abstract.

Study protocols, narrative reviews, commentaries, text and opinion papers, viewpoints, editorials, and conference proceedings/abstracts and correspondences will be excluded as this scoping review aims to decipher the available evidence from what is reflected in the implemented programs across various LMICs. Systematic and scoping reviews will also be excluded as they may not include all the articles from national-level, government-operated CHW programs. The CHW programs operated by non-governmental organizations will be excluded as their management is usually external to the country where the programs are implemented, or they work independently of the health system with heavy investment that is not possible at the national level or in the public sector. Articles will also be excluded if they do not involve CHWs and are focused on midwives, nurses, or traditional birth attendants only. Articles describing the training methods of CHWs only and economic analysis of CHW programs will also be excluded.

Methods

The proposed scoping review will be conducted in accordance with the JBI methodology.[30]

Search strategy

The search strategy will aim to locate published primary studies. A three-step search strategy will be employed. An initial limited search of MEDLINE (PubMed) was undertaken to analyze text words in the title and abstract and index terms used to describe the articles relevant to the topic. The logic grid for developing and executing the search in MEDLINE is provided as an example (Appendix II). The search strategy, including all identified keywords and index terms, will be adapted for each included information source. An iterative approach will be used, and further search terms may be discovered and utilized within the search strategy. Thirdly, the reference lists of the included articles will be screened for additional relevant papers.

Duplicate sources and publications that do not directly relate to the review question will be eliminated. The title and abstract of each article will be reviewed thoroughly to select the most relevant sources.

The databases to be searched include MEDLINE (PubMed), CINAHL (EBSCOhost), Embase (Elsevier), and Scopus (Elsevier).

Study selection

Two reviewers will independently review the articles and select the studies for inclusion. Extracted data will be charted, categorized, and summarized.

Following the search, all identified records will be collated and uploaded into Covidence software (Veritas Health Innovation. Melbourne, Australia) and duplicates removed. Titles and abstracts will then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant papers will be retrieved in full

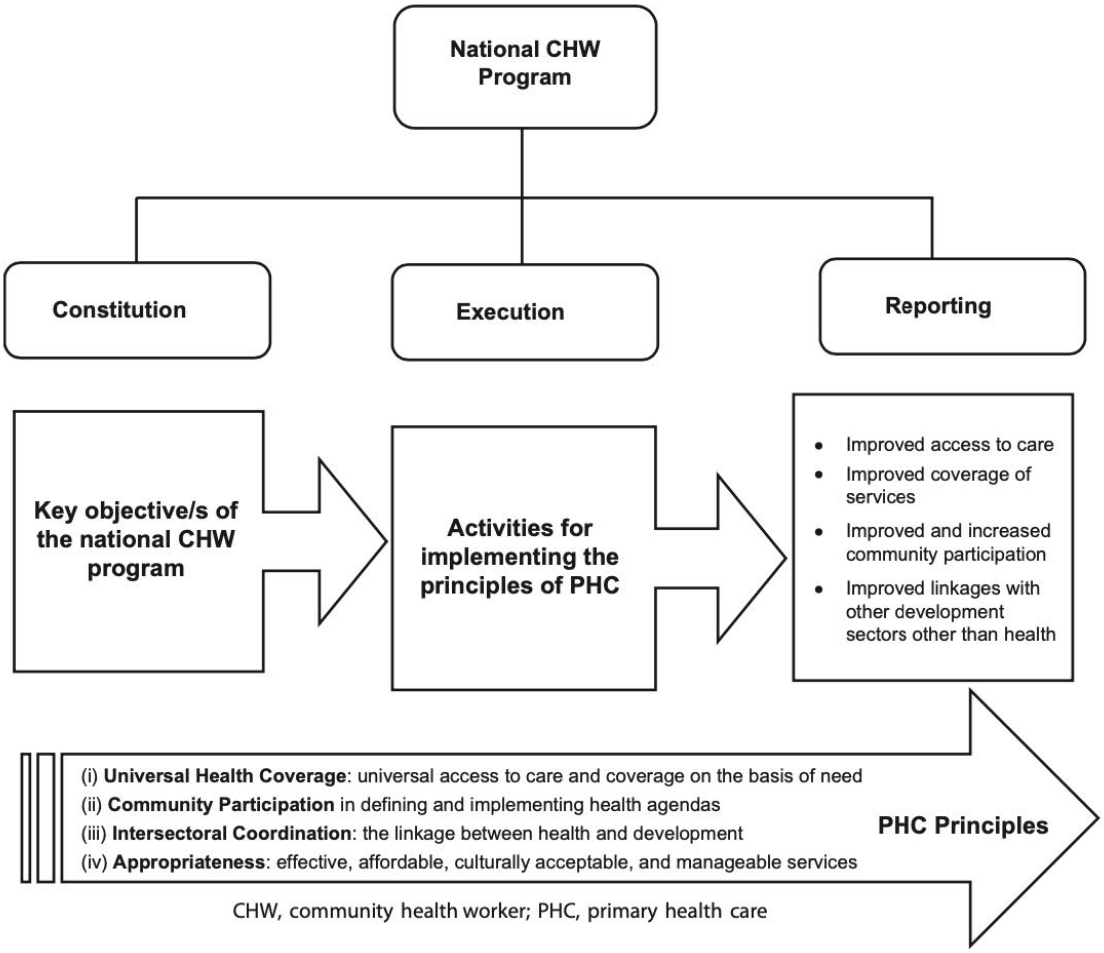


Figure 1: Conceptual framework for reporting results of the scoping review

and their citation details imported into Covidence. The full-text of selected citations will be assessed in detail against the inclusion criteria by two independent reviewers. Reasons for exclusion of full-text papers that do not meet the inclusion criteria will be recorded and reported in the scoping review. Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through discussion or with a third reviewer. The results of the search will be reported in full in the final scoping review report and presented in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.[31]

Data extraction

Data will be charted[32] (extracted) from papers included in the scoping review by two independent reviewers using a data charting form developed by the reviewers. The data charting will include specific details about the concept, context, study methods, and key findings relevant to the review question. A draft data charting form is provided in Appendix III. The draft data charting form will be modified and revised as necessary during the process of extracting data from each included paper. Modifications will be detailed in the full scoping review. Any disagreements that arise between the reviewers will be

resolved through discussion or with a third reviewer. Authors of papers will be contacted to request missing or additional data, where required. There will be no quality assessment of the included studies in this scoping review.

Data presentation

The extracted data will be presented in diagrammatic or tabular form in a manner that aligns with the objective of this scoping review. A narrative summary will accompany the tabulated and/or charted results and will describe how the results relate to the review objective and question. The conceptual framework, including definitions of the four PHC principles, for reporting results of this scoping review is presented in Figure 1.

Acknowledgments

The University of Adelaide's librarian, Vikki Lington, for her support with search strategy development.

References

1. World Health Organization. Primary Health Care: report of the International Conference on Primary Health Care, Alma-Ata, USSR, 6–12 September 1978.
2. Rifkin SB. Alma Ata after 40 years: Primary Health Care and Health for All - from consensus to complexity. BMJ Glob Health 2018;3(Suppl 3):e001188.
3. Perry HB. An extension of the Alma-Ata vision for primary health care in light of twenty-first century evidence and realities. Gates Open Res 2018;2:70.
4. Rifkin SB. Health for All and Primary Health Care, 1978–2018: a historical perspective on policies and programs over 40 years. Oxford Research Encyclopedia of Global Public Health. USA: Oxford University Press; 2019.
5. Lawn JE, Rohde J, Rifkin S, Were M, Paul VK, Chopra M. Alma-Ata 30 years on: revolutionary, relevant, and time to revitalise. Lancet 2008;372(9642):917–27.
6. Bryant JH. Ten years after Alma-Ata. World Health 1988:10.
7. World Health Organization. The world health report: 2003: shaping the future. In: chapter 7: health systems: principled integrated care. WHO; 2003.
8. Hall JJ, Taylor R. Health for all beyond 2000: the demise of the Alma-Ata Declaration and primary health care in developing countries. Med J Aust 2003;178(1):17–20.
9. Lahariya C, Khanna R, Nandan D. Primary health care and child survival in India. Indian J Pediatr 2010;77(3):283–90.
10. World Health Organization and International Bank for Reconstruction and Development/The World Bank. Tracking universal health coverage: 2017 global monitoring report. Geneva, Switzerland: World Health Organization and International Bank for Reconstruction and Development/The World Bank; 2017.
11. World Health Organization; United Nations Children's Fund. Declaration of Astana [internet]. Global conference on primary health care, Astana, Kazakhstan 2018 October 25–26 [cited 2020 Feb 02]. Available from: https://www.who.int/primary-health/conference-phc.
12. Kahssay HM, Taylor ME, Berman P. Community health workers: the way forward United Kingdom. Geneva, Switzerland: World Health Organization; 1998.
13. Olaniran A, Smith H, Unkels R, Bar-Zeev S, van den Broek N. Who is a community health worker?–a systematic review of definitions. Global Health Action 2017;10(1):12722231.
14. Mukherjee JS. Community health workers. In: Mukherjee JS, Farmer P, editors. An introduction to global health delivery. New York: Oxford University Press; 2017.
15. Rifkin SB. Community health workers. In: Heggenhougen K, Quah S, editors. International Encyclopedia of Public Health. San Diego: Academic Press, 2008;773–82.
16. World Health Organization. Strengthening the performance of community health workers in primary health care. Report of a WHO Study Group [meeting held in Geneva from Dec 2–9, 1987]. Geneva, Switzerland: World Health Organization; 1989.
17. Christopher JB, Le May A, Lewin S, Ross DA. Thirty years after Alma-Ata: a systematic review of the impact of community health workers delivering curative interventions against malaria, pneumonia and diarrhoea on child mortality and morbidity in sub-Saharan Africa. Hum Res Health 2011;9(1):27.
18. Rifkin SB. Paradigms lost: toward a new understanding of community participation in health programmes. Acta Trop 1996;61(2):79–92.
19. Perry HB, Zulliger R, Rogers MM. Community health workers in low-, middle-, and high-income countries: an overview of their history, recent evolution, and current effectiveness. Annu Rev Public Health 2014;35:399–421.
20. Perry H. A brief history of community health worker programs. Encyclopedia of Public Health. Berlin: Springer; 2013:1–12.
21. Strodel RJ, Perry HB. The National Village Health Guide Scheme in India: lessons four decades later for community health worker programs today and tomorrow. Hum Resour Health 2019;17(1):76.
22. Pallas SW, Minhas D, Perez-Escamilla R, Taylor L, Curry L, Bradley EH. Community health workers in low- and middle-income countries: what do we know about scaling up and sustainability? Am J Public Health 2013;103(7):e74–82.
23. Schneider H, Okello D, Lehmann U. The global pendulum swing towards community health workers in low- and middle-income countries: a scoping review of trends, geographical distribution and programmatic orientations, 2005 to 2014. Hum Res Health 2016;14(1):65.

