Primary Care Service Delivery Redesign

This Doctoral Thesis, *Primary Care Service Delivery Redesign*, presented by *Rodrigo Bazua Lobato*, and Submitted to the Faculty of The Harvard T.H. Chan School of Public Health in Partial Fulfillment of the Requirements for the Degree of Doctor of *Public Health*, has been read and approved by:

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A Doctoral Thesis Submitted to the Faculty of

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Abstract

Primary Health Care (PHC) is considered capable of meeting 90% of people's health needs and fundamental to achieving the Sustainable Development Number 3 of Good Health and Well-Being. Furthermore, there is abundant evidence of PHC's positive health, equity, and economic outcomes in countries with well-resourced and well-functioning PHC platforms. However, despite the ample evidence regarding PHC's effectiveness, PHC has also failed to deliver on its promises in several countries, particularly in LMICs. Because of this, it is increasingly recognized that to deliver on its promises, PHC must be of high-quality and high performing itself and, consequently, redesigned and reorganized.

This thesis presents a set of themes and approaches to how the delivery of primary care can be redesigned and reorganized in LMICs to improve health outcomes based on an umbrella review of the evidence available in the peer-reviewed scientific literature on delivery arrangements, as defined by Cochrane's Effective Practice and Organization, implemented in primary care settings and conducted in, or applicable to LMICs.

Through the umbrella review, 1269 reviews were identified, and 84 of them were included. The findings of these reviews were grouped into the main delivery arrangements of the interventions that they evaluated, as well as according to their health categories (e.g.,

mental health). Some of the key findings of the umbrella review are the following: Nurses can take on responsibilities currently assigned to primary care physicians for highly prevalent conditions, such as NCD and HIV care; integration or linkages of care throughout the continuum of care consistently improved outcomes for some conditions; LHWs can substitute some in-service care with at-home or in-community care, as well as support and enhance the care for several conditions; and remote consulting was found effective for NCD care and mental health disorders.

Through the analysis of these findings, it was identified that team-based delivery, proactive care, integration throughout the continuum of care, and leveraging mHealth and telemedicine for dialogue-based services were common elements of the design of highly effective interventions. Building from the findings, this project presents an approach to designing more effective PC models by using bundles of interventions, termed bundled primary care, for different conditions along the care continuum. The thesis concludes with a case study of Chiapas and Mexico City to illustrate the application and the suggested context-specific design of models of care in primary care.

This project sets forth the idea that the provision of primary care should be designed in bundles of delivery arrangements or interventions at each step of the continuum of care, based on the best available evidence, delivered by a diverse group of providers.

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Acknowledgments

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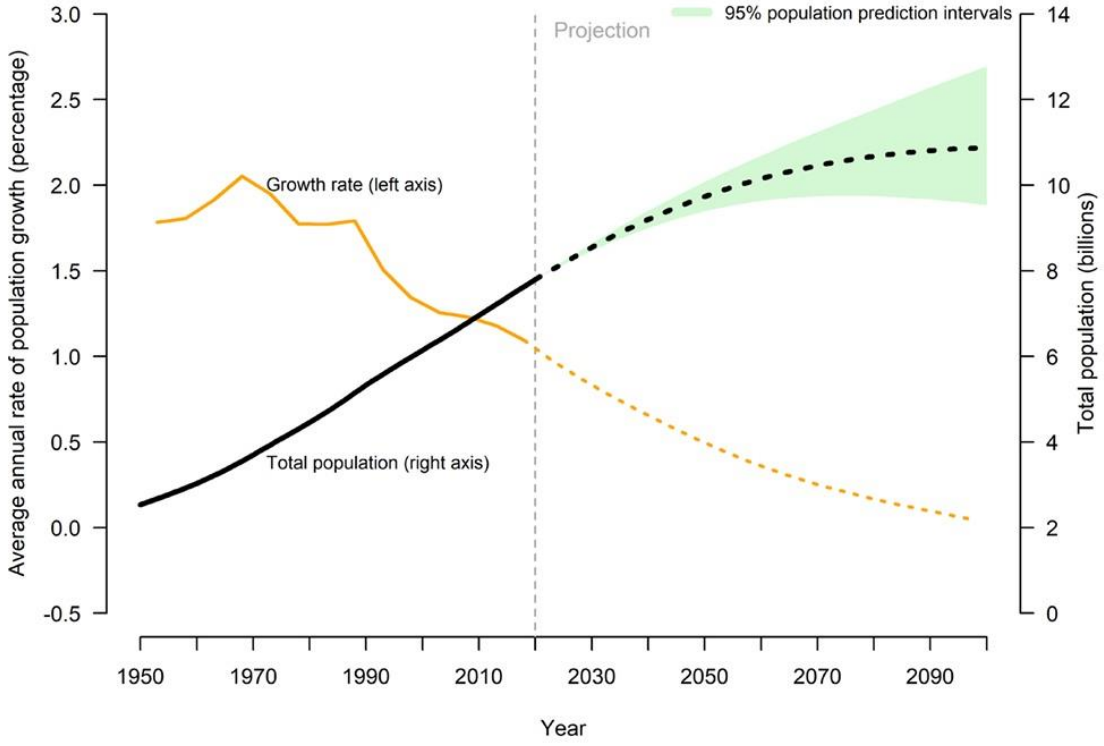
Introduction

Health systems are at a crossroads brought about by tremendous changes that have occurred in the demographic and health landscapes around the world, especially in low- and middle-income countries (LMICs). Over the last 50 years, the world's population has doubled; in some regions, it will double again by 2050 (World Bank, 2018). Additionally, a generalized and continuous reduction in fertility rates in LMICs, combined with increasing life expectancies, has resulted in the expansion of the proportion of their population in the adult and older age groups, accompanied by a contraction of the proportion of their child and adolescent populations (World Bank, 2022).

This demographic transition has created a significant shift in populations' health needs from requiring basic and sporadic care for infectious diseases, to requiring longitudinal care for chronic diseases, mental health conditions, and other more complex conditions (Kruk et al., 2018a). In 1990, 34% of worldwide deaths were caused by communicable, maternal, neonatal, and nutritional diseases, which primarily affect children and pregnant women and, in general, require less complex care and systems, and 56% by non-communicable diseases mainly affecting adults and older individuals. In contrast, by 2019, deaths from communicable, maternal, neonatal, and nutritional diseases had decreased to 18%, while those due to non-communicable diseases had increased to 74% of total deaths (Global Burden of Disease Collaborative Network, 2020). Figures 1 and 2 show the demographic transition and the shift in the percentage of global deaths by cause, respectively.

Figure 1. Global population growth rate and total population projections, 1950 – 2100. (Reproduced from United Nations, 2019).

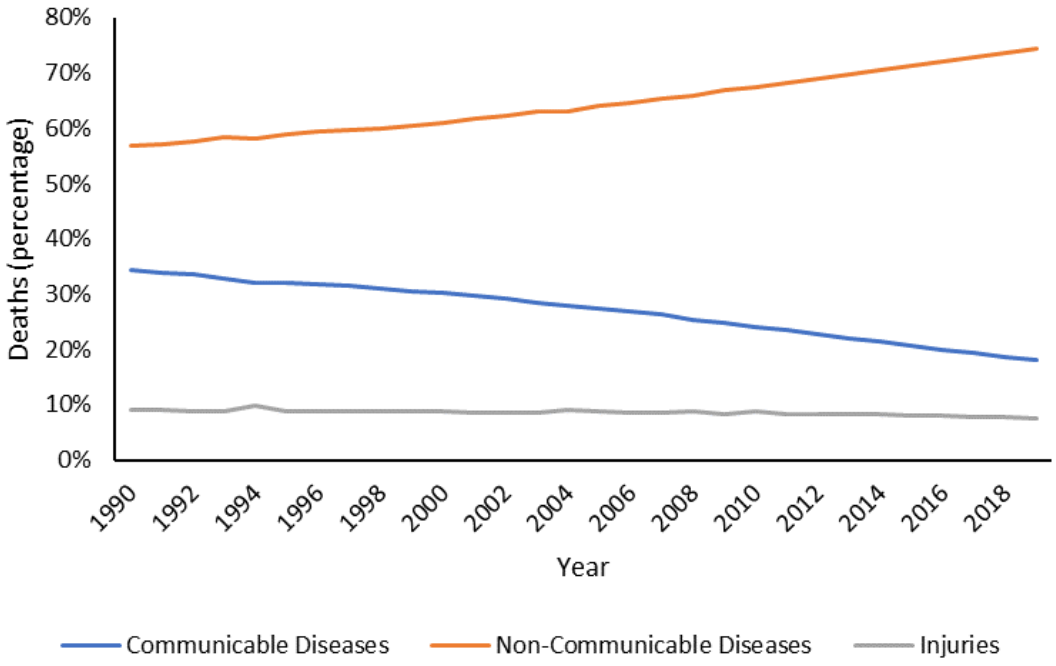


The overall burden of disease and health needs worldwide is highest in LMICs, which have the least resources for healthcare. While 77% of deaths due to non-communicable diseases occur in LMICs (World Health Organization [WHO], 2022), LMICs spent in 2019 between $34 and $551 USD per person on healthcare, a minimal amount compared to the $5,635 USD spent per person on healthcare in high-income countries (HICs) in that same year (World Bank, 2022). Moreover, most LMICs' health systems were designed to provide the basic care required for infectious diseases and have not been appropriately transformed to provide high-quality healthcare and meet the evolving needs of their expanding and aging populations with chronic needs (Kruk et al., 2015). As a result of this mismatch, it has been

estimated that LMICs in 2016 had an estimated 15.6 million excess deaths, 3·6 million were due to non-utilization of health care services, and five million were due to poor quality of available care (Kruk et al., 2018b).

Figure 2. Percentage of total global deaths by cause, 1990-2019.

(Data source: IHME Global Burden of Disease).



Therefore, the challenges that health systems in LMICs face are not easy ones as they contend with high burdens of disease, shifting demographics with changing health needs, and extremely constrained resources. It is imperative that they find ways to increase available resources and make the best use of these resources. It is in this context that primary health care (PHC), a whole-of-government and whole-of-society approach to health that includes the provision of healthcare and public health services in most proximity to where people live and work (WHO & United Nations Children's Fund

[UNICEF], 2018), has been globally recognized as an essential element to achieving health for all since 1978, with the Declaration of Alma-Ata (International Conference on Primary Health Care, 1978).

Primary health care is considered capable of meeting 90% of people's health needs and fundamental to achieving the Sustainable Development Goal Number 3 of Good Health and Well-Being (WHO, 2018; Chotchoungchatchai et al., 2020). Furthermore, PHC has been proposed as a central element of high-quality and high-performing health systems (Hanson et al., 2022), given the abundant evidence of PHC's positive impact on health, equity, and economic outcomes in countries with well-resourced and well-functioning healthcare systems. These positive outcomes include longer life expectancies (Hsieh et al., 2015), lower under-five mortality rates (Shi et al., 2004), increased satisfaction with healthcare systems, decreased utilization of hospital care (Shi, 2012), reduced hospitalizations due to ambulatory care-sensitive conditions (Monahan et al., 2011; Flores & San Sebastian, 2021), and a narrowing of the gap between socioeconomic groups (Rao & Pilot, 2014; Kringos et al., 2013). However, despite the ample evidence regarding PHC's effectiveness, it has also failed to deliver on its promises in several countries, particularly in LMICs (Hanson et al., 2022).

This project focuses on one specific component of PHC, referred to as primary care (PC). PC utilizes healthcare providers to deliver services directly to individuals to prevent, diagnose, treat, and follow up on illnesses, ideally in close proximity to where people live. The differences between PHC and PC, and this project's definitions are further discussed

in the literature review section. For now, Figure 3 summarizes this project's distinction between PHC and PC.

Figure 3. Schematic representation of PC as an element of PHC.

Many countries' PC platforms suffer from a number of problems that affect the quality and effectiveness of the care they can deliver: they may underperform because they are under-resourced or because they are fragmented into several vertical programs; they may be not integrated into the rest of the healthcare system; the services they deliver may not be tailored to the needs of the population or services may simply not exist in practice (Langlois et al., 2020). For instance, as a consequence of low-quality PC, approximately 44% of patients bypass PC when in need of healthcare in some LMICs (Kruk et al., 2018a). Because of this, it is increasingly recognized that to deliver on its promises, PC must be of high quality and high performing itself (Hanson et al., 2022).

Quality in PC, as in any healthcare activity, starts with and requires much more than simply having the correct inputs, such as well-trained and competent providers, hospitals and clinics, and the availability of drugs and equipment. Quality in healthcare requires having the right provider being able to deliver the right care to the right person at the right place at the right time, which in turn requires the well-functioning of a multiplicity of other actors and activities. Based on these premises, this project asks: How can service delivery be redesigned in PC to maximize quality?

Given the diverse contexts in which PC is delivered, and the diversity and scope of its functions, the overarching objective of this project was to identify the ways of organizing PC that consistently show the highest strength of evidence of improving people's health outcomes in LMICs, that could then inform the reorganization of PC healthcare delivery.

To achieve this objective, this project had three stages:

1. Conducting an umbrella review of delivery arrangements in primary care to identify the most effective interventions in improving people's health outcomes, and to analyze the similarities and differences in social contexts and organizational settings of the most effective ones.
2. Performing a synthesis of the common features of the most effective interventions.
3. Applying the synthesis of common features to the design of models of care in primary care following the continuum of care framework, illustrated through case studies.

The next section introduces the project's background and origins, followed by the theoretical frameworks through which PC and its ways of being organized were approached and conceptualized in this project. This is followed with a literature review of some of the major efforts that have been conducted to improve PHC and PC, both present and past. Subsequently, that section is followed by a detailed description of the methods employed to achieve the project's aims and objectives. After the methods section, the results section presents the project's findings alongside a contextualized discussion and analysis. That section ends with a set of context-specific recommendations for reorganizing PC. The last section of this project includes the project's main conclusions and takeaways, and a case study that exemplifies their application in two areas of Mexico.

Background, Literature Review and Framework for Change

Background. QuEST's Service Delivery Redesign Efforts

This doctoral project builds upon previous efforts to improve the quality of healthcare and people's health conducted by the Quality Evidence for Health System Transformation (QuEST) Network, the project's host organization. QuEST is a global research and development network for health systems innovation, established in 2021 by Dr. Margaret Kruk at the Harvard T.H. Chan School of Public Health. QuEST focuses on producing high-impact research to build national health systems and health systems research expertise. The evidence generated by QuEST can guide local action and be adapted for use across many contexts (QuEST, n.d.).