24. Perry H, Zulliger R, Scott K, Javadi D, Gergen J, Shelley K, *et al.* Case studies of large-scale community health worker programs: examples from Afghanistan, Bangladesh, Brazil, Ethiopia, Niger, India, Indonesia, Iran, Nepal, Pakistan, Rwanda, Zambia, and Zimbabwe. USAID/MCHIP; 2017.
25. Damari B, Riazi-Isfahani S. Evaluating the Women Health Volunteers Program in Iran - a quarter century experience (1992–2016). Arch Iran Med 2018;21(12):566–71.
26. Panday S, Bissell P, Van Teijlingen E, Simkhada P. Perceived barriers to accessing Female Community Health Volunteers' (FCHV) services among ethnic minority women in Nepal: a qualitative study. PLoS One 2019;14(6):1–17.
27. Negussie A, Girma G. Is the role of Health Extension Workers in the delivery of maternal and child health care services a significant attribute? The case of Dale district, southern Ethiopia. BMC Health Serv Res 2017;17(1):641.
28. Hafeez A, Mohamud BK, Shiekh MR, Shah SAI, Jooma R. Lady health workers programme in Pakistan: challenges, achievements and the way forward. JPMA: J Pak Med Assoc 2011;61(3):210.
29. Cochrane Effective Practice and Orgnaisation of Care (EPOC) [internet]. 2012 [cited 2019 Sep 01]. Available from: https://epoc.cochrane.org/lmic-filters.
30. Peters MD, Godfrey CM, Khalil H, McInerney P, Parker D, Soares CB. Guidance for conducting systematic scoping reviews. Int J Evid Based Healthc 2015;13(3):141–6.
31. Moher D, Liberati A, Tetzlaff J, Altman DG; the PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med 2009;6(7):e1000097.
32. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol 2005;8(1):19–32.

Appendix I: World Bank classification of countries' economies in 2009

	Country	Classification by income
1.	Afghanistan	L
2.	Albania	UM
3.	Algeria	UM
4.	American Samoa	UM
5.	Angola	LM
6.	Antigua and Barbuda	UM
7.	Argentina	UM
8.	Armenia	LM
9.	Azerbaijan	UM
10.	Bangladesh	L
11.	Belarus	UM
12.	Belize	LM
13.	Benin	L
14.	Bhutan	LM
15.	Bolivia	LM
16.	Bosnia and Herzegovina	UM
17.	Botswana	UM
18.	Brazil	UM
19.	Bulgaria	UM
20.	Burkina Faso	L
21.	Burundi	L
22.	Cabo Verde	LM
23.	Cambodia	L
24.	Cameroon	LM
25.	Central African Republic	L
26.	Chad	L
27.	Chile	UM
28.	China	LM
29.	Colombia	UM
30.	Comoros	L
31.	Congo, Dem. Rep.	L
32.	Congo, Rep.	LM
33.	Costa Rica	UM
34.	Côte d'Ivoire	LM
35.	Cuba	UM
36.	Djibouti	LM
37.	Dominica	UM
38.	Dominican Republic	UM
39.	Ecuador	LM
40.	Egypt, Arab Rep.	LM
41.	El Salvador	LM
42.	Eritrea	L
43.	Eswatini	LM
44.	Ethiopia	L
45.	Fiji	UM
46.	Gabon	UM
47.	Gambia, The	L
48.	Georgia	LM
49.	Ghana	L
50.	Grenada	UM
51.	Guatemala	LM
52.	Guinea	L
53.	Guinea-Bissau	L
54.	Guyana	LM
55.	Haiti	L
56.	Honduras	LM
57.	India	LM
58.	Indonesia	LM
59.	Iran, Islamic Rep.	UM
60.	Iraq	LM
61.	Jamaica	UM
62.	Jordan	LM
63.	Kazakhstan	UM
64.	Kenya	L
65.	Kiribati	LM
66.	Korea, Dem. Rep.	L
67.	Kosovo	LM

(*Continued*)		
	Country	**Classification by income**
68.	Kyrgyz Republic	L
69.	Lao PDR	L
70.	Lebanon	UM
71.	Lesotho	LM
72.	Liberia	L
73.	Libya	UM
74.	Lithuania	UM
75.	Madagascar	L
76.	Malawi	L
77.	Malaysia	UM
78.	Maldives	LM
79.	Mali	L
80.	Marshall Islands	LM
81.	Mauritania	L
82.	Mauritius	UM
83.	Mexico	UM
84.	Micronesia, Fed. Sts.	LM
85.	Moldova	LM
86.	Mongolia	LM
87.	Montenegro	UM
88.	Morocco	LM
89.	Mozambique	L
90.	Myanmar	L
91.	Namibia	UM
92.	Nepal	L
93.	Nicaragua	LM
94.	Niger	L
95.	Nigeria	LM
96.	North Macedonia	UM
97.	Pakistan	LM
98.	Palau	UM
99.	Panama	UM
100.	Papua New Guinea	LM
101.	Paraguay	LM

(*Continued*)		
	Country	**Classification by income**
102.	Peru	UM
103.	Philippines	LM
104.	Romania	UM
105.	Russian Federation	UM
106.	Rwanda	L
107.	Samoa	LM
108.	São Tomé and Principe	LM
109.	Senegal	LM
110.	Serbia	UM
111.	Seychelles	UM
112.	Sierra Leone	L
113.	Solomon Islands	L
114.	Somalia	L
115.	South Africa	UM
116.	South Sudan	L
117.	Sri Lanka	LM
118.	St. Kitts and Nevis	UM
119.	St. Lucia	UM
120.	St. Vincent and the Grenadines	UM
121.	Sudan	LM
122.	Suriname	UM
123.	Syrian Arab Republic	LM
124.	Tajikistan	L
125.	Tanzania	L
126.	Thailand	LM
127.	Timor-Leste	LM
128.	Togo	L
129.	Tonga	LM
130.	Tunisia	LM
131.	Turkey	UM
132.	Turkmenistan	LM
133.	Tuvalu	LM
134.	Uganda	L
135.	Ukraine	LM

(*Continued*)		
	Country	**Classification by income**
136.	Uruguay	UM
137.	Uzbekistan	LM
138.	Vanuatu	LM
139.	Venezuela, RB	UM
140.	Vietnam	LM
141.	West Bank and Gaza	LM
142.	Yemen, Rep.	LM
143.	Zambia	L
144.	Zimbabwe	L

L, low income; LM, lower-middle income; UM, upper-middle income.
Information from reference 29.

Appendix II: Search strategy

MEDLINE (PubMed); search date September 9, 2019

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]	174,984
#2	Program[tiab] OR programs[tiab] OR programme[tiab] OR programmes[tiab] OR initiative*[tiab] OR project[tiab] OR projects[tiab]	959,578
#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]	71,349
#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 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	

(*Continued*)

Search	Query	Records retrieved
	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 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]))	1,903,167
#5	#1 AND #2 AND #3 AND #4	956
Limited to 1978 onwards in English language only		863

Appendix III: Draft data charting form

Scoping review question: What principles of PHC are reflected in the implementation of national-level CHW programs in the context of LMICs?	
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/s is/are reflected in the reported objective of the national CHW program?	• Universal health coverage (access, equity, comprehensiveness) • Community participation • Intersectoral coordination • Appropriateness
Which PHC principle/s is/are reflected in the implementation activities of the national CHW program?	
Stated outcome of the CHW program with reference to PHC principle/s	
Key findings of the article	
Characteristics of CHWs	
Nomenclature of CHWs	
Number of CHWs present	

Gender	
Key role of CHWs stated	
Selection process of CHWs	
Employment status	
Pre-service training/refreshers	
Catchment area	
Additional notes:	

CHW, community health worker; PHC, primary health care

Appendix B: Supplementary Material for Study 2—Survey Questionnaires

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND ONE)

Research Team
Dr Shagufta Perveen, Dr Mohammad Afzal Mahmood, Prof Caroline Laurence
School of Public Health, University of Adelaide, South Australia

Ethics Approval Number: H-2020-179

ABOUT THIS SURVEY!

This survey which is being conducted by researchers at the University of Adelaide, intends to develop consensus regarding implementation of Primary Health Care (PHC) principles in national or large-scale Community Health Worker (CHW) programs in Low-and Middle-Income Countries (LMICs).

This survey will take you approximately 40-60 minutes to complete, and is anonymous to maintain confidentiality.

There are three sections in this survey, please complete each section before moving to the next.

The questions with an asterisk (*) need a mandatory response.

Your contribution to this survey is greatly appreciated.

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND ONE)

ELECTRONIC CONSENT

Clicking on the "agree" button below acknowledges that;

- you have read the **Participant Information Sheet** and understand the purpose of the project.
- you understand that participation is voluntary with no direct benefits to you.
- you understand that, while information gained during the study may be published, you will not be identified and your personal responses will not be divulged.
- you understand that, you are free to withdraw from the project at any time.
- you understand that if you have any additional questions or concerns you can contact the research team.
- you are at least 18 years of age.
- Agree to participate in the project.
- Click "Next" to start round one of the survey

*** 1.** Do you agree to the above terms? By clicking "Yes", you consent that you are willing to answer the questions in this survey

- ○ **Yes, I agree**
- ○ **No, I disagree**

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries
(DELPHI ROUND ONE)

3

Project Background:

This research project is about developing expert consensus on the relative importance of primary health care (PHC) principles and identify activities to reflect implementation of these principles in national community health worker (CHW) programs in low and middle income countries (LMICs). The aim of this project is to develop guidelines on the application of PHC principles in the implementation of national or large-scale CHW programs in LMICs. The objectives of this research project are;

- To determine the relative importance of PHC principles
- To identify the activities reflecting PHC principles in the implementation of national CHW programs in LMICs
- To identify any additional PHC principle/s related to implementation of CHW programs in LMICs

Bryant in 1988 highlighted the fact that "PHC is the key to achieve 'Health for All' and should include the following five key concepts;

1. Universal coverage on the basis of need: This is the call of equity. Universal coverage aims at that no one should be left out, no matter how poor or how remote. Care according to need (equity) adds a dimension considering that not all have equal needs and for that reason while everyone needs to be served, the extent and level of service needs adjusting according the relative needs of people. Within a context of relative resource scarcity, those most in need should have priority. Here is the All in Health for All.

2. Comprehensiveness: Services should be promotive, preventive, curative and rehabilitative. Services should not only be curative, but should also be focused at prevention of diseases and promotion of health through education, better environment and healthy policies. The services need to target the root causes of disease with preventive emphasis. Treatment of illness and rehabilitation are important as well.

3. Community Participation: The community's role must be more than that of responding to services planned and designed from the outside. The community should be actively involved in the entire process of defining health problems and needs, developing solutions and implementing and evaluating programs.

4. Inter-sectoral Coordination: A larger spectrum of social determinants determine health. Hence, factors that enhance or reduce health also reside in domains that relate to other sectors which have a substantial impact on health in particular education, clean water and sanitation, agriculture, improved housing and infrastructure of transportation, communication, safety and security, rights of sub-populations groups and minorities etc.

5. Appropriateness: Services should be effective, culturally acceptable, affordable and manageable. Effectiveness (in terms of potential to achieve intended health outcomes) and acceptability (from cultural and social perspectives) are mutually dependent. Services must also be affordable to individuals and implementable within the context of local economic development with a consideration to available governmental resources and becausethe community will often have to share in the costs.

The process of implementing PHC principles however, has been challenging. The Alma Ata declaration proposed the development of national CHW programs as an important policy for promoting PHC and achieving better health outcomes. National CHW programs were created by many governments as a popular way to incorporate PHC principles into health policies and programs. However, several gaps are evident in the existing literature reflecting on the limited application of these principles in the national or large-scale CHW proms in the context of LMICs. Therefore, this research project aims to develop guidelines on the application of PHC principles in the implementation of national or large-scale CHW programs in LMICs.

Operational Definitions:

1. A national CHW program is one that is authorized and supported by the national health system and is deployed nationally.

2. A large-scale program is one that involves a large number of CHWs but is not a government-sponsored program.

3. The concept of Universal Health Coverage (UHC) now incorporates the concepts of universal coverage and comprehensiveness therefore, this research focuses on the four PHC principles; (i) UHC (ii) Commuity participation (iii) Intersectoral coordination and (iv) Appropriateness.

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND ONE)

SECTION 1: DEMOGRAPHICS

The following questions are about yourself:

*** 2. In what country do you currently reside? (please select from the dropdown options)**

3. What is your gender?

- ○ Female
- ○ Male

4. What is your age?

*** 5. Your Qualification(s)?**

6. Does your current job relate to community health workers OR CHW Program(s)?

- ☐ Yes
- ☐ No
- ☐ Other (please specify)

*** 7. Your current role/ job title?**

*** 8. Have you been involved in the evaluation/s of national CHW programs in LMICs?**

- [ ] Yes
- [ ] No

*** 9. Have you been involved in the implementation of national CHW programs in LMICs?**

- [ ] Yes
- [ ] No

*** 10. Approximate number of years of experience in planning, providing advice on planning and/or implementation and/or evaluation of national CHW programs in LMICs?**

- ○ less than 5 years
- ○ 5-10 years
- ○ 10-15 years
- ○ 15-20 years
- ○ more than 20 years

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND ONE)

SECTION 2: PRIMARY HEALTH CARE PRINCIPLES

In this section you will be asked about the importance of PHC principles and the challenges in their implementation.

11. Please rate the importance of incorporating the PHC principles (universal health coverage, community participation, intersectoral coordination, appropriateness) in the implementation of national CHW programs in LMICs.

Very Important	Important	Somewhat important	Not so important	Not at all important
○	○	○	○	○

12. Explain briefly your reasons to the above rating, relevance of these principles to CHW programs and impact of these principles on implementation and outcomes of the program:

13. Please rank each of the following four PHC principles in terms of its importance in the implementation of national CHW programs in LMICs?

	1 = Most important	2	3	4 = Least important
Universal Health Coverage	○	○	○	○
Community Participation	○	○	○	○
Intersectoral coordination	○	○	○	○
Appropriateness	○	○	○	○

14. Explain briefly your reasons to the above ranking in question 13

15. Are there any PHC principle/s in addition to the four listed above which are relevant to apply in national CHW programs in LMICs?

*** 16. Which PHC principle/s is/are most challenging to implement in national or large-scale CHW programs in LMICs? (please select all that apply)**

- ☐ **Universal Health Coverage**
- ☐ **Community Participation**
- ☐ **Intersectoral Coordination**
- ☐ **Appropriateness**

17. Explain briefly your reasons for your choice/s in question 16.

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND ONE)

SECTION 3: ACTIVITIES TO IMPLEMENT PRIMARY HEALTH CARE PRINCIPLES

18. In your opinion, what are the activities which reflect the implementation of 'Universal Health Coverage' in the national or large-scale CHW programs in LMICs?

19. In your opinion, what are the activities which reflect the implementation of equity [a sub-attribute of universal health coverage] in the national or large-scale CHW programs in LMICs?

20. In your opinion, what are the activities which reflect the implementation of access [a sub-attribute of universal health coverage] in the national or large-scale CHW programs in LMICs?

21. In your opinion, what are the activities which reflect the implementation of comprehensiveness [a sub-attribute of universal health coverage] in the national or large-scale CHW programs in LMICs?

22. In your opinion, what are the activities which reflect the implementation of 'Community Participation' in the national or large-scale CHW programs in LMICs?

23. In your opinion, what are the activities which reflect the implementation of 'Intersectoral Coordination' in the national or large-scale CHW programs in LMICs?

24. In your opinion, what are the activities/characteristics or features of a program which reflect the implementation of the principle of 'Appropriateness' in the national or large-scale CHW programs in LMICs?

25. In your opinion, what are the core activities which reflect effectiveness [a sub-attribute of the principle of appropriateness] in the national or large-scale CHW programs in LMICs?

26. In your opinion, which characteristics and /or features of a program reflect cultural acceptability [a sub-attribute of the principle of appropriateness] in the national or large-scale CHW programs in LMICs?

11

27. In your opinion, which characteristics and /or features of a program reflect affordability [a sub-attribute of the principle of appropriateness] in the national or large-scale CHW programs in LMICs?

28. In your opinion, which characteristics and /or features of a program reflect that the services are manageable [a sub-attribute of the principle of appropriateness] in the national or large-scale CHW programs in LMICs?

29. In your opinion, what are the challenges to apply PHC principles in the national or large-scale CHW programs in LMICs?

12

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND ONE)

Thank you very much for taking the time to complete our survey. You contribution to this research is much appreciated!