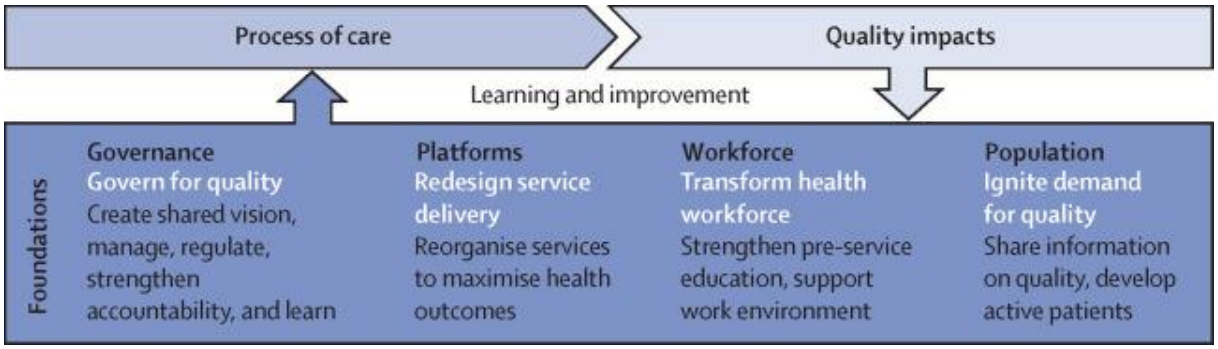
QuEST's mission is to build the evidence base to support the transformation to high-quality health systems by improving measurement, testing solutions, and creating generalizable knowledge in partnership with researchers and changemakers (QuEST, n.d.). QuEST aims to accomplish its mission through five key activities:

1. Producing and sharing rigorous and policy-driven research that can assist in the transformation to high quality health systems.
2. Generating global public goods to enable replication and scale-up of new quality measures and health system models.
3. Expanding global interest in and funding for innovative, large-scale health system quality research.

4. Translating research and promoting evidence-based policies through partnerships with local, national, and global policymakers.
5. Mentoring the next generation of health system scientists by providing opportunities for supportive collaboration and skill building.

Specifically, this project originated from the service delivery redesign (SDR) efforts conducted by QuEST. SDR is an approach to strengthening health systems first introduced by the Lancet Global Health Commission on High Quality Health Systems (hereinafter referred to as the Commission) as one of its four pillars for improving the quality of healthcare at scale (Kruk et al., 2018a). Figure 4 shows the actions recommended by the Commission for improving quality at scale.

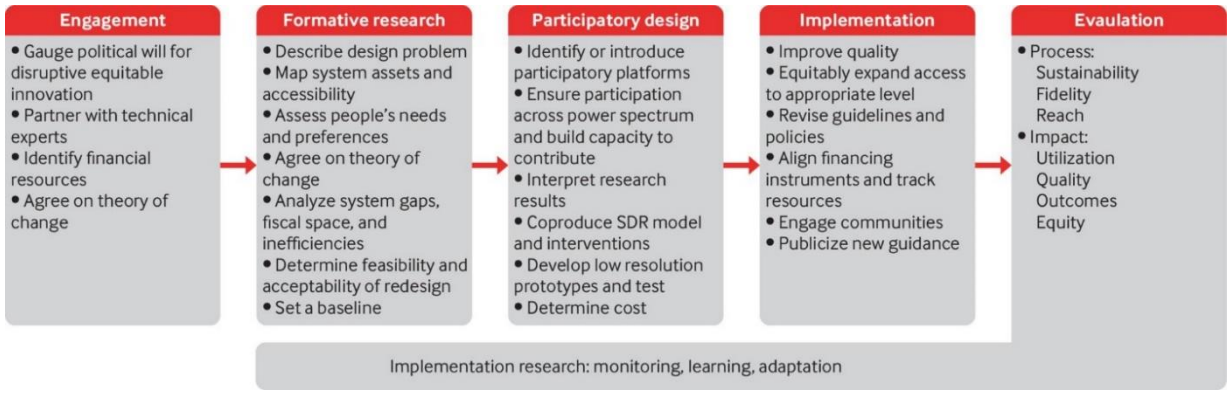
Figure 4. Actions for improving quality at scale recommended by Lancet Global Health Commission on High Quality Health Systems. (Reproduced from Kruk, 2018).



SDR is the intentional reorganization of a health system to improve equity, quality, and outcomes (Roder-DeWan et al., 2023) though a five-phase process that comprises a stakeholder engagement period, formative research, participatory design, implementation and evaluation. Figure 5 shows the five phases of SDR.

Figure 5. Five phases of service delivery redesign.

(Reproduced from Roder-DeWan et al., 2023).



Accordingly, this project aims to generate an overview of the interventions that have shown the strongest evidence of consistently improving people's health outcomes and to identify their commonalities to support health systems SDR efforts in PC during the participatory design stage. More details about previous efforts to improve PC internationally at scale are presented in the literature review section.

Literature Review

This section first presents a discussion about the definitions of PHC and PC found in the literature, as well as the definition of them used in this project. It is followed by a brief discussion of two previous global efforts to improve PHC and PC and their relevance for this project, namely, the Primary Health Care Improvement Initiative and World Health Organization's Primary Health Care Efforts.

Primary Health Care and Primary Care: Definitions and this Project's Approach

Primary Health Care (PHC) and Primary Care (PC) are similar terms used to refer to the health services and efforts provided as close as possible to where people live and work. However, there are important differences between the two concepts.

Primary Health Care. PHC is defined by the WHO and UNICEF as a whole-of-government and whole-of-society approach to health that combines multisectoral policy and action, the empowerment of people and communities, and the provision of primary care and essential public health functions (WHO & UNICEF, 2018). Therefore, PHC is not only a medical and public health service delivery platform but can be considered as a framework to conceptualize the major elements required to generate healthy societies.

As was mentioned in the introduction, PHC first came to the forefront of health policy when it was set as a global priority by the WHO in its 1978 Declaration of Alma-Ata in the Soviet Republic of Kazakhstan (Hanson et al. 2022; Birn & Krementsov, 2018). The Declaration calls for "health for all the people of the world by the year 2000," based on the expansion and global adoption of the polyclinic model established by the USSR in 1918, immediately after the 1917 Russian Revolution.

Central to the Soviet healthcare model were polyclinics. Polyclinics were in charge of caring for simple and common medical conditions in the outpatient setting. However, an essential element of the Soviet model was the collaboration between the Ministry of Health Protection and other state agencies to not only provide medical curative and preventive services but also to provide social protection measures, such as housing, pensions, workers'

compensation, paid maternity leave, nutrition, and other elements of social welfare, which are now well-known as social determinants of health. The notions of universal access, equity, integration of prevention and treatment, and the government's responsibility for the population's health were cornerstones of this model (Birn & Krementsov, 2018).

Even though the most commonly used definition of PHC is the one set forth by WHO and UNICEF, the concept of PHC is not uniformly described by different authors, organizations, and contexts (Muldoon, Hogg & Levitt, 2016). In spite of these differences, in most contexts, PHC definitions agree that it is the foundation of health systems and is more than just a platform for healthcare delivery. Not only does PHC seek to deliver individual-based curative and preventive services, but it also provides population-based interventions that prevent the occurrence of disease, ranging in different contexts from solely providing immunizations to establishing comprehensive social welfare programs (PCHPI, n.d.; WHO & UNICEF, 2018).

Primary Care. The term Primary Care was likely first introduced in 1920 in the Dawson Report, commissioned by the British Government to guide the expansion and redesign of its health system. The Dawson Report suggested introducing three hierarchical levels of care (primary health centers, secondary health centers, and tertiary teaching hospitals), with primary care as the basic level of care responsible for caring for simple and common medical conditions in the outpatient setting (Frenk, 2009). Currently, most of the definitions of PC found in the literature describe it as person-focused and not disease-oriented, and as providing care over time and through a partnership with patients

(Muldoon, Hogg & Levitt, 2016). In that sense, PC is strictly a delivery platform for healthcare services, providing out-patient or ambulatory, individual-level care for common health needs in proximity to where people live and work. As such, in contrast to PHC, PC is mainly the responsibility of health agencies, such as ministries of health. Figure 3, shown in the introduction, shows a schematic representation of the distinction between PC and PHC used in this project.

This Project's Approach. While the scope of PHC is ambitious and comprehensive, with clear relevance for the health of populations, there is no global consensus on the specific elements that constitute PHC (Hanson et al., 2022). Moreover, the activities related to PHC may be shared and conducted across several different actors with different budgets, workforce, priorities and objectives, and differ significantly from country to country.

Consequently, the elusiveness of generating an operational definition of PHC makes it challenging to attribute health outcomes to it. In contrast, PC is more clearly defined, and its specific models of service delivery can be identified, defined, measured, and compared. For these reasons, this project focused exclusively on PC, and, therefore, the broader aspects of PHC not included in PC were not explored.

Selected Previous Strengthening and Improvement Efforts in Primary Care

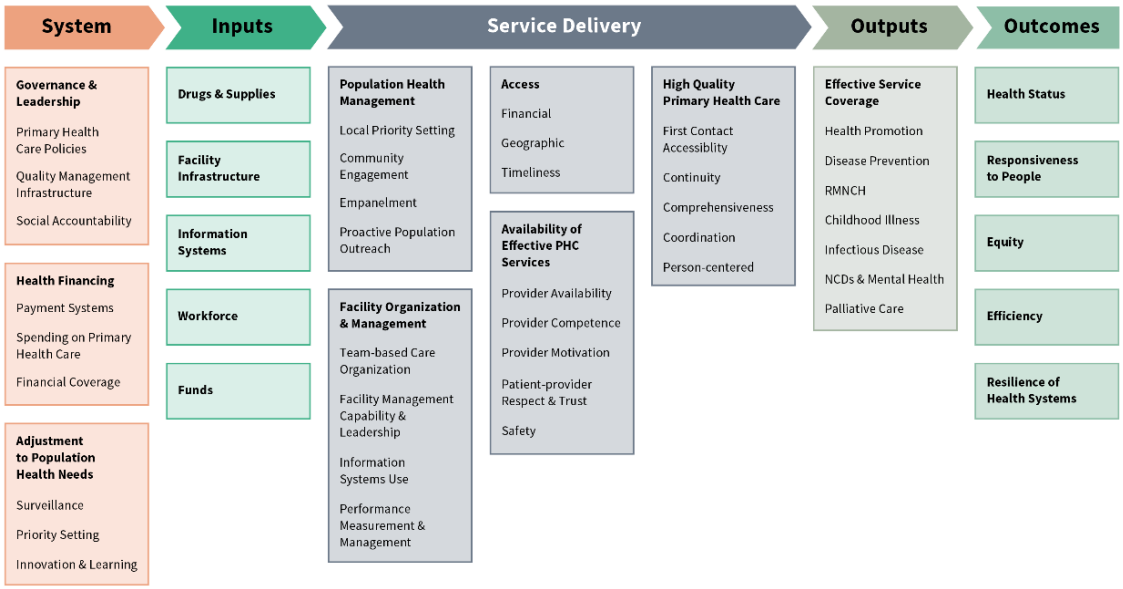
Primary Health Care Performance Initiative. The Primary Health Care Performance Initiative (PHCPI) was a partnership founded in 2015 by the Bill & Melinda Gates Foundation, the World Health Organization, and the World Bank, with support from

UNICEF and the Global Fund, and with Ariadne Labs and Results for Development as technical partners. PHCPI ended its operations in 2022.

PHCPI's guiding philosophy was that PHC is the cornerstone of sustainable development, and that good measurement of its performance is critical to supporting governments and development partners to drive evidence-based improvements. PHCPI primarily focused on PC rather than PHC as defined in this project. As such, most of PHCPI's efforts were directed toward creating tools to measure PC performance at the national and sub-national levels (PHCPI, n.d.).

PHCPI focused on creating tools that used existing and emerging data to monitor and report on PC performance. PHCPI designed its measurement tools based on its own PHC conceptual framework, shown in Figure 6.

Figure 6. PHCPI's PHC framework. (Reproduced from PHCPI's webpage).



PHCPI created two main instruments to measure primary care quality: the Vital Signs Profile, and the PHC Progression Model. The Vital Signs Profile instrument includes a set of indicators that evaluate the financing, capacity, performance, and equity domains of PHCPI's framework. This instrument evaluates how much the government spends on PHC, if it has the policies, infrastructure, and other physical and human resources required to deliver PHC, assesses the quality of care delivered, and if the PHC effectively serves the most marginalized and disadvantaged groups in society. PHCPI successfully conducted the Vital Signs Profile in 30 countries around the world (PHCPI, n.d.).

PHCPI's Progression Model is a mixed-methods assessment tool used to populate the capacity pillar of the Vital Signs Profile. This tool evaluates if a PHC platform has the policies, infrastructure, and other physical and human resources to deliver quality PHC and if a given PHC platform has the fundamentals needed for PHC delivery. (PHCPI, n.d.).

In addition to its main measurement efforts, PHCPI also has a set of PHC improvement strategies and engagement strategies to support countries in finding resources for PHC. The improvement strategies are of relevance to this doctoral project. PHCPI offers a set of improvement strategies built from case studies of countries that show good performance in one or more areas of PHC in their Vital Signs Profile. PHCPI offers improvement strategies in governance, financing, inputs, management of service and population health, access and availability, and quality. The management of the service and population health section includes a section of organization of care that suggests a set of key activities and principles to improve the functioning of the health system. However, it does not offer a set

of context-specific strategies to reorganize service delivery to improve outcomes. PHCPI offers some examples of how some select countries are providing PHC (PHCPI, n.d), but it does not address the peer-reviewed scientific literature.

In contrast to using countries as examples, this project had a complementary approach by identifying the delivery arrangements (defined later in this section) in PC that have consistently been shown to be effective in improving people's health outcomes in the published peer-reviewed scientific literature, and that, in turn, could inform PC service delivery redesign. This approach builds from the idea that innovation in PC delivery not only happens at the national or regional level, but that innovation happens more often in smaller-scale initiatives. Therefore, integrating the knowledge gained from large, medium, and small-scale initiatives can greatly increase the possibilities for redesigning PC to improve quality and solve people's health needs.

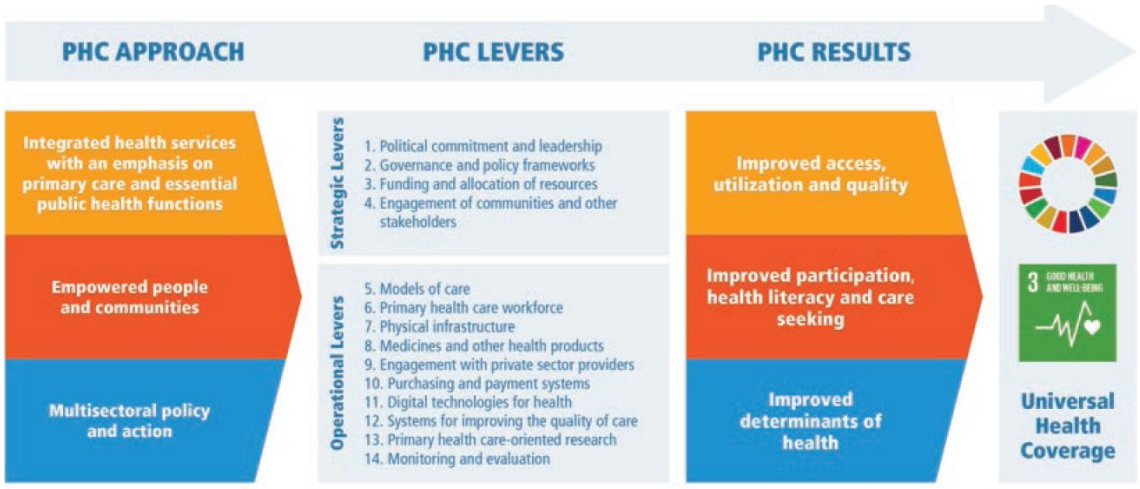
World Health Organization's Primary Health Care Efforts. The World Health Organization (WHO) has spearheaded efforts to strengthen PHC worldwide since 1978 with the Declaration of Alma-Ata, discussed in the previous section. In 2018, WHO revisited its PHC efforts and organized a global conference on PHC in Astana, Kazakhstan. This conference produced the Declaration of Astana, which reaffirmed that strengthening PHC is the most inclusive, effective, and efficient approach to enhancing people's physical and mental health, as well as social well-being (WHO, 2019).