If you have any queries or further interest in this research, please contact:

Dr Shagufta Perveen
School of Public Health, The University of Adelaide
shagufta.perveen@adelaide.edu.au

END OF SURVEY

13

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND ONE)

Thank you very much.

If you have any comments or further interest in this research, please contact:

Dr Shagufta Perveen
School of Public Health, The University of Adelaide
shagufta.perveen@adelaide.edu.au

END OF SURVEY

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

Research Team
Dr Shagufta Perveen, Dr Mohammad Afzal Mahmood, Prof Caroline Laurence
School of Public Health, University of Adelaide, South Australia

Ethics Approval Number: H-2020-179

ABOUT THIS SURVEY!

This survey which is being conducted by researchers at the University of Adelaide, intends to develop consensus regarding implementation of Primary Health Care (PHC) principles in national or large-scale Community Health Worker (CHW) programs in Low- and Middle-Income Countries (LMICs).

The purpose of round two of the Delphi study is to develop consensus on the narrative responses received in round one from the study participants.

This survey will take you approximately 15-30 minutes to complete, and is anonymous to maintain confidentiality.

There are two sections in this survey, please complete each section before moving to the next.

All the questions are mandatory.

Your contribution to this survey is greatly appreciated.

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

CONSENT REMINDER

By clicking on the "NEXT" button below you are indicating that;

- you have read the **Participant Information Sheet** and understand the purpose of the project.
- you understand that participation in this research project is entirely voluntary with no direct benefits to you.
- you understand that, while information gained during the study may be published, you will not be identified and your personal responses will not be divulged.
- you understand that, you are free to withdraw from the project at any time.
- you understand that if you have any additional questions or concerns you can contact the research team.
- you are at least 18 years of age.
- Agree to participate in the project.
- Click "Next" to start Round 2 of the survey

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

Project Background:

This research project is about developing expert consensus on the relative importance of PHC principles and identify activities to reflect implementation of these principles in national CHW programs in LMICs.

The aim of this project is to develop guidelines on the application of PHC principles in the implementation of national or large-scale CHW programs in LMICs.

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

SECTION 1: PRIMARY HEALTH CARE PRINCIPLES - Importance and challenges in implementation

- In the Round 1 Survey, all the participants rated PHC principles as very important or important to incorporate in the implementation of national or large-scale CHW programs in LMICs - consensus reached

- For the ranking of PHC principles in terms of importance in the implementation, we reached consensus on the principles of "Community Participation" and "Intersectoral Coordination". However, consensus was not reached on the importance of "Universal Health Coverage" and "Appropriateness".

*** 1.** Therefore, please rate which of these two PHC principle is relatively more important than the other in relation to national or large-scale CHW programs in LMICs (select only one).

- ☐ **Universal Health Coverage**
- ☐ **Appropriateness**

4

*** 2.** From the Round 1 Survey, participants reported a number of additional PHC principles. Please select which of the following additional principles you agree should be added to the original PHC principles.

	AGREE	DISAGREE
Political Commitment	○	○
Sustainability	○	○
Social Justice	○	○
Accountability to the community	○	○
Appropriate (or Good) leadership and governance	○	○

3. In the Round 1 Survey, we reached consensus on that the principles of "Community Participation" and "Appropriateness" were challenging to implement. However, consensus was not reached for other principles.
For the following principles please determine which one do you consider as MORE CHALLENGING than the other to implement in CHW programs in LMICs (select only one).

- ☐ **Universal Health Coverage**
- ☐ **Intersectoral Coordination**

5

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

SECTION 2: ACTIVITIES TO IMPLEMENT PRIMARY HEALTH CARE PRINCIPLES

- We have summarized the activities reported by the participants in Round 1 of the Survey that reflect the implementation of each PHC principle and its sub-attributes.

- For each list of activities reported for the PHC principles and its sub-attributes, please indicate if you AGREE or DISAGREE that the suggested activity reflects the PHC principle by ticking the appropriate boxes.

UNIVERSAL HEALTH COVERAGE (UHC):

*** 4.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **UHC** by ticking the appropriate boxes.

	AGREE	DISAGREE
Defining the catchment area (with reference to the population that is to be served by the CHW program)	○	○
Community sensitization: informing the community about services that will be provided	○	○
Annual [re]planning for implementation	○	○

6

	AGREE	DISAGREE
Evaluation of the program implementation	○	○
Appropriate distribution of resources (Staff and material)	○	○
Transparent distribution of resources	○	○
Provision of basic maternal, newborn and child health services	○	○
Outreach services to remote areas	○	○
Medical care services for physical and mental health	○	○

5. Comments (if any):

Equity (a sub-attribute of UHC):

*** 6.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Equity** by ticking the appropriate boxes.

	AGREE	DISAGREE
Equity-based planning from the beginning	○	○
Bottleneck analyses	○	○

	AGREE	DISAGREE
Identification of groups that are discriminated against	○	○
Implementation focused on vulnerable sub-populations	○	○
Service packages are adapted to the particular needs of disadvantaged groups	○	○
Provision of services in hard to reach areas	○	○
Removing financial and geographic barriers to health care	○	○
Program cost discussion with the community representatives	○	○
Gender mainstreaming	○	○
Broadening of selection criteria of CHWs e.g. low literacy groups and women	○	○

7. Comments (if any):

Access (a sub-attribute of UHC):

8

*** 8.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Access** by ticking the appropriate boxes.

	AGREE	DISAGREE
Identification of the causes of low demand and utilization	○	○
Addressing privacy and confidentiality	○	○
Training and mentorship of CHWs	○	○
Distribution of CHWs across a population	○	○
Role clarity between the community, CHWs and supervisors/program	○	○
Renumeration arrangements for CHWs in case of emergency	○	○
Ensuring financial protection	○	○
Ensuring all community members can access the program irrespective of distance, ethnic or religious group, gender, age, social status, physical and mental state, and ability to pay	○	○

9. Comments (if any):

Comprehensiveness (a sub-attribute of UHC):

*** 10.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Comprehensiveness** by ticking the appropriate boxes.

	AGREE	DISAGREE
Provision of preventive, curative, and rehabilitative services	○	○
Linkages with higher level service providers, referral pathways and other sectors (social protection, education, etc.)	○	○
Referral for and management of endemic illnesses within acceptable distance of nearest health facility	○	○
Skilled CHWs to participate in decisions about health care addressing social determinants	○	○
Pro-active CHWs to participate in decisions about health care addressing social determinants	○	○

	AGREE	DISAGREE
Needs assessment (sensitive to social, economic, cultural aspects) and with a social determinants of health lens	○	○

11. Comments (if any):

11

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

COMMUNITY PARTICIPATION:

*** 12.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Community Participation** by ticking the appropriate boxes.

	AGREE	DISAGREE
Joint ownership and design of CHW programs: Involving community at all levels for decision making from planning, training, selecting and oversight of CHWs, and in local management and monitoring - Key to sustainability	○	○
Availability of health data to the community	○	○
Community sensitization and awareness of the program activities	○	○

	AGREE	DISAGREE
Traditional leaders and other community leaders should be engaged	○	○
Involving community members in supervision of the program activities	○	○
Ensuring feedback by the community [and acting on it]	○	○
A practical monitoring system incorporating data from communities and the health system	○	○
The integration of CHWs in health care decisions that go beyond medical care and address wider issues concerning power and control, advocacy and social mobilization	○	○
A balanced package of incentives for CHWs, both financial and non-financial	○	○

13

13. Comments (if any):

14

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

INTERSECTORAL COORDINATION:

*** 14.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Intersectoral Coordination** by ticking the appropriate boxes.

	AGREE	DISAGREE
Partner mapping: to identify all partners who are implementing CHW related interventions	○	○
Involvement of multiple ministries/sectors in supporting approaches to renumeration and career ladder opportunities for CHWs	○	○
Collaboration in governance structures from local to national level	○	○
Horizontal integration at the service delivery level	○	○

	AGREE	DISAGREE
Vertical integration within the health systems	○	○
Senior leadership requires to be accessible and flexible to negotiate with different sectors to promote health	○	○
When CHWs work with community development personal to solve problems beyond service delivery and work with government officials to meet community needs beyond the health sector	○	○
Addressing needs of water, sanitation, food, housing, transport	○	○

15. Comments (if any):

16

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

APPROPRIATENESS:

17

*** 16.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Appropriateness** by ticking the appropriate boxes.

	AGREE	DISAGREE
Need-based and context specific program design and implementation	○	○
CHW program follows international ethical and human rights standards	○	○
Competent CHWs	○	○
Respectable CHWs	○	○
Prioritization for service packages should consider interventions that are technically sound, operationally manageable and most promising in their potential for maximum health impact	○	○

17. Comments (if any):

Effectiveness (a sub-attribute of appropriateness):

*** 18.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Effectiveness** by ticking the appropriate boxes.

	AGREE	DISAGREE
Clear coordination	○	○
Monitoring and performance systems	○	○
Achievement of the target of the specific programs	○	○
Consistent access to required training, supplies and supervision for CHWs to implement program as designed and in accordance with expectation of communities	○	○
Review of health outcomes and from an equity lens	○	○
Monitoring to assess outputs with reference to the stated PHC, Maternal Newborn Child Health and Reproductive Health goals	○	○

19. Comments (if any):

19

Cultural acceptability (a sub-attribute of appropriateness):

*** 20.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Cultural Acceptability** by ticking the appropriate boxes.

	AGREE	DISAGREE
Situation analysis of the target population	○	○
Community ownership	○	○
Relevance of the primary health care, MNCH and reproductive health services will help out in assessing acceptability	○	○
Community involvement in the selection of the CHWs	○	○
Monitoring to make sure that people understand the messages shared by CHWs and feel that they belong to the health system	○	○
CHWs are in high demand, have access to all community members, and their advices are welcomed and appreciated	○	○

20

	AGREE	DISAGREE
Cultural acceptability is met when those who are defined as the objective of an intervention become the subjects and work with CHWs to address both needs and concerns in a way that is acceptable	○	○

21. Comments (if any):

Affordability (a sub-attribute of appropriateness):

*** 22.** Please indicate if you AGREE or DISAGREE that the suggested activity indicates **Affordability** by ticking the appropriate boxes.

	AGREE	DISAGREE
Assess the ability of the local community to pay	○	○
Identify the costs of alternate interventions	○	○
Make an assessment / estimation whether chosen interventions are financially viable for longer period of time in that country	○	○
Assess if transport cost is a barrier and provide subsidy/transport	○	○
Assess if the full spectrum of treatment needed is affordable [not only the counselling/primary treatment by CHW]	○	○
Drugs dispensed free to all people irrespective of their ability to pay	○	○
Provision of a basic package of health services that are cost effective	○	○

23. Comments (if any):

Manageability (a sub-attribute of appropriateness):

22

*** 24.** Please indicate if you AGREE or DISAGREE that the suggested activity informs that the services [of a CHW Program] are **Manageable** by ticking the appropriate boxes.

	AGREE	DISAGREE
Regular provision of a comprehensive package of services at a high standard of quality to all the individuals in need of the services within their catchment area	○	○
A balanced package of financial and non-financial incentives is required for CHWs	○	○
Supervisors are available who have capacity, clear role, time and resources for adequate supportive supervision and performance review	○	○
Majority of people are provided the needed services at the cost they can afford	○	○

23

	AGREE	DISAGREE
A continuous adjustment of the role of CHWs as the program evolves over time with respect to communities' needs	○	○
Providing adequate human resource	○	○

25. Comments (if any):

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

The following **challenges** have been reported by the study participants in the Round 1 Survey when applying PHC principles in the national or large-scale CHW programs in LMICs.

*** 26.** For each of the following challenges, please indicate if you AGREE or DISAGREE that this is a challenge for the implementation of PHC principles in CHW Programs in LMICs.

	AGREE	DISAGREE
Geographic location	○	○
Inadequate resource allocation	○	○
Sustainable funding	○	○
Poor understanding of community needs	○	○
Non-involvement of critical stakeholders in non-health sectors	○	○
Political commitment	○	○
Intersectoral collaboration	○	○
Poor leadership and Governance	○	○

25

	AGREE	DISAGREE
Inadequate Human Resource for Health	○	○
Misunderstanding of role of CHW as "doctor"	○	○
Understanding of PHC by the senior decision makers	○	○
Top-down approach where the government tends to make one-way decisions and leave people's voices out	○	○
Taking CHW programs outside the bio-medical framework	○	○
Adopting national approaches with flexibile context-specific strategies	○	○

27. Comments (if any):

26

THE UNIVERSITY of ADELAIDE

Primary Health Care Principles and Community Health Worker Programs in Low and Middle Income Countries (DELPHI ROUND TWO)

Thank you very much for taking the time to complete our survey. You contribution to this research is much appreciated!

If you have any queries or further interest in this research, please contact:

Dr Shagufta Perveen
School of Public Health, The University of Adelaide
shagufta.perveen@adelaide.edu.au

END OF SURVEY

Appendix C: Ethics Approval Letter for Study 2—Delphi Exercise

THE UNIVERSITY of ADELAIDE

RESEARCH SERVICES
OFFICE OF RESEARCH ETHICS, COMPLIANCE AND INTEGRITY
THE UNIVERSITY OF ADELAIDE

LEVEL 4, RUNDLE MALL PLAZA
50 RUNDLE MALL
ADELAIDE SA 5000 AUSTRALIA

TELEPHONE +61 8 8313 5137
FACSIMILE +61 8 8313 3700
EMAIL hrec@adelaide.edu.au

CRICOS Provider Number 00123M

Our reference 34674

02 September 2020

Professor Caroline Laurence
Public Health

Dear Professor Laurence

ETHICS APPROVAL No: H-2020-179
PROJECT TITLE: Primary health care principles and community health worker programs in low and middle income countries

The ethics application for the above project has been reviewed by the Low Risk Human Research Ethics Review Group (Faculty of Health and Medical Sciences) and is deemed to meet the requirements of the *National Statement on Ethical Conduct in Human Research 2007 (Updated 2018)* involving no more than low risk for research participants.

You are authorised to commence your research on: 02/09/2020
The ethics expiry date for this project is: 30/09/2023

NAMED INVESTIGATORS:

Chief Investigator:	Professor Caroline Laurence
Student - Postgraduate Doctorate by Research (PhD):	Dr Shagufta Perveen
Associate Investigator:	Dr Mohammad Mahmood

CONDITIONS OF APPROVAL: Thank you for addressing the feedback. The revised ethics application provided on the 31st of August 2020 has been approved.

Ethics approval is granted for three years and is subject to satisfactory annual reporting. The form titled Annual Report on Project Status is to be used when reporting annual progress and project completion and can be downloaded at http://www.adelaide.edu.au/research-services/oreci/human/reporting/. Prior to expiry, ethics approval may be extended for a further period.

Participants in the study are to be given a copy of the information sheet and the signed consent form to retain. It is also a condition of approval that you immediately report anything which might warrant review of ethical approval including:

- serious or unexpected adverse effects on participants,
- previously unforeseen events which might affect continued ethical acceptability of the project,
- proposed changes to the protocol or project investigators; and
- the project is discontinued before the expected date of completion.

Yours sincerely,

Ms Yvette Kim Clarissa Wijnandts
Secretary

The University of Adelaide

References

1. Langlois EV, McKenzie A, Schneider H, Mecaskey JW. Measures to strengthen primary health-care systems in low-and middle-income countries. B World Health Organ. 2020;98(11):781.https://doi.org/10.2471%2FBLT.20.252742.

2. Van Weel C, Kidd MR. Why strengthening primary health care is essential to achieving universal health coverage. CMAJ. 2018;190(15):E463-E6.

3. World Health Organization and the United Nations Children's Fund (UNICEF). A vision for primary health care in the 21st century: towards universal health coverage and the Sustainable Development Goals. Geneva; 2018.

4. Kahssay HM, Taylor ME, Berman P. Community health workers: the way forward. United Kingdom: World Health Organization; 1998 [cited 2019 May 5]. Available from: https://apps.who.int/iris/handle/10665/42034

5. Perry HB, Zulliger R, Rogers MM. Community health workers in low-, middle-, and high-income countries: an overview of their history, recent evolution, and current effectiveness. Annu Rev Public Health. 2014;35:399-421.https://doi.org/10.1146/annurev-publhealth-032013-182354.

6. Druetz T. Integrated primary health care in low- and middle-income countries: a double challenge. BMC Med Ethics. 2018 Jun 15;19(Suppl 1):48.https://doi.org/10.1186/s12910-018-0288-z.

7. World Health Organization. The world health report 2008: primary health care now more than ever. Geneva 2008 [cited 2021 Mar 24]. Available from: https://apps.who.int/iris/handle/10665/43949

8. Hanson K, Brikci N, Erlangga D, Alebachew A, De Allegri M, Balabanova D, et al. The Lancet Global Health Commission on financing primary health care: putting people at the centre. Lancet Glob Health. 2022 May;10(5):e715-e72.https://doi.org/10.1016/.

9. Bitton A, Ratcliffe HL, Veillard JH, Kress DH, Barkley S, Kimball M, et al. Primary health care as a foundation for strengthening health systems in low-and middle-income countries. J Gen Inter Med. 2017;32(5):566-71.https://doi.org/10.1007%2Fs11606-016-3898-5.

10. Perry HB. Primary Health Care: history, trends, controversies and challenges. In: Schleiff M, Bishai D, editors. Achieving Health for All: Primary Health Care in action. Baltimore: Johns Hopkins University Press; 2020. p. 19-55.

11. Rifkin SB. Community health workers. In: Carrin G, Buse K, Heggenhougen HK, Quah SR, editors. Health Systems Policy, Finance and Organization Oxford: Elsevier Academic Press; 2008. p. 381-90.

12. Duggal R. Bhore Committee (1946) and its relevance today. Indian J Pediatr. 1991;58(4):395-406. https://link.springer.com/content/pdf/10.1007/BF02750917.pdf.

13. World Health Organization. Primary health care: report of the International Conference on Primary Health Care, Alma-Ata, USSR, 1978 Sep 6-12 Geneva: WHO, UNICEF; 1978 [cited 2019 Jun]. Available from: https://apps.who.int/iris/handle/10665/39228

14. Bishai D, Schleiff M. Achieving Health for All: primary health care in action. Baltimore (MD): Johns Hopkins University Press; 2020.