Following the Declaration of Astana, the WHO and UNICEF have produced a technical series on PHC, including a a vision for PHC in the 21st century (WHO & UNICEF, 2018), an

operational framework for PHC (WHO & UNICEF, 2020), and a PHC measurement framework and indicators (WHO & UNICEF, 2022).

WHO's vision for PHC defines and lists PHC's components and a set of levers for action. The levers include governance, policy, finance levers, and operational levers. The operational levers include "models of care that prioritize primary care and public health functions," "ensuring the delivery of high quality and safe health care services." Additionally, the document states that strategies should be developed to ensure that primary care is involved in addressing both existing and new health problems, and that "the local, subnational, and national levels should be equipped to continuously assess and improve the quality of PHC, selecting and tailoring evidence-based quality improvement strategies to suit their needs." Figure 7 shows WHO's theory of change for PHC, which includes its strategic and operational levers (WHO & UNICEF, 2018).

Figure 7. WHO's PHC theory of change (WHO, 2020).



Following its vision for PHC, WHO published in 2020 its operational framework for PHC (WHO, 2020), which expands on the operational levers initially described in the vision for PHC document. This document includes a section on models of care, which offers a conceptualization of how services should be delivered, including processes of care, organization of providers, and management of services. It highlights that models of care must be tailored to local contexts, integrate public health and primary care functions, promote continuous, comprehensive, coordinated, and person- and people-centered care, rather than focus on specific diseases, and promote multidisciplinary teams.

WHO's operational framework offers a vision and a set of principles for reorganizing healthcare. However, it does not point to specific ways service delivery could be reorganized. This project aims to fill this gap.

Frameworks for Change

High-Quality Health Systems Framework

Driven by the recognition that access to healthcare is not enough to meet the Sustainable Development Goals (SDGs) if health systems do not provide high-quality care, and by the lack of agreement upon a definition of what constitutes high-quality health systems, The Lancet commissioned a report on High-Quality Health Systems in 2017: The Lancet Global Health Commission on High-Quality Health Systems in the SDG Era (The Commission), chaired by Margaret Kruk and Muhammad Pate (Kruk et al., 2017).

The Commission's report was published in 2018. In it, the Commission noted that high-quality health systems are social institutions shaped by different histories that determine

their functioning (Kruk et al., 2018a). The report recognized that the main objective of health systems is to improve health outcomes, resulting in longer lives, a better quality of life, and an improved capacity to function. However, health systems' impacts are not limited to improving health. As social institutions, health systems should be designed for the people, strive to generate security and confidence in people, and provide financial protection and economic benefit to the population. Building on these fundamental principles, the Commission defined high-quality health systems as follows:

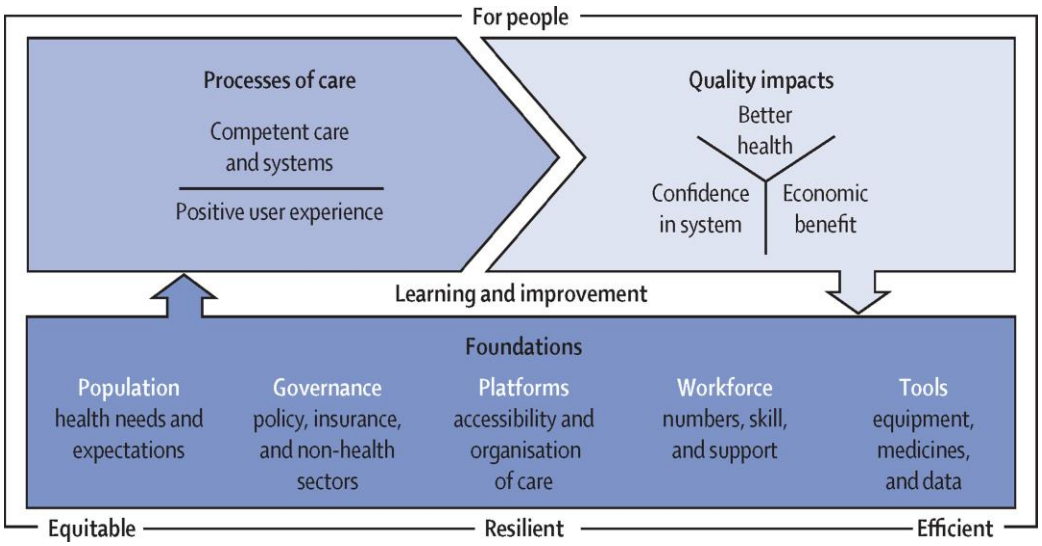
> A high-quality health system is one that optimizes health care in a given context by consistently delivering care that improves or maintains health outcomes, by being valued and trusted by all people, and by responding to changing population needs.

Following its definition of high-quality health systems, the Commission proposed a framework that identified three key domains for high-quality health systems: foundations, processes of care, and quality impacts. The foundations include population, governance, platforms, workers, and tools. The processes of care involve competent care and systems, and positive user experience. The quality impacts refer to better health, confidence in the system, and economic benefit. Figure 8 shows the Commission's High-quality health systems framework.

The Commission's framework marked a fundamental change from previous health systems frameworks, such as the WHO's building blocks framework shown in Figure 9 (WHO, 2010), given that it shifts the emphasis from inputs to health system function, user

experience, and how people benefit from healthcare. The shift in emphasis from inputs to processes and impacts is highlighted by the fact that the number of inputs does not predict the quality of care received by people, nor does it indicate if their health improves with healthcare, highlighting that poor care still occurs in adequately resourced settings (Leslie et al., 2017).

Figure 8. High-quality health systems framework (Reproduced from Kruk et al., 2018).

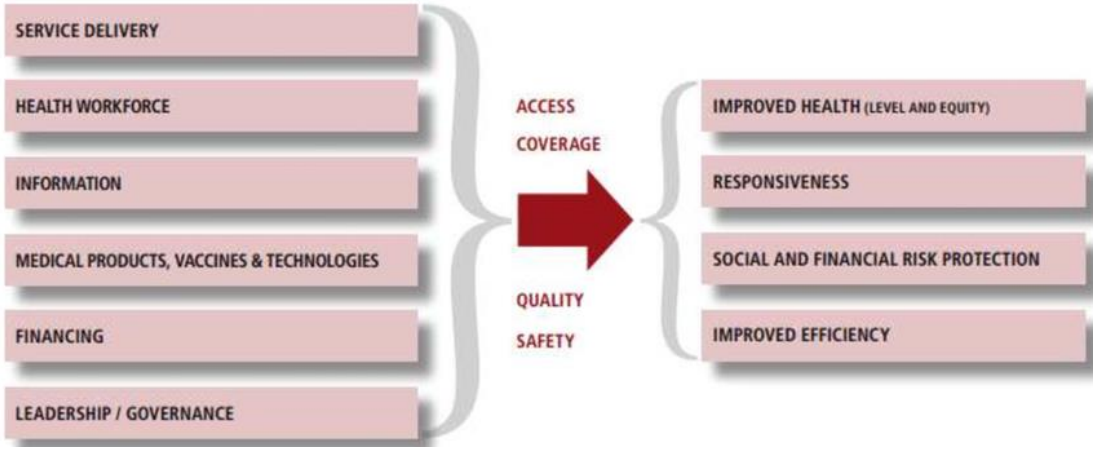


The Commission's framework highlights in its foundations domain that health systems fundamentally depend on and begin with the population they belong to. People are not only beneficiaries and users of health systems, but they are also agents that constitute and shape health systems.

Each population has its own health needs and expectations, and therefore will require different health systems. Additionally, health systems require strong governance and financing. The platforms of care as defined by the Commission's framework involve three

platforms of care: community care, PC, and hospital care. For the purposes of this project, community health will be considered as an element of PC. Lastly, the foundations domain highlights that the workforce is critical for high-quality health systems and that it requires adequate numbers, skills, support, tools, equipment, medicines, and data systems to provide adequate services. For example, the WHO has estimated that a minimum of 2.5 healthcare professionals (such as physicians and nurses) per 1,000 people are needed to provide adequate PC coverage (WHO, 2006).

Figure 9. The World Health Organization's health system building blocks framework. (Reproduced from WHO, 2010).



The processes of care domain includes competent care and systems, and user experience, which must be present in the system as a whole, as well as in each interaction with its users. The care should be user-focused, evidence-based, provided with dignity and respect, and provide autonomy and confidentiality.

The ultimate goal of health systems is reflected in the framework's quality impacts domain. Health systems should improve the health of their users, including reduced mortality and

morbidity, as well as improving people's quality of life. Therefore, the outcomes perceived by users are of key importance. High-quality health systems are for people and, therefore, should generate trust and confidence, which is essential to motivate active participation in care. Lastly, health systems should also create economic benefits by supporting people to lead productive lives and by providing financial protection through risk sharing.

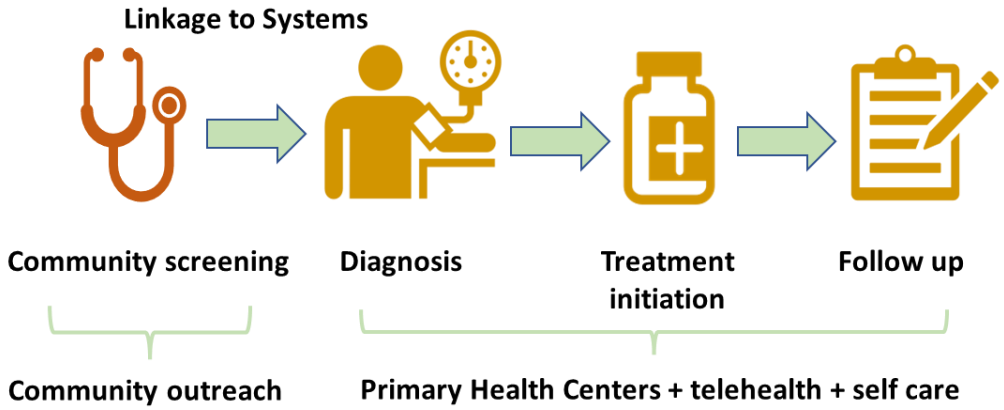
Building upon this framework, this project considers PC as a platform for healthcare delivery (foundations dimension) of a larger national or regional health system with the fundamental objective of solving or sourcing solutions to people's health needs. Therefore, this project places emphasis on the organization of healthcare delivery outside of hospitals, and on identifying the impacts of different ways of organizing the delivery of PC on people's health outcomes, which, if positive, should also generate trust and economic benefit.

Continuum of Care in Primary Care Framework

The activities that PC is responsible for generally encompass a set of actions that span a wide range of health needs from prevention to treatment, referred to as a continuum of care. In 2022, QuEST developed a continuum of care model that includes the following activities: preventive and screening activities, diagnosis, treatment initiation, follow-up, and referral and counter-referral of acute events or other needs that require more advanced care. Each activity plays a pivotal role in the process of offering services that protect or restore health, and, in the vision of the continuum of care, are interlinked and dependent on one another.

For the analysis of the findings, this project uses this continuum of care framework, but will not include the referral and counter-referral stage of the framework because the delivery arrangements evaluated in the umbrella review are exclusively for services and activities conducted outside of hospital settings. Figure 10 shows the PC continuum of care as defined for this project.

Figure 10. Continuum of care in primary care.



Effective Practice and Organization of Care Taxonomy

The Effective Practice and Organization of Care (EPOC) group was established in 1992 as a part of the Cochrane Collaboration to develop and promote the use of evidence to improve healthcare delivery. Cochrane is an international network headquartered in the UK that synthesizes the evidence about healthcare decision-making issues, particularly high-quality systematic reviews (Cochrane, n.d.). As a part of Cochrane, the EPOC group conducts, supports, and publishes systematic reviews of the global evidence to guide health system decision-making to improve health service and population outcomes.

As one part of its efforts for improving healthcare delivery, in 2002 the EPOC group developed a taxonomy to help classify, describe, organize, and categorize health systems interventions (EPOC, 2015). The EPOC taxonomy has been widely used in research studies and systematic reviews to help classify and describe different types of interventions aimed at improving healthcare delivery. The taxonomy includes four main elements:

1. Delivery arrangements: the ways in which healthcare services are organized, such as the use of multidisciplinary teams, changes in the roles of healthcare providers, or the use of electronic health records.
2. Financial arrangements: how healthcare services are financed, such as the use of pay-for-performance incentives or capitation payments.
3. Governance arrangements: the ways in which healthcare services are governed, such as the use of quality improvement committees or the involvement of patients and families in decision-making.
4. Implementation strategies: the ways in which interventions are implemented, such as the use of educational outreach visits or the use of reminders and feedback to healthcare providers.

The delivery arrangements framework is particularly relevant for this project because it allows interventions to be classified according to how and when care is delivered, where care is provided, changes to the healthcare environment, who provides care and how the healthcare workforce is managed, coordination of care and management of care processes,

and the use/support of information and communication technology for care delivery (EPOC, 2015).

This project uses EPOC's delivery arrangements as a guiding framework to organize and classify the PC interventions identified in the umbrella review (more details about the review can be found in the Methods section), in order to facilitate the synthesis of finding and identifying the common features of the most effective interventions. In turn, the common features of effective interventions identified in this study could support health systems in redesigning their PC models of care, as WHO's Operational Framework for PHC and the Commission calls for.

Methods

The project was conducted in three phases. First, an umbrella review of the peer-reviewed literature was conducted to identify the delivery arrangements with the strongest evidence of improving people's health outcomes. Second, an analysis of the findings from that review was conducted to assess the geographical, economic, and social settings in which the identified delivery arrangements were implemented. This analysis was guided by the principles of the High Quality Health Systems framework and the SDR framework. Lastly, a set of recommendations and options for service delivery redesign were constructed from the previous findings and analysis. In this last phase, the delivery arrangements were organized in stages according to the continuum of care for different sets of conditions, from case identification to longitudinal care and prompt action in case of complications.

Umbrella Review Methods

A review of systematic, scoping, and qualitative reviews (i.e., an umbrella review) was conducted to provide an overview of the performance of various delivery arrangements implemented at the primary and community levels of care in low- and middle-income countries. Specifically, this review aimed to identify the delivery arrangements with the strongest evidence of improving patients' health outcomes in primary care in LMICs

The specific question that this review aimed to answer was:

- Which delivery arrangements at the primary level of care show the strongest evidence of generating better health outcomes?

The review was based on the Joana Briggs Institute (JBI) Umbrella Reviews Methodology. JBI is a global organization promoting and supporting evidence-based decisions to improve health and healthcare delivery (JBI, n.d.). Among their different activities, JBI has created manuals to create evidence synthesis, including the JBI Umbrella review methodology used for this review (Aromataris et al., 2020).

Given the diversity of populations that primary care platforms are intended to serve, there were no age, gender, ethnicity, racial, or migratory status restrictions regarding this review's study subjects. Additionally, even though the focus of the review was on LMICs, there were no restrictions on the countries studied in the reviews. However, the search strategy focused only on LMICs. When the retrieved reviews included studies from HICs, they were only included if the delivery arrangements evaluated were not resource-intensive and, therefore, applicable to LMICs.

Given the range of medical conditions that can be treated in primary care, there were no limitations to the types of conditions evaluated by the reviews (e.g., maternal health, mental health, chronic conditions, and infectious diseases were all included). Taking into consideration that systematic reviews of delivery arrangements are relatively recent (generally found from 2010 onwards), there were no date restrictions in this review. Only reviews published in English, Spanish, French, and Portuguese were included.

Inclusion Criteria. Systematic, scoping, and qualitative reviews were included if they met the following inclusion criteria:

- Assessed one or more of the dimensions included in the delivery arrangements of Cochrane's EPOC taxonomy framework. It was not required for the review to state the arrangements according to the EPOC taxonomy explicitly. Rather, the reviews had to include a description of the interventions or programs evaluated so that the reviewer could be able to classify the delivery arrangements evaluated in the review clearly.
- The delivery arrangements evaluated in the reviews had to take place outside of a hospital setting, such as in a household, community, outpatient or PC facility, or other non-hospital settings.
- The reviews had to report on patient health outcomes (either clinical or patient-reported outcomes).
- The reviews had to include articles with a methodological design that allowed to attribute the effects observed on the health outcomes to the delivery arrangements evaluated, either quantitatively or qualitatively.
- The reviews had to include at least one LMIC and be relevant to LMICs, as classified by the World Bank in 2022.

Exclusion Criteria. The reviews were excluded if they:

- Predominantly included studies from HICs and/or the arrangements had low applicability to resource-constrained settings.
- Had significant methodological limitations that compromised the reliability of the findings.

- The review evaluated the effectiveness of specific therapeutic interventions, pharmacologic or otherwise (e.g., a drug, a psychological therapy modality, etc.).

Search Strategy. PubMed and Ovid were the databases searched on October 6th, 2022, to identify systematic, scoping, umbrella, and qualitative reviews published from inception. Four main search domains were used for the search strategy: 1) primary care, 2) delivery arrangements and 3) low and middle-income countries, and 4) review articles. Appendices 1 and 2 show the search strategies for the search in PubMed and Ovid, respectively.

Selection of Reviews. The reviews retrieved with the search strategy underwent a two-stage screening process. First, the title and abstract were screened to identify reviews that appeared to meet inclusion criteria. Subsequently, the selection criteria were applied to the full text of reviews that passed the title and abstract screening stage. The reviews that met the inclusion criteria after the full-text evaluation and did not present exclusion criteria were included for data extraction and analysis.

Data Collection and Extraction. Data extraction and management were conducted using a form adapted from the JBI data extraction form Aromataris et al., (2020) for the purposes of the review. The form had the following elements:

- Review design: review title, year, author(s), review type, participants (characteristics/total number), setting/context, and description of interventions.
- Search details: Sources searched, range (years) of included studies, number of studies included, types of studies included, and country of origin of included studies.

- Appraisal: appraisal instruments used by the reviews to assess the quality of the included studies and the overall appraisal rating given to the articles included by the reviews.
- Analysis: method of analysis, conditions assessed, outcome(s) assessed, results/findings significance/direction/strength, heterogeneity.
- Delivery Arrangements: how, when, where (care is delivered), who (delivers and receives care), coordination and management of care processes, information, and communication technology. these categories correspond to the delivery arrangements defined by Cochrane's EPOC taxonomy.

Critical Appraisal. JBI's checklist for critical appraisal of reviews was used for assessing the methodological rigor of the reviews. This checklist is shown in Appendix 3.

Data Summarizing. The data was summarized for each review using an adapted version Chochrane's SUPPORT Summary approach after extraction, with the following components:

- Key findings from the review
- Key background information needed to understand the findings.
- A summary of what the review authors searched for and found.
- A summary of the delivery arrangements assessed.
- A detailed summary of the main findings of the review, including an assessment of the quality of evidence for those findings.
- An assessment of the relevance of the review to primary care platforms in LMIC.

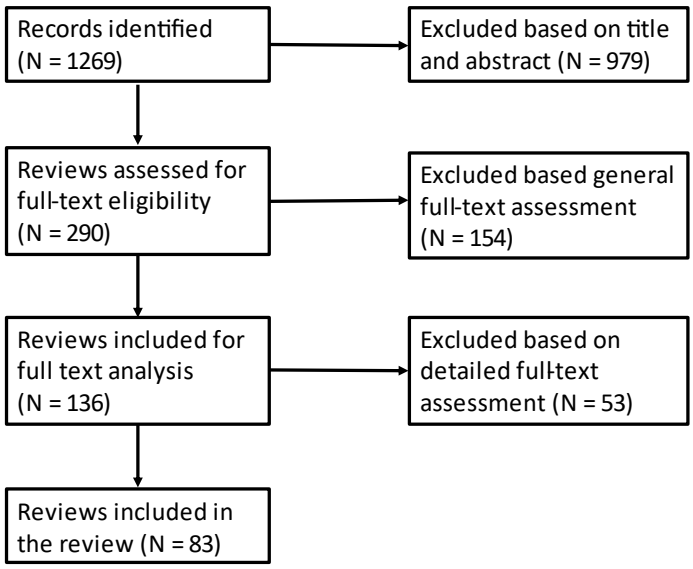
- References for additional information on the topic.

Analysis methodology. The data extracted from the reviews were grouped according to the delivery arrangements that each review evaluated and according to the health themes that these delivery arrangements targeted. Subsequently, interventions were classified into four categories according to their effectiveness: 1) effective (the interventions had positive desirable effects and no undesirable effects, with at least moderate certainty of evidence), 2) ineffective (the intervention had little or no effect with at least moderate certainty of evidence), 3) adverse (the interventions had at least one undesirable effect, with at least low certainty of evidence), and 4) uncertain (the interventions had very low or low certainty, or the degree of certainty was not clear). Using the previously mentioned classification, a thematic analysis was conducted with the effective interventions to identify themes and organizational characteristics that were recurrent among them.

Results

The search strategy was conducted on the 10th of October 2023. In total, 1269 reviews evaluating delivery arrangements in PC in LMICs and their effects on health outcomes were identified. Of these, 979 were excluded based on an initial title and abstract screening. Subsequently, 290 reviews were retrieved to conduct a full-text screening. Of these, 154 were excluded, and 136 were included for a full-text detailed review. Lastly, 53 were further excluded after the detailed full-text review. This umbrella review had a total of 83 reviews. Figure 12 shows the flowchart of review inclusion.

Figure 11. Review Inclusion Flowchart



Description of the included reviews

Of the 83 reviews included, 59 were systematic reviews, 16 were systematic reviews with a meta-analysis, 5 were scoping reviews, 2 were qualitative reviews, and 1 was a systematic review with a meta-regression.

The reviews included reported results from 1506 studies. The study designs of the articles evaluated by the reviews included randomized controlled trials, cluster randomized controlled trials, stepped-wedge designs, controlled pre-test post-test studies, not controlled pre-test post-test studies, quasi-randomized controlled trials, historically controlled trials, prospective and retrospective cohort designs, case-control studies, intermittent time series, cross-sectional studies, case study designs, policy analysis studies, mixed methods studies, and qualitative studies. The number of studies included in each review ranged from three in Ogedegbe et al. (2014) to 114 in Bulstra et al. (2021).

The most researched health themes in the included reviews were maternal and newborn health with 30 reviews (23 exclusive, 2 with NCDs, 3 with mental health, and 2 with HIV), followed by HIV with 20 reviews (18 exclusive, and 2 with MNH), non-communicable diseases with 18 studies (15 exclusive, 2 with MNH and 1 with physical rehabilitation), and mental health with 11 reviews (8 exclusive, and 3 with MNH). The other health themes studied, with lesser amounts of reviews, were tuberculosis and other neglected tropical diseases, with five reviews; physical therapy and musculoskeletal conditions, with four reviews; and vaccination or child health, with three reviews. Table 1 shows these major health themes evaluated by the included reviews.

Not all the delivery arrangements included in the EPOC framework were assessed by the reviews included, and a small number of arrangements dominated the reviews. This finding may be partially driven by the major research interests covered in the literature over the

last decades, as well as a bias towards those delivery arrangements in the search strategy. Table 2 shows the number of reviews that focused on each delivery arrangement.

Table 1. Major health themes evaluated by the included reviews and types of reviews.

Health Theme	Number of reviews
Non-communicable diseases	18
Maternal and newborn health	30
Mental health	11
HIV care	20
Tuberculosis and malaria	5
Musculoskeletal conditions	4
Child health	3

*Some reviews evaluated more than one health theme.

Table 2. Number of reviews evaluating each delivery arrangement.

Delivery Arrengement	Number of reviews
How and when care is delivered	
Group Vs. Individual Care	10
Coordination of care amongst different providers	2
Where care is provided and changes in healthcare environment	
Environment	3
Outreach services	12
Site of service delivery	34
Who provides care and how the healthcare workforce is managed	
Role expansion or task shifting	35
Self-management	3
Recruitment and retention	1
Coordination of care and management of care processes	
Care pathways	1
Case Management	4
Integration	8
Referral systems	2
Information and communication technology	
Health information systems	3
The use of information and communication technology	12
Smart home technologies	2
Telemedicine	3

*Some reviews evaluated more than one delivery arrangement

Effect of the interventions

To present the effect of the interventions assessed in the included reviews, findings are grouped according to the delivery arrangement category (i.e., who provides care, where, how, and when; how care is coordinated and managed; and the information and communication technology used) and subcategory (e.g., the use of role expansion or task shifting; care pathways; health information systems; mHealth; and outreach services), and by the condition group that the interventions targeted (e.g., maternal and newborn health, HIV, NCDs). The next section presents a summary of the findings from a selection of the most relevant findings from the included reviews in narrative form. Appendix 4 presents a description of all the included reviews.

1. Who Provides Care

1.1 Lay health workers

Lay health workers (LHWs) are defined as any health worker carrying out functions related to healthcare delivery, trained in a particular intervention, and having no formal professional or paraprofessional certificated or degreed tertiary education (Lewin et al., 2005). For the purposes of reporting consistency, any term related to LHW used by the included reviews, such as community health workers (CHWs) and lay counsellors, is presented here as LHW.

1.1.1 Mental health. Seven reviews (Barnett et al., 2018; Connolly et al., 2021; Karyotaki et al., 2022; Mutamba et al., 2013; Nguyen et al., 2019; Rahman et al., 2013; Fang et al., 2022) evaluated the effects of different LHW in supporting the care of people with mental health

conditions, including depression, anxiety, substance use, childhood disruptive behavior disorders, autism spectrum disorders, post-traumatic stress disorders, and other psychological trauma-related, alcohol and substance use disorders, maternal and perinatal depression, and severe mental illness (schizophrenia, mania, bipolar disorder, psychotic depression, and other psychotic/neurological disorders). In total, these reviews included 130 articles, mostly from LMICs.

The interventions that LHWs performed included different forms of psychoeducation, psychosocial services, psychotherapy (e.g., cognitive behavioral therapy, thought field therapy, narrative exposure therapy, and interpersonal psychotherapy), outreach services, counselling, and informational, emotional, and evaluative support. In most of the interventions, LHWs were supervised and supported by professional providers, and their services were complemented with services provided by professional providers. Most interventions took place at patients' homes and/or in their communities. In most studies, LHWs were only conducting one or two concrete tasks.

Most studies found these interventions resulted in statistically significant improvements in their primary outcomes, which were mostly control scales for the conditions mentioned above. In four of the seven reviews, the authors conducted a meta-analysis of the findings of their included studies. Connolly et al. (2021) found the interventions were moderately effective at reducing symptoms (Hedges' g: –0.616; CI: –0.866 to –0.366), using a random-effects meta-analysis model. Karyotaki et al. (2022) found a significantly larger reduction in depressive symptom severity compared to the standard of care using a random effects

model (Hedges' g, 0.48; CI: 0.26-0.68; p < .001), even though heterogeneity was high (I^2 = 86%; CI: 78%-91%). Rahman et al. (2013) found a standardized effect size of –0.38 (CI: –0.56 to –0.21; I^2 = 79.9%) for maternal and perinatal depression, even though the authors noted high heterogeneity in the effects. Fang et al. (2022) found an overall statistically significant positive effect on perinatal depression symptoms (SMD = - 0.70; CI - 0.95, - 0.45; p < 0.001).

Additionally, Barnett et al. (2018) found that the interventions were the most effective when an LHW's primary role was as an auxiliary or supporter of care, rather than as the sole provider (p < 0.001 versus p = 0.194), and when the LHW had training plus ongoing supervision versus only training (p = 0.098 compared to p = 0.768). Fang et al. (2022) found that in a subgroup analysis, LHW support was especially effective at reducing the odds of or improving perinatal depression when it was provided at least once a week, individually, face-to-face, by telephone or internet, and was not only provided before delivery.

Overall, LHWs' interventions were found to be effective in improving the primary outcomes in most of the included studies in the review. The diversity in the training of LHWs was high, as were the organizational settings of the interventions, which could affect the direction and significance of their effect. Nevertheless, the positive effect that LHWs generally have on improving mental health interventions is clear and should be considered by health systems. It remains to be clarified what is the ideal type of intervention LHWs should deliver according to context (e.g., problem-solving therapy, cognitive behavioral therapy, etc.) and the ideal training for them to develop the skills to provide their interventions adequately.

1.1.2 Maternal and newborn health. Five reviews evaluated the effects of different interventions involving LHWs in supporting or providing care for maternal and newborn health (Chapman et al., 2010; Gogia et al., 2016; Lassi et al., 2019; Janmohamed et al, 2020; Tiruneh et al., 2019). The five reviews included a total of 150 studies, mostly from LMICs in South and Southeast Asia, and Sub-Saharan Africa. The reviews evaluated the effectiveness of LHW interventions on breastfeeding initiation, duration, and exclusivity, infant diarrhea, on neonatal, infant, and perinatal mortality, and on infant and child nutrition. Most of the articles involved interventions delivered at home on an individual basis, and a few involved group-based care.