15. Goodman RA, Bunnell R, Posner SF. What is "community health"? Examining the meaning of an evolving field in public health. Prev Med. 2014;67:S58-S61.https://doi.org/10.1016/j.ypmed.2014.07.028.

16. Bryant JH. Ten years after Alma-Ata. World Health. World Health Organization; 1988 [cited 2020 Jan]. Available from: https://apps.who.int/iris/bitstream/handle/10665/52699/WH-1988-Aug-Sep-p10-15-eng.pdf?sequence=1#:~:text=Ten%20years%20since%20Alma%2DAta&text=and%20principles%20of%20HFA%20elaborated,and%20development%20community%20world%2D%20wide.

17. Hall JJ, Taylor R. Health for all beyond 2000: the demise of the Alma-Ata Declaration and primary health care in developing countries. Med J Aust. 2003;178(1):17-20. https://doi.org/10.5694/j.1326-5377.2003.tb05033.x.

18. Lahariya C, Khanna R, Nandan D. Primary health care and child survival in India. Indian J Pediatr. 2010 Mar;77(3):283-90. https://doi.org/10.1007/s12098-010-0036-y.

19. World Health Organization. The World health report 2003: shaping the future. In chapter 7:health systems: principled integrated care. Geneva: World Health Organization; 2003 [cited 2020 Mar 23]. Available from: https://apps.who.int/iris/handle/10665/42789

20. World Health Organization and International Bank for Reconstruction and Development / The World Bank. Tracking universal health coverage: 2017 global monitoring report. Geneva, Switzerland; 2017. Report No.: 978-92-4-151355-5.

21. Levesque J-F, Harris MF, Russell G. Patient-centred access to health care: conceptualising access at the interface of health systems and populations. Int J Equity Health. 2013;12(1):1-9. http://www.equityhealthj.com/content/12/1/18.

22. Rifkin SB. Health for All and Primary Health Care, 1978 - 2018: a historical perspective on policies and programs over 40 years. Oxford Research Encyclopedia of Global Public Health USA: Oxford University Press; 2019.

23. Perry HB. An extension of the Alma-Ata vision for primary health care in light of twenty-first century evidence and realities. Gates Open Res. 2018 Dec 14;2:70. https://doi.org/10.12688/gatesopenres.12848.1.

24. Rule J, Ngo DA, Oanh TT, Asante A, Doyle J, Roberts G, et al. Strengthening primary health care in low- and middle-income countries: generating evidence

through evaluation. Asia Pac J Public Health. 2014 Jul;26(4):339-48. https://doi.org/10.1177/1010539513503869.

25. Bishai D. Introduction: why does Primary Health Care matter in the twenty-first century? In: Schleiff M, Bishai D, editors. Achieving Health for All: primary health care in action. Baltimore (MD): Johns Hopkins University Press; 2020. p. 1-15.

26. De Maeseneer J WS, De Sutter A, Van de Geuchte I, Billings M. Primary health care as a strategy for achieving equitable care: a literature review commissioned by the Health Systems Knowledge Network: WHO Commission on the Social Determinants of Health; 2007.

27. Cueto M. The origins of primary health care and selective primary health care. Am J Public Health. 2004 Nov;94(11):1864-74. https://doi.org/10.2105%2Fajph.94.11.1864.

28. Walsh JA, Warren KS. Selective primary health care: an interim strategy for disease control in developing countries. N Engl J Med. 1979 Nov 1;301(18):967-74. https://doi.org/10.1056/nejm197911013011804.

29. Frenk J. Reinventing primary health care: the need for systems integration. Lancet. 2009 Jul 11;374(9684):170-3. https://doi.org/10.1016/s0140-6736(09)60693-0.

30. Baum F, Freeman T, Lawless A, Labonte R, Sanders D. What is the difference between comprehensive and selective primary health care? Evidence from a five-year longitudinal realist case study in South Australia. BMJ Open. 2017 Apr 28;7(4):e015271. https://doi.org/10.1136/bmjopen-2016-015271.

31. Rifkin SB, Walt G. Why health improves: defining the issues concerning 'comprehensive primary health care' and 'selective primary health care'. Soc Sci Med. 1986;23(6):559-66. https://doi.org/10.1016/0277-9536(86)90149-8.

32. Obimbo EM. Primary health care, selective or comprehensive, which way to go? East Afr Med J. 2003 Jan;80(1):7-10. https://doi.org/10.4314/eamj.v80i1.8659.

33. Veillard J, Cowling K, Bitton A, Ratcliffe H, Kimball M, Barkley S, et al. Better measurement for performance improvement in low- and middle-income countries: The Primary Health Care Performance Initiative (PHCPI) experience of conceptual framework development and indicator selection. Milbank Q. 2017 Dec;95(4):836-83. https://doi.org/10.1111/1468-0009.12301.

34. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. Milbank Q. 2005;83(3):457-502. https://doi.org/10.1111/j.1468-0009.2005.00409.x.

35. Shi L. The impact of primary care: a focused review. Scientifica. 2012 Oct. https://doi.org/10.6064/2012/432892.

36. Lawn JE, Rohde J, Rifkin S, Were M, Paul VK, Chopra M. Alma-Ata 30 years on: revolutionary, relevant, and time to revitalise. Lancet. 2008 Sep 13;372(9642):917-27. https://doi.org/10.1016/S0140-6736(08)61402-6.

37. World Health Organization. Urgent health challenges for the next decade. 2020 Jan 13 [cited 2022 Jun 03]. Available from: https://www.who.int/news-room/photo-story/photo-story-detail/urgent-health-challenges-for-the-next-decade

38. World Health Organization. Declaration of Astana: Global Conference on Primary Health Care. Astana, Kazakhstan World Health Organization; 2018 Oct 25-26 [cited 2020 February 02]. Available from: https://apps.who.int/iris/handle/10665/328123

39. World Health Organization and the United Nations Children's Fund (UNICEF). Operational framework for primary health care: transforming vision into action. Geneva 2020 [cited 2021 Sep 22]. Available from: https://apps.who.int/iris/handle/10665/337641

40. Masis L, Gichaga A, Zerayacob T, Lu C, Perry HB. Community health workers at the dawn of a new era: 4. Programme financing. Health Res Policy Sys. 2021;19:1-17.https://doi.org/10.1186/s12961-021-00751-9.

41. Perry HB, Hodgins S. Health for the people: past, current, and future contributions of national community health worker programs to achieving global health goals. Glob Health Sci Pract. 2021 Mar 31;9(1):1-9. https://doi.org/10.9745/GHSP-D-20-00459.

42. Dodd R, Palagyi A, Jan S, Abdel-All M, Nambiar D, Madhira P, et al. Organisation of primary health care systems in low- and middle-income countries: review of evidence on what works and why in the Asia-Pacific region. BMJ Glob Health. 2019 Aug 16;4(Suppl 8):e001487. https://doi.org/10.1136/bmjgh-2019-001487.

43. Liu A, Sullivan S, Khan M, Sachs S, Singh P. Community health workers in global health: scale and scalability. Mt Sinai J Med. 2011 May-Jun;78(3):419-35. https://doi.org/10.1002/msj.20260.

44. Olaniran A, Smith H, Unkels R, Bar-Zeev S, van den Broek N. Who is a community health worker?–a systematic review of definitions. Glob Health Action. 2017;10(1):1272223. https://doi.org/10.1080%2F16549716.2017.1272223.

45. Bien CH. China's rural health care revolution, 1968-1981. Middletown (CT): Wesleyan University; 2008 Apr [cited 2022 Jan 10]. Available from: https://digitalcollections.wesleyan.edu/object/ir-676

46. Community health workers: a review of the literature. Minnesota Department of Health (MDH): office of rural health and primary care emerging professions program; 2016.

47. Perry H. A brief history of community health worker programs. Encyclopedia of public health. Berlim: Springer; 2013 [cited 2019 Dec 25]. 1-12. Available from: https://www.mchip.net/sites/default/files/mchipfiles/02_CHW_History.pdf

48. Mukherjee JS. Community health workers. In: Mukherjee JS, Farmer P, editors. An introduction to global health delivery. New York (NY): Oxford University Press; 2017.

49. Berman PA, Gwatkin DR, Burger SE. Community-based health workers: head start or false start towards health for all? Soc Sci Med. 1987;25(5):443-59. https://doi.org/10.1016/0277-9536(87)90168-7.

50. Hartzler AL, Tuzzio L, Hsu C, Wagner EH. Roles and functions of community health workers in primary care. Ann Fam Med. 2018 May;16(3):240-5. https://doi.org/10.1370%2Fafm.2208.

51. Schneider H, Okello D, Lehmann U. The global pendulum swing towards community health workers in low-and middle-income countries: a scoping review of trends, geographical distribution and programmatic orientations, 2005 to 2014. Hum Resour Health 2016;14(1):65. https://doi.org/10.1186/s12960-016-0163-2.

52. Bhutta ZA, Lassi ZS, Pariyo G, Huicho L. Global experience of community health workers for delivery of health related millennium development goals: a systematic review, country case studies, and recommendations for integration into national health systems: Global Health Workforce Alliance and World Health Organization; 2010.