Four of the reviews conducted a meta-analysis. Using a random effects model, Gogia et al. (2016) found that home-based neonatal care provided by LHWs within one week after delivery in resource-limited settings with poor access to health facility-based care is associated with a significant reduction in neonatal mortality (RR 0.75; CI: 0.61 to 0.92; p = 0.005; I^2 = 82.2%) and perinatal mortality (RR 0.78; CI: 0.64 to 0.94, p = 0.009; I^2 = 79.6%; p = 0.007). Lassi et al. (2019) evaluated the effects of health education strategies delivered in communities by LHWs and found a reduction in overall neonatal mortality (RR 0.87, CI: 0.78 to 0.96; I2 = 88%), in early (RR 0.74, CI: 0.66 to 0.84; I2 = 86%) and late neonatal mortality (RR 0.54, CI: 0.40 to 0.74; I2 = 88%), and in perinatal mortality (RR 0.83, CI 0.75 to 0.91; I2 = 81%), with low or very low certainty of evidence. Janmohamed et al., (2020) conducted a pooled analysis and found that, compared to care as usual, LHW home visits increased early initiation of breastfeeding (OR: 1.50; CI: 1.12, 1.99) and exclusive breastfeeding (OR: 4.42; CI: 2.28, 8.56), using a random effects model, with low certainty

of evidence. Lastly, Tiruneh et al. (2019) evaluated the effects of home-based post-partum care provided by LHWs on a series of outcomes, including breastfeeding practices. The authors found that home-based postnatal care improved exclusive breastfeeding compared to routine post-natal care (pooled OR 2.99, CI: 1.57, 5.29) with a high certainty of evidence, and reduced neonatal mortality by 24% in a pooled analysis (RR 0.76, CI: 0.62, 0.92), with moderate certainty of evidence.

Regarding the structure of interventions, Chapman et al., (2010) found that in the studies with the most positive and significant outcomes, counselling occurred before and after birth, with more than two sessions at each moment; breastfeeding practices increased significantly when more than six peer counseling sessions were provided. Lassi et al. (2019) found that group counselling had a more positive impact on neonatal survival than one-to-one counselling, and was more effective when provided during both the antenatal and post-natal period, versus only postnatally or antenatally.

1.1.3 Family planning. Two reviews evaluated the effects of interventions in which LHWs provided family planning services, mostly at women's homes or in their communities (Ayuk et al., 2022; Scott et al., 2015). The reviews included a total of 69 studies, mostly from rural areas in Sub-Saharan Africa. The reviews did not pool the effects of the interventions, and found that LHWs' interventions were associated with an increase in contraceptive use over time that was approximately twice that of clinic-based services.

Scott et al. (2015) point out that the findings were more dramatic in areas with limited access to standard in-clinic services. They found that the use of modern contraceptives

increased to up to 68.7% versus 21% at two years after the start of the intervention, as reported in a study conducted in Sri Lanka (Malwenna et al., 2012). An additional finding was that two studies based in Matlab, Bangladesh (Phillips et al. 1993; Phillips et al., 1996) found that only female LHWs produced statistically significant improvements in contraceptive use. Ayuk et al. (2022) found that the uptake, safety, and acceptability of injectable contraceptives in rural sub-Saharan Africa are equivalent or superior when provided by LHWs at women's homes or communities compared to when provided by healthcare professionals in medical facilities, with no increase seen in adverse effects associated with LHWs administering contraceptive injections.

1.1.4 HIV care. Four reviews evaluated the effects of different interventions involving LHWs, in supporting or providing HIV care (Genberg et al., 2016; Mwai et al., 2013; Schmitz et al., 2019; Chishinga et al., 2014). The reviews included a total of 68 articles, mostly from Sub-Saharan Africa. Most interventions included counseling, education, adherence support, psychosocial support, linkage to care, defaulter tracing, and livelihood support, delivered at patients' homes or in community settings.

The reviews found that HIV LHW-supported care (i.e., reducing the intensity of in-clinic care by substituting some of it by LHW care) was non-inferior to higher intensity care provided by physicians in clinics, in terms of adherence to treatment and viral suppression (Genberg et al., 2016) and mortality at 26 months (Mwai et al., 2013). Schmitz et al. (2019) found that it was not clear whether LHW-supported care improved virologic outcomes for HIV+ mother-child pairs given the high variability of programs and settings. However, the

in places with a low penetration of services, involving LHWs in HIV care could increase ART initiation from 8.8% to 87.7% (Kim et al., 2012), with a six-fold improvement in retention and five times higher odds of viral suppression at six months for LHW-supported women (Sam-Agudu et al., 2017). Chishinga et al. (2014) performed a meta-analysis of five trials and found equivalent rates of ART initiation associated with home-based by LHWs compared to the standard in-clinic care (OR 1.13; CI: 0.51, 2.52, p = 0.757).

In summary, LHW-supported care is most effective in contexts where there is scarcity or difficult access to in-clinic services. Additionally, some in-clinic HIV follow-up appointments can be substituted by LHW services when there is scarcity of services, to reduce the strain and overcrowding of facilities without affecting clinical outcomes.

1.1.5 Tuberculosis care. Three reviews evaluated the effects of LHW interventions on tuberculosis (TB) care (Musa et al., 2014; Burke et al., 2021; Karumbi & Garner, 2015). In total, the reviews included 44 studies, mostly from LMICs. Most interventions evaluated door-to-door active case-finding and treatment support as directly observed therapy (DOT) delivered in a variety of settings (facility, patients' homes, or the home of a community volunteer.

Musa et al. (2014) conducted a meta-analysis and found that LHW participation in TB care has a moderate, though not statistically significant, increase in TB treatment success rate compared to standard facility-based care (pooled RR 1.09; CI: 0.98, 1.21), and that rural-based studies showed a moderate increase in TB treatment success rate compared to

standard facility-based care (pooled RR 1.12; CI: 1.01, 1.24), while studies in urban areas showed a marginal non-significant benefit (pooled RR 1.01; CI: 0.91, 1.13).

Additionally, Burke et al. (2021) found that active case-finding by LHWs could reduce TB prevalence if delivered with sufficient intensity and coverage, and that a single round was not enough to change the prevalence of TB. Rather, the authors suggest that to reduce community transmission, active case-finding should be implemented with sufficient intensity and over a sufficiently long period or in repeated rounds. Lastly, Karumbi & Garner (2015) found that daily DOT may improve TB cure when compared to visiting a clinic every month (RR 1.15, CI: 1.06, 1.25).

1.2 Nurses as primary care providers

Six reviews (Callaghan et al., 2010; Han et al., 2019; Bhanbhro et al., 2011; Kredo et al., 2014; Laurant et al., 2018; Tan et al., 2020) evaluated the effects of incorporating nurses as primary care providers in several activities, including care for individuals with NCDs, HIV and in providing antenatal care. In total, the reviews included 172 articles, from a mix of LMICs and HICs from countries across the globe.

The interventions assessed included task-shifting from medical doctors to nurses for HIV treatment and care (Callaghan et al., 2010; Kredo et al., 2014), community-based nursing interventions for cardiovascular disease (Han et al., 2019; Tan et al., 2020), and drug prescribing and NCD follow-up by nurses (Bhanbhro et al., 2011; Laurant et al., 2018).

1.2.1 HIV Care. Callaghan et al. (2010) reported that the performance of nurses was equivalent to that of physicians in terms of patients' clinical outcomes, including CD4 count and viral load, even though the review does not provide measures of association of these outcomes. Kredo et al. (2014) conducted a meta-analysis using a random effects model and found high-quality evidence that there is no difference in the mortality at one-year whether nurses or doctors initiate antiretroviral therapy (RR 0.96; CI: 0.82, 1.12), and moderate quality evidence that task shifting of antiretroviral maintenance care from doctors to nurses could result in no difference in death at one year (RR 0.89; CI: 0.59, 1.32). Both reviews highlight that the effective models of care included specific in-depth training and ongoing support for professional nurses.

1.2.2 Community-based nursing interventions for cardiovascular disease. Han et al. (2019) and Tan et al. (2020) evaluated nursing services in addition to facility-based medical care. Han et al. (2019) found significant improvements in patients' knowledge and ability to self-manage, severity of disease, functional status, quality of life, risk of death, hospital readmission days, emergency department visits, healthcare costs, and satisfaction with care. Tan et al. (2020) found that community nursing interventions led to a significant reductions in HbA1c (mean of difference 0.590; SD 0.729; $p < .001$) and fasting blood glucose (mean of difference 35.618; $p < .001$) for individuals with diabetes, better control of blood pressure, and improved blood cholesterol levels.

1.2.3 Drug prescription and NCD follow-up. Laurant et al. (2018) evaluated the evidence of involving nurses as the main medical providers to patients with diabetes, hypertension, and

other NCDs, compared to physician-led care. The authors performed a meta-analysis of 18 studies and found slightly improved outcomes for both systolic blood pressure (MD -3.73; CI: -6.02, -1.44) and diastolic blood pressure (MD -2.54; CI: -4.57, -0.52), similar outcomes for patients with heart failure or diabetes (HbA1c levels: MD 0.08; CI: -0.25, 0.41; total cholesterol: MD -0.15; CI: -0.32, 0.02), equivalent outcomes for rheumatological diseases (pain: MD 0.76, CI: -3.85, 5.38), and no difference in physical functioning (RR 1.03, CI: 0.98, 1.09).

In summary, care delivered by nurses, compared to care delivered by medical doctors, probably generates similar or better health outcomes for a broad range of patient conditions, including HIV and NCDs. The high level of performance of nurses occurred in the context of in-depth training for a specific condition or group of conditions, and ongoing support.

2. Where care is provided and changes to the healthcare environment

2.1 Home-based and community-based HIV treatment. Three reviews evaluated community- or home-based HIV care versus clinic-based care (Chishinga et al., 2014; Eshun-Wilson et al., 2021; Ibiloye et al., 2022). The reviews included 25 articles, all originating from Sub-Saharan Africa. The interventions assessed involved reducing in-clinic services by adding at-home services provided by LHWs, as well as community-based antiretroviral therapy initiation and delivery of ART therapy.

Chishinga et al. (2014) conducted a meta-analysis on substituting some in-clinic services with home-based services and found equivalent viral suppression outcomes (pooled OR

1.13; CI: 0.51, 2.52, p = 0.757). Eshun-Wilson et al. (2021) also conducted a meta-analysis on community-initiation care compared to facility-initiation and standard of care and found that community-initiation was associated with improved ART uptake (RR 1.73; CI: 1.22, 2.45), retention (RR 1.43; CI: 1.32, 1.54) and viral suppression (RR 1.31; CI: 1.15, 1.49) at 12 months. Ibiloye et al. (2022) evaluated the effects of community-based delivery of ART for key populations (sex workers, men who have sex with men, persons who inject drugs, transgender people, and people in prisons and other closed settings) and found that studies reported that ART uptake and adherence, retention in care, and viral suppression were equivalent to facility-based care.

2.2 Home-based rehabilitation and physiotherapy. Two reviews evaluated the effectiveness of home or near-home delivery rehabilitation or physiotherapy (Gelaw et al., 2020; Cobbing et al., 2016). The interventions mostly consisted of physiotherapy delivered either by physiotherapists, nurses, trainers, and multi-disciplinary teams at patients' homes, near their homes, or mixed clinic- and home-based services.

The reviews included a total of 15 studies from both LMICs and HICs. Gelaw et al. (2020) found that home-based rehabilitation programs are not superior to hospital-based rehabilitation for persons with stroke and other physical disabilities. Cobbing et al. (2016) evaluated the effectiveness of home-based or near-home rehabilitation interventions for adults living with HIV and found that the intervention improved patients' body fitness, but not CD_4 and viral outcomes.

2.3 Home-based or community-based management of malaria. One review (Hopkins et al., 2007) evaluated the effectiveness of home-based management of malaria in rural areas of Sub-Saharan Africa. It included six studies. Most interventions involved diagnosis, treatment initiation, and delivery of antimalarials at home by LHWs, although there was a high level of intervention and methodological heterogeneity among the included articles. The review found heterogenous findings, as well. The authors reported that home-management of malaria was found in individual studies to be effective at reducing under-5 mortality (40.6%; CI: 29.2 to 50.6; $p < 0.003$), and the risk of progression to severe disease (RR 0.47; CI: 0.37, 0.60; $p < 0.0001$).

2.4 Home-based postpartum care. One review (Tiruneh et al., 2019) evaluated the effectiveness of home-based postpartum care. The authors included 15 studies from India, Syria, Bangladesh, Brazil, Ghana, and Uganda. Most interventions were conducted in rural areas with poor infrastructure and connectivity. Twelve trials recruited LHWs, and three studies employed health professionals, including midwives and nurses. The authors conducted a pooled analysis, finding that home-based PNC reduced neonatal mortality by 24% (RR 0.76; CI: 0.62 to 0.92). Additionally, more than three home visits contributed to a reduction in neonatal mortality (RR 0.70; CI: 0.53 to 0.91) than less than three (RR 0.77; CI: 0.61 to 0.98). Home visits by LHWs were associated with better survival of neonates (RR 0.69; CI: 0.55 to 0.87) than visits by health professionals (RR 1.26; CI: 0.37 to 4.30). Regarding intervention characteristics, community mobilization efforts with home visits to promote newborn care practices were more effective at reducing neonatal mortality (RR 0.69; CI:0.54 to 0.88) than home visits alone (RR 0.97; CI: 0.90 to 1.05).

3. Coordination of care and management of care processes

3.1 Integration of HIV care with other services. Two reviews evaluated the effects of integrating HIV care with other non-HIV services, mostly maternal and reproductive services (Bulstra et al., 2021; Lopez et al., 2016). The reviews included a total of 124 articles, mostly from Sub-Saharan Africa and Asia.

Bulstra et al. (2021) conducted a meta-analysis and found the effects of integration were positive for viral suppression (RR 1.19; CI: 1.03 to 1.37; p = 0.025), ART initiation coverage (RR 1.42; CI: 1.16 to 1.75; p = 0.002), time until ART initiation (RR 0.45; CI 0.20 to 1.00; p = 0.050), retention in HIV care (RR 1.68; CI 1.05 to 2.69; p = 0.031). However, the intervention was not effective at ensuring HIV-free survival among infants (RR 1.04; CI: 0.98 to 1.11; p = 0.135), reducing AIDS-related mortality (RR 0.72; CI: 0.47 to 1.11; p = 0.118), or non-AIDS related mortality (RR 0.43; CI: 0.16 to 1.17; p = 0.083).

Lopez et al. (2016) reported the effects of individual studies evaluating HIV services integration in family planning, and found that HIV-positive women were less likely to have been pregnant than the HIV-negative women (OR 0.55, CI: 0.43 to 0.69), HIV+ women slightly had a lower incidence of undesired pregnancy per 100 women-years (IR 1.07, CI 0.41 to 1.73) compared with HIV- women (IR 2.39, CI 1.25 to 3.53), and that the HIV incidence rates per 100 women-years were lower when services were integrated (IR 4.8; CI 3.7 to 6.0) versus routine care (IR 7.8; CI 6.8 to 8.9).

3.2 Integration of reproductive, maternal and child health with other services. Two reviews evaluated the integration of reproductive, maternal and child health with other services

(Atun et al., 2011; de Jongh et al., 2016). The reviews included 25 studies, mostly from South Asia and Africa. Atun et al. (2011) evaluated the effects of IMCI programs (integrating reproductive health, maternal and child health, communicable diseases, immunization, and malnutrition interventions), and found that child mortality rates did not differ between intervention and control sites at 18 months (IMCI: from 27.2 to 24.4 vs. routine care: from 27.0 to 28.2, p = 0.28). de Jongh et al. (2016) found that integrating HIV and syphilis care into antenatal services could reduce HIV cases in children born to HIV+ women (OR 0.38; CI: 0.15, 0.95), as well as congenital syphilis (OR 0.07; CI: 0.01, 0.49).