53. Lehmann U, Sanders D. Policy brief: community health workers: what do we know about them? The state of the evidence on programmes, activities, costs and impact on health outcomes of using community health workers. Geneva: World Health Organization: Evidence and Information for Policy, Department of Human Resources for Health; 2007 Jan.

54. Ofosu-Amaah V. National experience in the use of community health workers: a review of current issues and problems. Geneva: World Health Organization; 1983 [cited 2022 Feb 28]. Available from: https://apps.who.int/iris/handle/10665/39257

55. Javanparast S, Windle A, Freeman T, Baum F. Community health worker programs to improve healthcare access and equity: are they only relevant to low- and middle-income countries? Int J Health Policy Manag. 2018;7(10):943. https://doi.org/10.15171/ijhpm.2018.53.

56. WHO Study Group on Community Health Workers & World Health Organization. Strengthening the performance of community health workers in primary health care. Report of a WHO Study Group. Geneva: World Health Organization Technical Report Series 780; 1989 Dec 2-9 [cited 2021 Oct 15]. 1-46. Available from: https://apps.who.int/iris/handle/10665/39568

57. Cometto G, Ford N, Pfaffman-Zambruni J, Akl EA, Lehmann U, McPake B, et al. Health policy and system support to optimise community health worker

programmes: an abridged WHO guideline. Lancet Glob Health. 2018 Dec;6(12):e1397-e404. https://doi.org/10.1016/s2214-109x(18)30482-0

58. Hodgins S, Kok M, Musoke D, Lewin S, Crigler L, LeBan K, et al. Community health workers at the dawn of a new era: 1. Introduction: tensions confronting large-scale CHW programmes. Health Res Policy Sys. 2021;19 (Suppl 3):109. https://doi.org/10.1186/s12961-021-00752-8

59. Maher D. 'Leaving no-one behind': how community health workers can contribute to achieving the Sustainable Development Goals. Public Health Action. 2017 Mar 21;7(1):5. https://doi.org/10.5588%2Fpha.17.0022.

60. Mariano AR, Cliff JL, Chilundo BG, George A, Rodríguez DC. Relaunch of the official community health worker programme in Mozambique: is there a sustainable basis for iCCM policy? Health Policy Plan. 2015 Dec;30(Suppl 2):ii54-ii64. https://doi.org/10.1093/heapol/czv036.

61. Christopher JB, Le May A, Lewin S, Ross DA. Thirty years after Alma-Ata: a systematic review of the impact of community health workers delivering curative interventions against malaria, pneumonia and diarrhoea on child mortality and morbidity in sub-Saharan Africa. Hum Resour Health. 2011 Oct 24;9(1):27. https://doi.org/10.1186/1478-4491-9-27.

62. Kampala Statement from the 1st International Symposium on Community Health Workers. Kampala, Uganda: Statement provided by Healthcare Information for All (HIFA); 2017 Feb 23 [cited 2019 May 14]. Available from: www.hifa.org/sites/default/files/publications_pdf/Kampala_CHW_symposium_statement-FINAL.pdf

63. Perry H, Editor. Health for the people: national community health worker programs from Afghanistan to Zimbabwe. Washington DC: Maternal and Child Survival Program, USAID; 2020 Oct [cited 2020 Dec 31]. Available from: https://chwcentral.org/wp-content/uploads/2021/11/Health_for_the_People_Natl_Case%20Studies_Oct2021.pdf

64. Perry H, Zulliger R, Scott K, Javadi D, Gergen J, Shelley K, et al. Case studies of large-scale community health worker programs: examples from Afghanistan, Bangladesh, Brazil, Ethiopia, Niger, India, Indonesia, Iran, Nepal, Pakistan, Rwanda, Zambia, and Zimbabwe. Maternal and Child Survival Program, MCHIP, USAID; 2017 [cited 2019 Apr 22]. Available from: https://www.mchip.net/sites/default/files/MCSP_CHW_Case%20Study%20Summaries.pdf

65. Lewin S, Lehmann U, Perry HB. Community health workers at the dawn of a new era: 3. Programme governance. Health Res Policy Syst. 2021;19(Suppl 3):129. https://doi.org/10.1186/s12961-021-00749-3.

66. Rifkin SB. Alma Ata after 40 years: Primary Health Care and Health for All-from consensus to complexity. BMJ Glob Health. 2018;3(Suppl 3):e001188. https://doi.org/10.1136/bmjgh-2018-001188.

67. Ahmed S, Chase LE, Wagnild J, Akhter N, Sturridge S, Clarke A, et al. Community health workers and health equity in low-and middle-income countries: systematic review and recommendations for policy and practice. Int J Equity Health. 2022;21(1):1-30. https://doi.org/10.1186/s12939-021-01615-y.

68. Zulu JM, Perry HB. Community health workers at the dawn of a new era. Health Res Policy Syst. 2021 Oct 12;19(Suppl 3):103. https://doi.org/10.1186/s12961-021-00753-7.

69. Perry H, Akin-Olugbade L, Lailari A, Son Y. A comprehensive description of three national community health worker programs and their contributions to maternal and child health and primary health care: Case studies from Latin America (Brazil), Africa (Ethiopia) and Asia (Nepal). Baltimore (MD): CHW Central; 2016 [cited 2022 Jun 07]. Available from: https://chwcentral.org/resources/a-comprehensive-description-of-three-national-community-health-worker-programs-and-their-contributions-to-maternal-and-child-health-and-primary-health-care/

70. Ballard M, Bancroft E, Nesbit J, Johnson A, Holeman I, Foth J, et al. Prioritising the role of community health workers in the COVID-19 response. BMJ Glob Health. 2020 Jun;5(6):e002550. https://doi.org/10.1136/bmjgh-2020-002550.

71. Bhaumik S, Moola S, Tyagi J, Nambiar D, Kakoti M. Community health workers for pandemic response: a rapid evidence synthesis. BMJ Glob Health. 2020;5(6):e002769. https://doi.org/10.1136/bmjgh-2020-002769.

72. Kok M, Crigler L, Musoke D, Ballard M, Hodgins S, Perry HB. Community health workers at the dawn of a new era: 10. Programme performance and its assessment. Health Res Policy Syst. 2021 Oct 12;19(Suppl 3):1-14. https://doi.org/10.1186/s12961-021-00758-2.

73. McCollum R, Gomez W, Theobald S, Taegtmeyer M. How equitable are community health worker programmes and which programme features influence equity of community health worker services? A systematic review. BMC Public Health. 2016;16(1):1-16. https://doi.org/10.1186/s12889-016-3043-8.

74. Chou VB, Friberg IK, Christian M, Walker N, Perry HB. Expanding the population coverage of evidence-based interventions with community health workers to save the lives of mothers and children: an analysis of potential global impact using the Lives Saved Tool (LiST). Journal Global Health. 2017 Dec;7(2):020401. https://doi.org/10.7189/jogh.07.020401.

75. Rifkin SB. Paradigms lost: toward a new understanding of community participation in health programmes. Acta Trop. 1996 Apr Apr;61(2):79-92. https://doi.org/10.1016/0001-706x(95)00105-n.

76. Schneider H. The governance of national community health worker programmes in low-and middle-income countries: an empirically based framework of governance principles, purposes and tasks. Int J Health Policy Manag. 2019;8(1):18. https://doi.org/10.15171%2Fijhpm.2018.92.

77. Perry H, Zulliger R. How effective are community health workers? An overview of current evidence with recommendations for strengthening community health worker programs to accelerate progress in achieving the health-related Millennium Development Goals. Baltimore (MD): Johns Hopkins Bloomberg School of Public Health; 2012 [cited 2021 May 18]. Available from: https://www.childhealthtaskforce.org/sites/default/files/2019-07/How%20Effective%20are%20CHWs_Evidence%20Summary%20Condensed%28JHSPH%2C%202012%29.pdf

78. LeBan K, Kok M, Perry HB. Community health workers at the dawn of a new era: 9. CHWs' relationships with the health system and communities. Health Res Policy Syst. 2021;19(3):1-19. https://doi.org/10.1186/s12961-021-00756-4.

79. WHO guideline on health policy and systems support to optimize community health worker programmes. Geneva: World Health Organization; 2018 [cited 2020 Nov 18]. Available from: https://www.who.int/publications/i/item/9789241550369

80. Assefa Y, Gelaw YA, Hill PS, Taye BW, Van Damme W. Community health extension program of Ethiopia, 2003-2018: successes and challenges toward universal coverage for primary healthcare services. Glob Health. 2019 Mar 26;15(1):24. https://doi.org/10.1186/s12992-019-0470-1.

81. Shakir FK. Community health worker programs: a review of recent literature. University Research Co., LLC: USAID Health Care Improvement Project (HCI) 2010 [cited 2019 June 25]. Available from: http://chwcentral.org/community-health-worker-programs-review-recent-literature

82. Wazir MS, Shaikh BT, Ahmed A. National program for family planning and primary health care Pakistan: a SWOT analysis. Reprod Health. 2013 Nov 22;10(1):60.10.1186/1742-4755-10-60.

83. World Health Organization. The challenges of a changing world. In: The world health report 2008: primary health care now more than ever [Internet]. Geneva: WHO Press; 2008. p. 3 [cited 2021 Jun 23]. Available from: https://apps.who.int/iris/handle/10665/43949

84. Agarwal S, Curtis SL, Angeles G, Speizer IS, Singh K, Thomas JC. The impact of India's accredited social health activist (ASHA) program on the utilization of maternity services: a nationally representative longitudinal modelling study. Hum Resour Health. 2019 Aug 19;17(1):68. https://doi.org/10.1186/s12960-019-0402-4.