3.3 Integrated community case management of childhood illness. One review (Oliphant et al., 2021) evaluated the effectiveness of integrated community case management of childhood illness (iCCM). The authors included seven studies from Sub-Saharan Africa and India. The interventions evaluated involved recruiting and retaining LHWs and other health workers, implementation of simplified clinical guidelines, payment interventions, improving systems referral and coordination between community and facility levels, and LHWs providing care for sick children. When compared to usual facility services, the authors found no or minimal effects of iCCM on coverage of appropriate treatment from an appropriate provider for any iCCM illness (RR 0.96; CI: 0.77, 1.19;), neonatal mortality (HR 1.01; CI: 0.73, 1.28), infant mortality (HR 1.02; CI: 0.83, 1.26) and under-five mortality (HR 1.18, CI: 1.01, 1.37; 1 trial), all with low or very low certainty of evidence.

3.4 Continuum of care linkages. Two reviews evaluated the continuum of care linkages for maternal and newborn services (Kikuchi et al., 2015) and HIV services (Medley et al., 2015).

The reviews included a total of 113 studies, mostly from Africa, and South and Southeast Asia. Kikuchi et al. (2015) conducted a meta-analysis, using a random effects model, and found that the interventions that linked antenatal care, skilled birth attendance, and postnatal care significantly reduced neonatal mortality (RR 0.84; CI 0.75, 0.94; $p < 0.01$) and perinatal mortality (RR 0.81; CI 0.74, 0.90; $p < 0.01$). However, the interventions did not lead to a significant decrease in maternal mortality (RR 0.75; CI 0.46, 1.22; $p < 0.01$). Medley et al. (2015) report that adherence counseling and support, and assessment and treatment of sexually transmitted infections were associated with positive impacts on the morbidity experienced by people living with HIV. However, although the authors report the effects of the included articles narratively, they did not provide the measures of association from the original articles.

3.5 Integrated multi-morbidity models of care. One review (Rohwer et al., 2021) evaluated the effects of integrated models of care for diabetes and hypertension in LMICs and conducted a meta-analysis. It included five studies from South Africa, Uganda, Kenya, and India. The authors defined fully integrated care as a "one-stop-shop" model whereby a patient receives all necessary care or services under one roof by one or more healthcare professionals. Among its findings, the review reports that integrated care compared with standard of care did not improve HIV viral suppression and NCD control at baseline (RR 1.18; CI: 0.97 to 1.44;), but may increase both HIV viral suppression and NCD control for individuals with a NCD developed during follow up (RR 1.24; CI: 1.10 to 1.40). The authors conclude that based on these findings, the effects of integrated care on health outcomes are uncertain.

4. Information and communication technology

4.1 Videoconferencing psychological therapy. One review (Berryhill et al., 2019a) evaluated the effects of the delivery of mental health services remotely using video conference platforms. The review included 21 studies from USA, Canada, and Australia. The interventions evaluated consisted of one-on-one videoconferencing psychological therapy. Psychological interventions included CBT, behavioral activation, problem-solving therapy, acceptance-based behavioral therapy, proprietary interventions, and a mix of therapeutic approaches. The main finding of the review is that controlled studies that compared remote versus in-person care found them to have equivalent outcomes. The authors point out that other reviews have reported similar findings (Bashshur et al., 2016; Berryhill et al., 2019b; Bolton et al., 2015; Hilty et al., 2013).

4.2 Mobile health (mHealth) interventions for maternal and newborn health. Four reviews evaluated the effects of mHealth interventions on MNH (Dol et al., 2019; Sondaal et al., 2016; Lee et al., 2016; Palmer et al., 2020). In total, the reviews included 96 studies from LMICs across the globe. Most of the interventions evaluated consisted of phone calls and messages, or apps, either in one-way or two-way communications.

Two reviews conducted a meta-analysis of findings. Lee et al. (2016) pooled estimates showed that the rates of initiating breastfeeding within one hour after birth (OR 2.01; CI: 1.27, 2.75; I2 =80.9%), exclusive breastfeeding for four months (OR 1.88; CI: 1.26, 2.50; I2 =52.8%) and for six months (OR 2.58; CI: 1.44, 3.71; I 2 =0.0%) were higher in the groups given an SMS prenatal intervention compared to control. No benefits were found for the

duration of gestation, birth weight, preterm delivery, and cesarean section. Palmer et al. (2020) found that there were uncertain effects on maternal and neonatal mortality and morbidity because of a low certainty of the evidence. mHealth interventions had no effect on maternal and infant adherence to antiretroviral therapy, with low-certainty evidence.

Additionally, Dol et al. (2019) found low certainty of evidence that mHealth interventions may reduce early newborn mortality, increase the number of deliveries in facilities and the number of ANC and PNC contacts, only if participants had easy access to services. Sondaal et al. (2016) reported that mHealth interventions targeted at pregnant women can increase antenatal and postnatal care attendance and facility-based deliveries, while no consistent effects of mHealth interventions on maternal and neonatal health outcomes were observed.

4.3 mHealth and adherence to medication. One study (Palmer et al., 2018) evaluated the evidence of interventions to improve adherence to medication in adults with cardiovascular disease. The review included 13 reviews evaluating interventions with variable designs, but most involved apps, SMS, and voice reminders aimed at improving adherence to medication. Across 13 studies measuring systolic blood pressure, effect estimates ranged from a large reduction to a slight increase. Four trials showed intervention benefits for systolic and diastolic blood pressure. A pooled analysis of two trials of interventions delivered through SMS found little or no effect on systolic blood pressure (MD –1.55 mmHg; CI –3.36, 0.25). In summary, there is a lack of significant evidence of the effectiveness of mHealth interventions to improve medication adherence.

Analysis

Effective PC care implementation models vary by need and context

One clear finding of this project, as could be expected, is that there is no one-size-fits-all solution for redesigning primary care. Rather, through the umbrella review, it was found that the type and effectiveness of the assessed delivery arrangements varied according to the health needs of the population and the context in which various approaches were implemented. In addition, not every delivery arrangement has been researched for all health needs, even though many of these could potentially be applicable to other health needs than the ones for which evidence exists.

For instance, psychosocial support and brief psychological interventions provided by LHWs were consistently found to be effective at enhancing the effectiveness of the standard of mental health care where there was an already functioning delivery system (Nguyen et al., 2019; Karyotaki et al., 2022) or as a good strategy to provide simple mental health care in areas where there were no previous mental health care services (Barnett et al., 2018; Conolly et al., 2021). In most of the effective programs, LHWs were part of a team, so that they were supported and supervised by other healthcare professionals. Therefore, while one finding of the review is that mental health care should include LHWs providing basic or additive mental health services, the specific intervention (e.g., psychosocial support, problem-solving therapy, simplified cognitive behavioral therapy, etc.) and the organizational structure (e.g., supervised and supported by psychiatrists or by primary care physicians or psychologists) will vary according to the existing mental health ecosystem in

a given region, including the number and accessibility of mental health professionals, existing infrastructure,, the dispersion of the population, and the demand for services, etc.

For example, in a rural place with a dispersed population without adequate access to mental health, the initial approach to providing mental health services would be to have LHWs screen for mental health conditions. In that context, LHWs could provide simple psychological services, and existing primary care providers, either nurses or primary care physicians, could be trained to provide more advanced care and support the LHWs.

In contrast, in an urban setting with appropriate access to mental health services, services provided by LHWs could be added to strengthen the existing PC services, as well as to substitute some in-clinic care by professional providers (e.g., instead of a patient having an appointment every two months with psychologists, some of these visits could be substituted by LHWs services provided in communities or at home) to reduce the demand for and crowding of in-clinic services.

In addition to LHWs, mental health care could be supported by incorporating remote consultations via telemedicine. In the reviews, telemedicine was found to be equivalent to in-person care for anxiety and depression (Berryhill et al., 2019a; Berryhill et al., 2019b), which offers a set of opportunities to expand mental health care in PC. First, places without access to professional services could have remote access to mental health, while places with current access could reduce the saturation of the system by mixing in-person and remote care. This could also improve access for patients that have difficulties visiting clinics for any reason, even though they may have adequate geographic or financial accessibility. This

approach could also be effectively applied to other conditions, such as cardiovascular and metabolic diseases.

Additionally, the strategy for providing mental health services in PC should not only be shaped according to the existing resources and what is possible at the moment. Instead, while PC-SDR should start with designing and implementing strategies that will improve the quality of care in the present with the existing available resources, the PCR-redesign efforts should also include a long-term vision of the ideal primary care design that the health system is aiming for. In turn, these long-term strategies should consider what is possible based on the ability of existing educational institutions to train new providers; the present and forecasted economic resources available to expand and improve services; and the shifts in population structure and health needs, etc.

Mental health care is only one among many health needs such as MNH and NCDs that PC is suitable to care for; the approach taken to the PC redesign for any area should prioritize its efforts based on the burden of disease for a specific population, the population's health needs, and the degree to which each of these health needs is currently met.

In summary, one primary takeaway from this project is that each PC-SDR initiative should be shaped fundamentally by the local health needs and people's expectations, the burden of disease that these needs represent, the resources available for the redesign efforts (human, infrastructure, tools, technological, educational, institutional, legal, etc.), the existing PC structures and services, their performance on meeting people's health needs

and expectations, and the best available evidence of the delivery arrangement that work for those health needs.

A limitation of the findings is the limited generalizability of findings beyond the specific conditions and outcomes in which the interventions were tested. For instance, while some delivery arrangements were implemented and tested to address a specific condition or group of conditions, that does not necessarily mean that they are not applicable to other conditions. However, it could be analyzed what are the mechanisms through which effective delivery arrangements improve specific health outcomes and explore if they are applicable to other conditions.

For instance, continuing with the mental health example, while psychosocial and brief psychological services provided by LHWs were found to be effective for psychotic disorders, anxiety, and depression (Mutamba et al., 2013; Rahman et al., 2013; Barnett et al., 2018), that does not mean that similar interventions are not applicable to other conditions, such as NCDs. Instead, it means that LHWs can adequately provide simple and consistent services that require trust and rapport between patients and providers.

Accordingly, health systems should not only replicate the delivery arrangements that have been found to be effective for specific conditions. Rather, they should also innovate new applications for these delivery arrangements. For example, instead of providing problem solving therapy for mental health disorders, LHWs could use those skills to support patients with NCDs to navigate their required lifestyle changes and the personal challenges associated with them, or to increase adherence to care and their medication.

Common elements of the best-performing delivery arrangements

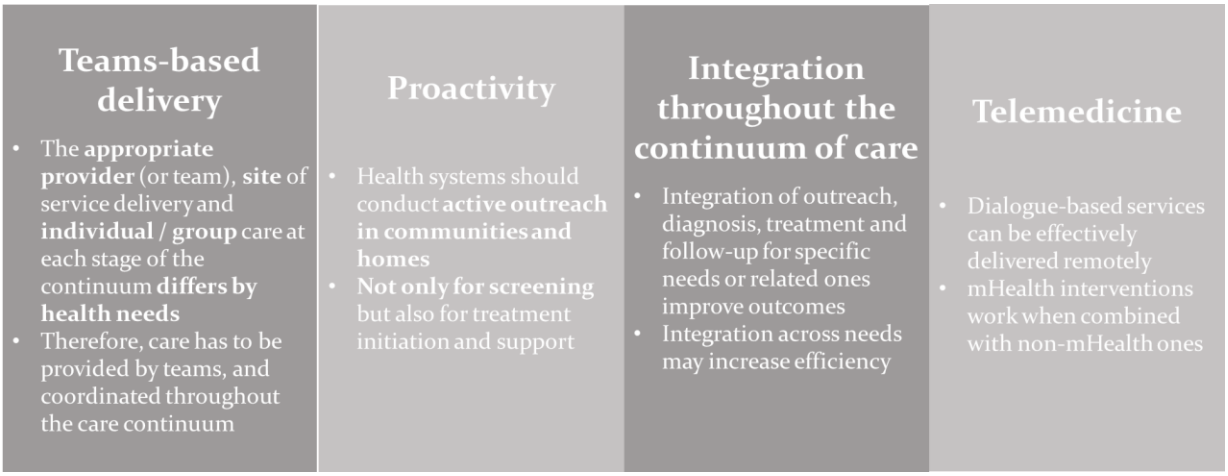
Throughout the umbrella review, there are several recurring features of the best-performing delivery arrangements, which can serve as guiding points for redesigning the delivery of primary care.

The five predominant common features identified were the following:

1. The appropriate provider, site, and media of service delivery vary by condition and by the stage of the continuum of care.
2. Follow-up is more effective for several conditions when it encompasses multiple complementary activities conducted by different providers.
3. Service delivery is more effective when it provides services not only when individual users demand them, but also when it offers its services proactively.
4. The integration of outreach, diagnosis, treatment, and follow-up for specific health needs or related ones yields better health outcomes.
5. Dialogue-based services can effectively be delivered remotely.

From these common features of the review, this project proposes four themes to guide the redesign of PC-SDR in any setting: team-based delivery; proactive delivery of PC services; integration of care throughout the continuum of care; and incorporating telemedicine for dialogue-based services, as shown in Figure 12. The next paragraphs describe these guiding themes and their rationale in detail. They are not mutually exclusive and exhaustive; rather, they are designed to be used as guiding elements for the redesign efforts.

Figure 12. Themes for the design of PC models of care



Theme 1: Team-based delivery of healthcare

The first common element of the most effective delivery arrangements identified in this study is that the appropriate provider, site of service delivery, the delivery of care individually or in groups, and the media of delivery (in-person vs. remote) often differ at each stage of the continuum of care and by health need. For example, LHWs were found to be effective at different stages of the continuum of care, such as conducting home visits to provide screening services and identify risk signs in newborns and mothers after delivery (Gogia & Sachdev, 2016); for screening, diagnosis, and treatment initiation for children with malaria in resource-limited settings (Hopkins et al., 2007); and for providing adherence support for individuals with diabetes and hypertension in communities. Nurses were found to provide equivalent care to physicians, including diagnosis, treatment initiation, and follow-up, for diabetes, hypertension, and HIV when appropriately trained and supported (Bhanbhro et al., 2011; Callaghan et al., 2010; Han et al., 2019; Kredo et al., 2014; Laurant et al., 2018).

Additionally, it was clear that the classification of the continuum of care process required in PC to improve people's health into screening, diagnosis, treatment initiation, and follow-up is not exhaustive. Rather, each one of these steps (e.g., screening) can be disaggregated into several activities. For instance, follow-up for NCDs or HIV may involve medication management by a nurse or a physician mixed with home visits by LHWs to identify complications and provide treatment and adherence support (Joshi et al., 2014; Ogedegbe et al., 2014), while in mental health it was found that LHWs could enhance the effectiveness of mental healthcare by offering simple psychotherapy or psychosocial services (Barnett et al., 2018; Connolly et al., 2021; Fang et al., 2022; Karyotaki et al., 2022; Rahman et al., 2013).

Therefore, while one provider may be better suited to conduct the screening activities, another one may be better suited to conduct the diagnosis, another one to initiate treatment, and another one to conduct the follow-up and treatment support activities. As such, the delivery of PC should be conceived and designed as a team endeavor conducted by providers with different professional backgrounds in close coordination and collaboration. While a team-based delivery of PC recognizes that the different activities required to adequately care for patients should be distributed among a group of providers, in which each one may conduct the tasks most appropriate to their level of training and scheme of work, it also highlights that to be effective, the activities that each provider conducts should be coordinated and integrated with one another.

Theme 2: Proactivity

Another common element of the high-performing delivery arrangements identified in the umbrella review was that PC is more effective when it not only provides services when individual users demand or need them but also when it offers its services proactively. Some very clear instances of this include conditions for which the delay between the development of signs and symptoms to prompt treatment can have a significant impact on health outcomes.

For instance, under-5 mortality due to malaria significantly decreases when LHWs visit households looking for children with signs of malaria, followed by a subsequent and immediate on-site diagnosis and treatment initiation, compared to the standard of care in which the guardians of the child have to actively go to facilities to demand care for them (Gogia & Sachdev, 2016; Lassi & Bhutta, 2015; Sonalkar et al., 2014; Tiruneh et al., 2019). This strategy was also found to be effective to improve the early detection of HIV and NCDs, linking patients to treatment, and preventing complications (Schmitz et al., 2019; Mwai et al., 2013). Based on these findings, this project suggests including in the redesign efforts a proactive component in which services for top-priority health needs are offered to people at their houses or communities, without waiting for individuals to demand them.

Theme 3: Integration and coordination throughout the continuum of care

Several reviews evaluated the effects of integration and coordination on people's health outcomes. While it was clear that integration and coordination of activities for a specific condition or group of related conditions effectively improved health outcomes, the effects

of integration for not related conditions were not clear in terms of health outcomes. Coordination throughout the continuum of care refers to the sequential delivery of all services needed to treat a particular condition or group of conditions. To be sure, while the review did not find positive effects of integration across different groups of needs in terms of health outcomes, this does not mean this type of integration is ineffective overall; for instance, it could be effective in terms of other outcomes, such as efficiency.

The clearest positive effects were found for the integration of HIV with other non-HIV but related services, such as antenatal care, family planning, and other sexually transmitted diseases (Bulstra et al., 2021; de Jongh et al., 2016; Lopez et al., 2016). Additionally, linkages or coordination across the continuum of care were found to improve health outcomes compared to independent services at each stage, even though, in some cases the strength of evidence was relatively low (Kikuchi et al., 2015; Rohwer et al., 2021).

Theme 4: Incorporating telemedicine for dialogue-based services

A clear finding of the review was that therapy services had equivalent outcomes when delivered in-person compared to when they were delivered remotely through telemedicine (Berryhill et al., 2019a; Berryhill et al., 2019b). Even though mental health was the area most studied for telemedicine, several implications for other types of conditions can be drawn from those findings. Given that psychological therapy is primarily a dialogue-based interaction that requires appropriate relationship-building between the patient and the provider, with effective rapport and communication, it can be extrapolated that dialogue-based services could be effective in other areas of healthcare, even though current evidence

of effectiveness was only found for mental health in this review (Berryhill et al., 2019a), it is starting to expand to other areas, such as cardiovascular and metabolic health (Jaen-Extremera et al., 2023; Kuan et al., 2022). Because of this, this project recommends considering incorporating telemedicine as a possible route of service delivery while redesigning service delivery in PC, particularly when it would enable individuals to have greater and most convenient access to those services without diminishing their clinical quality.

Additional findings for consideration

In addition to the four themes for redesign mentioned above, some additional delivery arrangements had positive effects, even though the body of evidence was lesser or less consistent, and should be considered as options depending on the local context and needs. First, several reviews identified that delivering services to patients in a group setting could generate better health outcomes than delivering them individually. For instance, some reviews identified that care for people living with HIV could be provided collectively (Hagey et al., 2018). Peer support groups or groups facilitated by LHWs, or other professional providers were shown to be effective for perinatal depression and other mental health disorders (Fang et al., 2022; Mwai et al., 2013).

Another relevant finding was that mHealth interventions did not have strong evidence of effectiveness, except for decision support tools for LHWs. Most of the reviews evaluated messaging services for reminders, and some included other types of cellphone apps, with most of them having null results in the included studies (Dol et al., 2019; Lee et al., 2016;

Palmer et al., 2018; Palmer et al., 2020; Sondaal et al., 2016). Therefore, it is suggested to consider mHealth strategies not as a core element of redesign, but as one that may support an already functional and effective PC delivery platform, particularly decision support tools (Agarwal et al., 2015; Agarwal et al., 2021).

Lastly, even though only a few reviews evaluated the effectiveness of group consultations, often termed shared medical appointments, they have promising evidence of effectiveness (Hagey et al., 2018). Additionally, several reviews evaluated peer groups in addition to the standard of care, which often improved health outcomes, particularly for perinatal depression, mental health disorders, and NCDs (Fang et al., 2022; Janmohamed et al., 2020; Mutamba et al., 2013).

Application: suggested approach to PC model design through bundling

Based on the findings of the review and the common elements of effectiveness of the high-performing delivery arrangements described in the previous section, this project suggests designing the provision of primary care in terms of bundles of delivery arrangements or interventions at each step of the continuum of care, in a six-step process.

The term "care bundles" has previously been used to describe a set of therapeutic interventions or practices performed collectively and reliably to improve the quality of care (Lavallee et al., 2017). As such, care bundles typically refer to specific therapeutic interventions that, when implemented together, achieve better outcomes than when applied separately. This project calls for the expansion of the notion of care bundles from

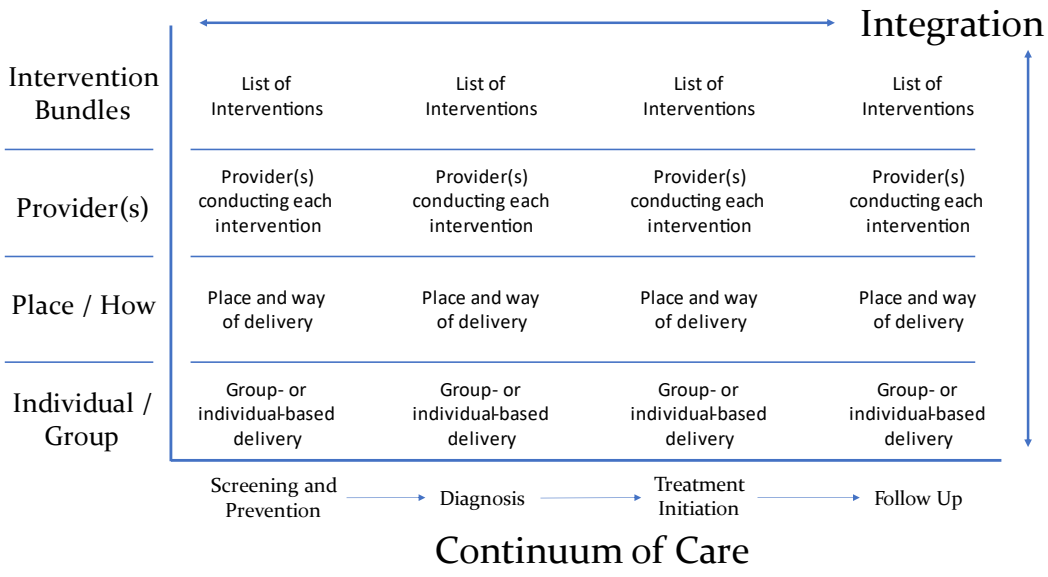
the previously described set of discrete therapeutic interventions to bundles of delivery arrangements in PC that may collectively achieve better outcomes.

Bundled Primary Care

To appropriately meet people's health needs with quality care, the review showed that, often, more than one delivery arrangement is effective at improving specific health outcomes at specific stages of the care continuum. Therefore, this project proposes that PC should be redesigned considering comprehensive sets of integrated delivery arrangements based on the best available evidence, delivered by a diverse range of providers. Accordingly, bundled primary care champions the idea that the design of healthcare should be conceived in bundles of interventions according to the severity and stage of each condition, and the phase of the continuum of care, adjusted to of the setting or context. Figure 13 shows a general schematic representation of bundled primary care design.

For instance, the stakeholders involved in PC redesign efforts should decide on a set of interventions to conduct screening and prevention, another set for diagnosis, another set for treatment initiation, and another set for follow-up. Each bundle should consider the ideal provider, the place (e.g., at home, in clinics) and method of delivery (e.g., remotely or in person), and if services should be delivered in groups or individually. All of these decisions should be based on the best available evidence, and all the interventions should be designed as a bundled set of integrated services, rather than as independent and disconnected interventions.

Figure 13. General representation of bundled primary care design.



Additionally, for each condition, the appropriate bundle of interventions and the team of providers delivering them will differ according to each stage of the continuum of care. For example, an individual with depression may have several requirements to improve their health. For example, they may need to be screened to identify and diagnose the condition promptly, to be connected to the appropriate prevention or treatment strategies, to receive adequate treatment and therapeutic interventions, to receive support to sustainably achieve the appropriate lifestyle changes, to adhere to the clinic and their medications, to be screened for complications and other related comorbidities, etc. With bundled primary care each of these needs would be addressed by a set of interventions provided by a team of providers.

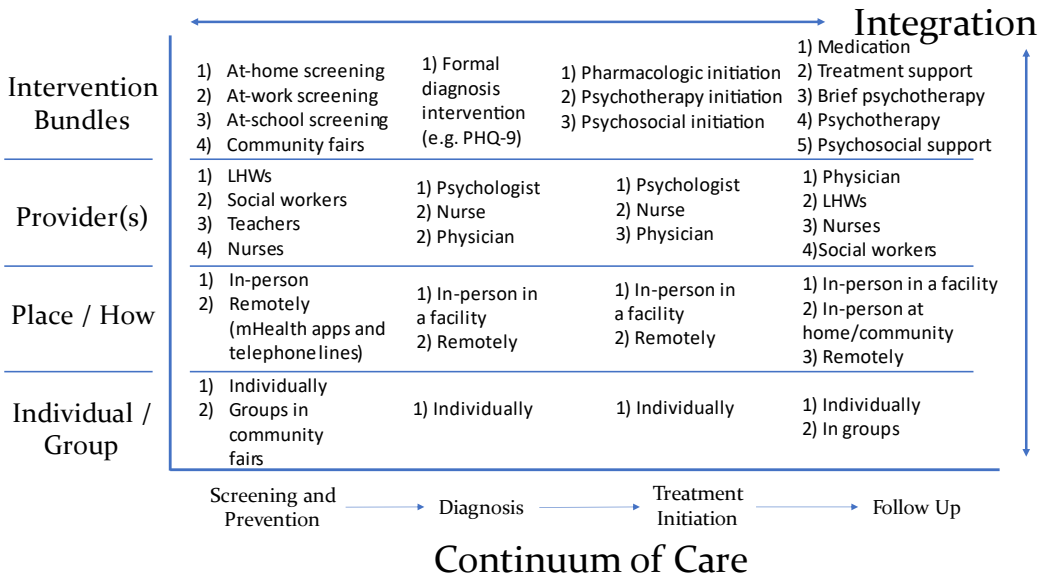
Continuing with the example, the bundle of delivery arrangements for screening could involve outreach by a local LHW that visited households in his catchment area to conduct

a set of questions and screening tools, such as the PHQ-2, followed by a referral to a professional provider to confirm the diagnosis (either remotely or in-person). Even though the review did not find evidence of other screening activities for mental health, health systems could innovate on this front, such as implementing in community fairs or conducting screening at the workplace or schools.

After confirming the diagnosis, the treatment could consist of a bundle of interventions and delivery arrangements, such as a mix of in-person and remote psychotherapy with support from LHWs in the form of psychosocial services, brief additional psychologic interventions at home (e.g., occupational therapies), adherence support, etc. Additionally, there could be social connectivity activities to support individuals. Figure 14 shows an example of the previously discussed possible bundled design of mental health in PC. Appendix 5 shows a matrix of some highlighted delivery arrangements that could help guide the design of these bundles in PC for the major groups of conditions identified through the umbrella review.

The approach to redesign is highly dependent on the population's specific health needs and the burden of disease. Because of the diversity of needs and burdens of disease, the first recommendation from this project is that health systems should identify their priorities in PC based on people's preferences and health needs, and on the relative burden of disease of these health needs.

Figure 14. Example of a bundled design of mental health care in PC



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Case study. Possibilities for PC-SDR in Chiapas and Mexico City

People's health needs and preferences are highly context-dependent, both between countries and within countries. In turn, health systems' approach to redesigning their primary care platforms should be contextualized and flexible enough to adapt to each country's general and regional conditions. To exemplify how the primary care redesign themes presented in this project can be implemented, this case study analyzes how PC-SDR could be implemented in two contrasting areas of Mexico: the state of Chiapas and

Mexico City. Figure 16 shows a map of Mexico with Mexico City and Chiapas highlighted in red.

Figure 15. Mexico City and Chiapas locations in Mexico.

Chiapas and Mexico City face starkly different realities within Mexico, with some key indicators summarized in Table 3.

On the one hand, Chiapas is Mexico's southernmost and poorest state, with 75.5% of its population living in poverty and 29% under extreme poverty (CONEVAL, 2020), and a GDP per capita of $44,387 MXN in 2020 (INEGI, 2021b). On the other hand, Mexico City is Mexico's wealthiest area, with a GDP per capita of $316,761 MXN in 2020 (INEGI, 2021b), with 32.6% of its population living in poverty and 4.3% in extreme poverty (CONEVAL, 2020). Additionally, Chiapas has the second highest proportion of its population self-identified as indigenous, with 28.2% speaking an indigenous language (INEGI, 2022). In Chiapas, 51% of its 5.5 million inhabitants live in rural areas, with a population density of 76 inhabitants per km^2. In contrast, the percentage of Mexico City's population that speaks

an indigenous language is 1.4%, 99% of its 9.2 million inhabitants live in urban areas, and it has a very high population density of 6,163 per km² (INEGI, 2020). The total fertility rate in Chiapas is 2.7, and the average educational achievement is 6.6 years (IHME, 2019a). The total fertility rate in Mexico City is 1.7, and the average educational achievement is 10.3 years (IHME, 2019b).

Table 3. Selected key indicators for Chiapas and Mexico City.