85. Strodel RJ, Perry HB. The National Village Health Guide Scheme in India: lessons four decades later for community health worker programs today and tomorrow. Hum Resour Health. 2019 Oct 28;17(1):76. https://doi.org/10.1186/s12960-019-0413-1.

86. Gilson L, Walt G, Heggenhougen K, Owuor-Omondi L, Perera M, Ross D, et al. National community health worker programs: how can they be strengthened? J Public Health Policy. 1989;10(4):518-32. https://doi.org/10.2307/3342522.

87. Bitton A, Fifield J, Ratcliffe H, Karlage A, Wang H, Veillard JH, et al. Primary healthcare system performance in low-income and middle-income countries: a scoping review of the evidence from 2010 to 2017. BMJ Glob Health. 2019;4(Suppl 8):e001551. https://doi.org/10.1136%2Fbmjgh-2019-001551.

88. Visagie S, Schneider M. Implementation of the principles of primary health care in a rural area of South Africa. Afr J Prm Health Care Fam Med. 2014;6(1). https://doi.org/10.4102%2Fphcfm.v6i1.562.

89. Glenton C, Javadi D, Perry HB. Community health workers at the dawn of a new era: 5. Roles and tasks. Health Res Policy Syst. 2021;19(Suppl 3):1-16. https://doi.org/10.1186/s12961-021-00748-4.

90. Mills A. Health care systems in low- and middle-income countries. N Engl J Med. 2014 Feb 6;370(6):552-7. https://doi.org/10.1056/nejmra1110897.

91. Perveen S, Mahmood MA, Lassi ZS, Perry HB, Laurence C. Application of primary health care principles in national community health worker programs in low- and middle-income countries: a scoping review protocol. JBI Evid Synth. 2021 Jan;19(1):270-83. https://doi.org/10.11124/jbisrir-d-19-00315.

92. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018 Oct 2 Oct 2;169(7):467-73. https://doi.org/10.7326/m18-0850.

93. Dalglish SL, Khalid H, McMahon SA. Document analysis in health policy research: the READ approach. Health Policy Plan. 2021 Feb 16;35(10):1424-31. https://doi.org/10.1093/heapol/czaa064.

94. Perveen S, Laurence C, Mahmood MA. Indicator-Activites to apply primary health care principles in national or large-scale community health worker programs in low- and middle -income countries: a Delphi exercise. BMC Public Health. 2022 Aug 22;22:1599. https://doi.org/10.1186/s12889-022-13996-y.

95. Hodgins S. Learning from Community Health Worker Programs, Big and Small. Glob Health Sci Pract. 2020 Jun 30;8(2):147-9. https://doi.org/10.9745%2FGHSP-D-20-00244.

96. Australian Government Productivity Commission. On efficiency and effectiveness: some definitions. Canberra: Productivity Commission Staff Research Note; 2013. p 13. Available from: https://www.pc.gov.au/research/supporting/efficiency-effectiveness

97. Rodela K, Wiggins N, Maes K, Campos-Dominguez T, Adewumi V, Jewell P, et al. The Community Health Worker (CHW) Common Indicators Project: Engaging CHWs in Measurement to Sustain the Profession. Front Public Health. 2021;9:674858. https://doi.org/10.3389%2Ffpubh.2021.674858.

98. Carrasco H, Napier H, Giber D, Kang S, Aguerreberre M, Hing M, et al. Accompanimeter 1.0: creation and initial field testing of a tool to assess the extent to which the principles and building blocks of accompaniment are present

in community health worker programs. Glob Health Action. 2019;12(1):1699348. https://doi.org/10.1080/16549716.2019.1699348.

99. Palazuelos D, Ellis K, Im DD, Peckarsky M, Schwarz D, Farmer DB, et al. 5-SPICE: the application of an original framework for community health worker program design, quality improvement and research agenda setting. Glob Health Action. 2013 Apr 3;6:19658. https://doi.org/10.3402/gha.v6i0.19658.

100. Ballard M, Bonds M, Burey J-A, Foth J, Fiori K, Holeman I, et al. Community health worker assessment and improvement matrix (CHW AIM): updated program functionality matrix for optimizing community health programs. CHW Central, Community Health Impact Coalition, Initiatives Inc., USAID and UNICEF 2018. Available from: https://www.unicef.org/media/58176/file

101. Perveen S, Lassi ZS, Mahmood MA, Perry HB, Laurence C. Application of primary health care principles in national community health worker programs in low- and middle -income countries: a scoping review. BMJ Open. 2022 Feb 1;12(2). https://bmjopen.bmj.com/content/12/2/e051940.

102. Lady Health Worker Programme, Pakistan: Performance Evaluation Report: Oxford Policy Management. ; 2019. Available from: https://www.unicef.org/pakistan/media/3096/file/Performance%20Evaluation%20Report%20-%20Lady%20Health%20Workers%20Programme%20in%20Pakistan.pdf.

103. Douthwaite M, Ward P. Increasing contraceptive use in rural Pakistan: an evaluation of the Lady Health Worker Programme. Health Policy Plan. 2005;20(2):117-23. https://doi.org/10.1093/heapol/czi014.

104. Admassie A, Abebaw D, Woldemichael AD. Impact evaluation of the Ethiopian health services extension programme. J Dev Effect. 2009 Dec 10;1(4):430-49. https://doi.org/10.1080/19439340903375724.

105. Teklu AM, Alemayehu YK, Medhin G, Fentaye FW, Dadi TL, Tsehay YE, et al. National assessment of the Ethiopian Health Extension Program: final master report. Addis Ababa, Ethiopia: MERQ Consultancy PLC; 2020.

106. Witter S, Awosus A. Ethiopia and the Health Extension Programme: learning for action across health systems - case study. United Kingdom: Oxford Policy Management; 2017 Oct.

107. Netsanet WW, Ramana GN. The Health Extension Program in Ethiopia. Universal health covergae UNICO studies series No. 10. Washigton DC: World Bank; 2013. Available from: http://hdl.handle.net/10986/13280

108. Wang H, Tesfaye R, Ramana GNV, Chekagn CT. Ethiopia Health Extension Program: an institutionalized community approach for universal health coverage. Washigton DC: World Bank Studies. International Bank for Reconstruction and Development / The World Bank; 2016. Available from: http://hdl.handle.net/10986/24119

109. Zhu N, Allen E, Kearns A, Jacquelyn Caglia, Atun R. Lady health workers in Pakistan: improving access to health care for rural women and families. Boston: Harvard School of Public Health; 2014. Available from: https://cdn2.sph.harvard.edu/wp-content/uploads/sites/32/2014/09/HSPH-Pakistan5.pdf

110. Snilstveit B, Oliver S, Vojtkova M. Narrative approaches to systematic review and synthesis of evidence for international development policy and practice. J Dev Effect. 2012;4(3):409-29. https://doi.org/10.1080/19439342.2012.710641.

111. Teklu A, Alemayehu Y, Medhin G, Fentaye F, Dadi T, Tsehay Y. National assessment of the ethiopian health extension program. Addis Ababa, Ethiopia: MERQ Consultancy PLC. 2019.

112. Bilal N. Health Extension Program: an innovative solution to public health challenges of Ethiopia-a case study: Health Systems 20/20 Project, USAID; 2012.

113. Dodson S, Good S, Osborne RH. Health literacy toolkit for low-and middle-income countries: a series of information sheets to empower communities and strengthen health systems. New Delhi: World Health Organization, Regional Office for South-East Asia; 2015 [cited 2022 Jul 28]. Available from: https://apps.who.int/iris/handle/10665/205244

114. Das S, Mia MN, Hanifi SM, Hoque S, Bhuiya A. Health literacy in a community with low levels of education: findings from Chakaria, a rural area of Bangladesh. BMC Public Health. 2017 Feb 16;17(1):203. https://doi.org/10.1186/s12889-017-4097-y.

115. Meherali S, Punjani NS, Mevawala A. Health literacy interventions to improve health outcomes in low- and middle-income countries. Health Lit Res Pract. 2020 Dec 11;4(4):e251-e66. https://doi.org/10.3928/24748307-20201118-01.

116. Musoke D, Ssemugabo C, Ndejjo R, Molyneux S, Ekirapa-Kiracho E. Ethical practice in my work: community health workers' perspectives using photovoice in Wakiso district, Uganda. BMC Med Ethics. 2020;21(68):1-10. https://doi.org/10.1186/s12910-020-00505-2.

117. Afzal MM, Pariyo GW, Lassi ZS, Perry HB. Community health workers at the dawn of a new era: 2. Planning, coordination, and partnerships. Health Res Policy Syst. 2021;19(3):1-17. https://doi.org/10.1186/s12961-021-00753-7.

118. Lehmann U, Twum-Danso NA, Nyoni J. Towards universal health coverage: what are the system requirements for effective large-scale community health worker programmes? BMJ Glob Health. 2019;4(Suppl 9):e001046. https://doi.org/10.1136%2Fbmjgh-2018-001046.