	Chiapas	Mexico City
Sociodemographic indicators		
Population (millions)	5.5	9.2
Poverty	75.5	32.6
GDP per capita (MXN)	$44,387	$316,761 MXN
Indigenous population	28.20%	1.40%
Rural population	51.00%	1%
Fertility rate	2.7	1.7
Educational achievement (years)	6.6	10.3
Human development index	Medium (0.67)	Very high (0.81)
Health indicators		
Life expectancy (years)	74.3	76.6
Maternal mortality rate (per 100,00 live births)	46	32
Diabetes prevalence	7.80%	12.70%
Hypertension prevalence	16.20%	20.20%
Depression symptoms prevalence	17.50%	12.50%
Health systems indicators		
Some type of health insurance	66.70%	72.60%
Health spending per capita (MXN)	$4,515.00	$25,301.00
Percent of out-of-pocket health spending	25%	12.60%
Physicians per 100,000 inhabitants	0.91	3.42
Nurses per 100,000 inhabitants	1.51	4.43

Mexico City has a very high human development index (0.815), the highest in Mexico, while Chiapas has a medium human development index (0.677), the lowest in Mexico (Global Data Lab, 2021). In terms of health indicators, Mexico as a whole had in 2020, a life expectancy at birth of 75.2 years. Chiapas had the third lowest life expectancy with 74.3 years, and Mexico City had the highest life expectancy in Mexico 76.6 years (CONAPO,

2018). Chiapas is the state with the second highest maternal mortality rate, with 46 per 100,000 live births. Mexico City is also among the Mexican states with a high maternal mortality rate, with 32 per 100,000 live births (Direccion General de Epidemiologia, 2019).

The prevalence of diabetes among individuals 20 years of age and older in Mexico City is 12.7%, while in Chiapas is 7.8%. For hypertension, the prevalence is 20.2% in Mexico City and 16.2% in Chiapas (INSP, 2018). The top causes of death in Chiapas and Mexico City were the same in 2019: ischemic heart disease, chronic kidney disease, diabetes, cirrhosis, and stroke. Four of the major risk factors that drive death and disability combined were shared between Mexico City and Chiapas (high fasting plasma glucose, high body-mass index, kidney dysfunction, and high blood pressure), but the third biggest was malnutrition in Chiapas (IHME, 2019a), and the fifth biggest in Mexico City were dietary risks (IHME, 2019b). Additionally, Chiapas has 17.5% of its population with some symptoms of depression, while in Mexico City it is 12.5% (INEGI, 2021a). The five most common diseases in terms of the number of consultations in Mexico City in 2021 were upper respiratory infections, COVID-19, urinary tract infections, acute diarrheal disease, and gastroduodenitis, while in Chiapas they were the same, except for COVID-19, which was not a major cause for consultations (SUIVE, 2021).

In terms of health coverage, 72.6% of the population in Mexico City have some type of health insurance, while in Chiapas is 66.7% (INEGI, 2020). Furthermore, the majority of the insured in Chiapas are affiliated to the safety net insurance systems, which have limited services, while in Mexico City, most of the population has universal coverage through social

security. As a consequence, health spending in Mexico City is $25,301 MXN per capita, while in Chiapas is $4,515 MXN. Chiapas has the lowest out-of-pocket expenses, with $1,150 MXN on average, even though it is 25% of Chiapas health spending, while Mexico City is the second highest, with $3,200 MXN, which is 12.6% of the total health spending (CIEP, 2018). In 2013, there were 0.91 physicians and 1.51 nurses per 100,000 inhabitants in Chiapas, while in Mexico City there were more than double, with 3.42 physicians and 4.43 nurses per 100,000 inhabitants (Ochoa, 2013).

Given the contrasts between Mexico City and Chiapas, how could primary care be redesigned in Mexico? To identify the most appropriate ways to deliver these interventions for Chiapas and Mexico City, the five phases of PC-SDR should be followed, as shown in Figure 5. However, given that this project focuses on the design of models of care, only the design phase will be considered. The engagement, formative research, implementation, and evaluation phases will not be explored.

Application of bundled primary care to model design

Even though Chiapas and Mexico City face significantly different demographic and economic conditions, their highest health needs are relatively similar. Therefore, even though the specific therapeutic interventions that people require from PC may be similar for both states, the ways of delivering them should adapt to the local realities. In practice, the redesign efforts should be conducted by the different healthcare institutions, as well as provider groups and patients, to devise the most applicable way of organizing their PC

services. For this example, we will consider what is the best delivery arrangements identified through the umbrella review.

The bundle of PC interventions for NCDs in Chiapas should target the dispersion of the population and adapt to the scarcity of medical professionals. Therefore, the emphasis should be placed on including task-shifting and sharing in areas where there is evidence of effectiveness, while also increasing the spacing of in-clinic services by substituting them with follow-up in communities and at home. However, it should be noted that that would be the strategy for short-term improvement. The longer-term improvement strategy should be broader, focusing, for example, on increasing the number of providers with advanced training.

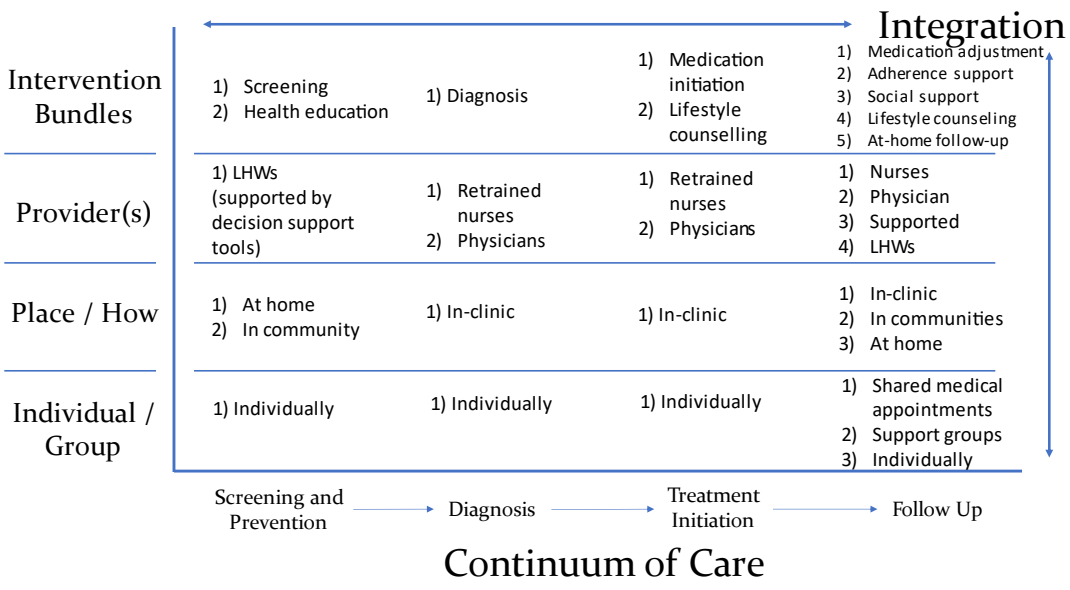
Therefore, in Chiapas, PC-SDR could have local LHWs in charge of the communities where they live (around one for every 2,000 to 3,000 inhabitants), for which they would need to conduct a health profile of each household in their catchment area, including screening individuals above 20 years of age for diabetes and hypertension, among other activities that target other types of conditions, not described in this case study, including MNH activities. To guide their activities, they could have decision support tools, such as a mobile phone app, to direct them on what course of action to take according to the measurements obtained for each individual, in addition to the educational resources required.

If an individual was found to have measurements suggestive of hypertension or diabetes, the LHW should be able to generate an appointment for the individual at the closest clinic to confirm the diagnosis. LHWs should be regularly supervised by LHWs with more

experience, following quality principles for LHWs, such as those identified by the community health impact coalition. Then, at the clinic, nurses could be specifically retrained to conduct the formal diagnosis, treatment initiation, and follow-up for diabetes and hypertension. They should be supported in their context of practice by other providers with more advanced training.

Patients could also receive adherence support and health education at home or in their communities, in addition to the in-clinic services. Additionally, some follow-up consultations and medication refills could be mixed with or substituted by follow-up provided by LHWs equipped with decision support tools, for patients under good clinical control. All these services would need to be integrated throughout the continuum of care and between the providers. Figure 16 shows the previously described design for Chiapas under the bundled PC framework.

Figure 16. Example of a possible bundle of PC in Chiapas



The situation in Mexico City would be different, given that, in contrast to Chiapas, more resources are available for healthcare, and the population and facility density is higher. To start with, the cultural and security differences place higher complexity on establishing a area-based system of LHWs. However, it could still be applicable. In Mexico City, screening services should be available in public and workspaces, probably also conducted by LHWs or technical nurses, also supported by decision support tools. However, compared to Chiapas, a formal diagnosis could also be conducted in that same setting with adequate support, given the option of having proximate providers with more advanced training. Then treatment initiation could happen at the closest clinic, by a nurse or a physician, as suggested in Chiapas.

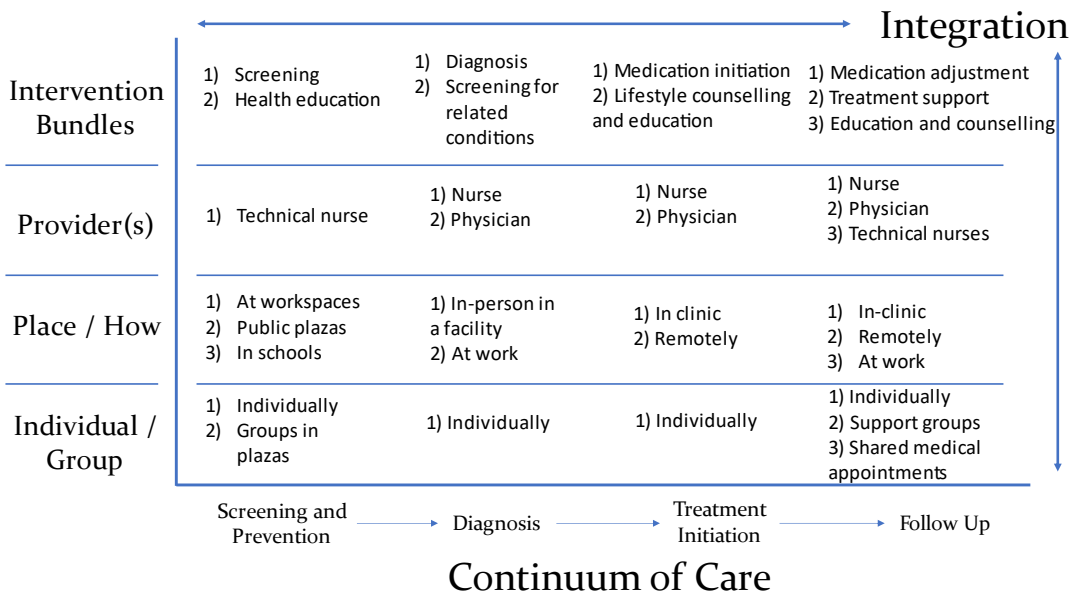
Nurses should be retrained to provide care. In the case of Mexico City, this would not necessarily increase access, but it would increase the amount of time the providers can spend with patients, while also increasing the availability of physicians to take care of emerging non-scheduled consultations for broader health needs, reducing the saturation of the health system (Laurant et al., 2018). Additionally, patients could conduct self-monitoring of their condition and conduct the follow-up with the local LHW supported by a nurse or a physician, in cases where the conditions were under control.

Follow-up and treatment initiation could then be conducted through a mix of in-person and remote care, by nurses or physicians. Additionally, there could be interventions of treatment support at the individual's workplace or community. Some of the appointments

could be replaced by shared medical appointments. Figure 17 shows the previously described design for Mexico City under the bundled PC framework.

In conclusion, even though health needs in Chiapas and Mexico City are similar, the resources to tackle them and the geographical and demographic contexts differ significantly. The bundle of interventions required for a specific group of conditions may be similar, but the providers, the site of service delivery, and the way of delivery should be adapted to the local circumstances.

Figure 17. Example of a possible bundle of PC in Mexico City.



Assumptions and limitations

There are several assumptions that this project takes that are worth mentioning. First, this project has a biomedical standpoint, in which diseases are caused by biophysical agents, genes, and risk factors. The biomedical perspective calls for individual medical interventions to maintain and restore health. Therefore, as was noted in the introduction,

the perspective of delivery arrangements evaluates exclusively individual services and does not involve wider influences on the health of populations. Because of that, it is worth noting that, even though it has a biomedical perspective, this project does not suggest a single-faceted approach to health. Rather, this project acknowledges that while the major forces shaping the health of populations reside outside of healthcare, healthcare still has tools that can maintain and restore people's health. Therefore, a population's approach to health should go beyond medical interventions and healthcare. It should encompass broader social policies and arrangements that influence the upstream forces shaping people's health.

Another assumption of this project is that PC service delivery should follow a rather centralized planning and execution, compared to a perspective of a system shaped by market forces acting independently and creating the most efficient distribution of healthcare goods and services through market mechanisms. Additionally, the emphasis of this review was on health outcomes, most of them defined by healthcare professionals. Therefore, this project assumes that the priorities of the users when accessing healthcare align with the views of the professional bodies that have created the health outcomes assessed by the included reviews, such as mortality measures, control rates, biomedical markers, etc.

A major limitation of the methodology of this project is that the most innovative and recent interventions may not be included and considered, given that, because of their innovative nature, they may not have been implemented and researched enough to have a review

evaluating them. Additionally, the search strategy may have some degree of bias to identify a certain type of review or delivery arrangements and, in turn, to not identify others.

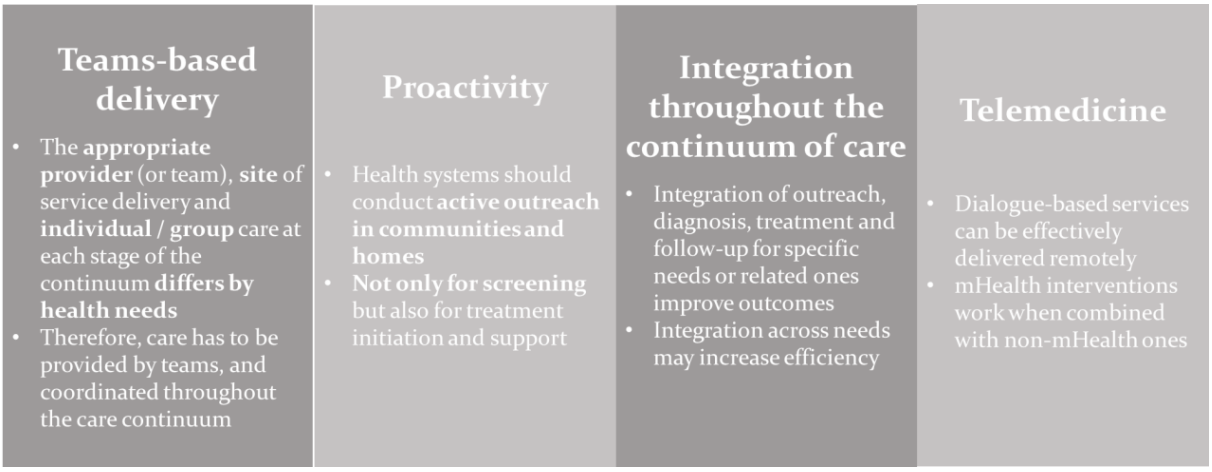
Conclusion

There are many alternatives to redesigning the delivery of primary care, and there is not a single best option to do it. Rather, through this project it became clear that the approach to PC-SDR should be highly contextualized to people's health needs, the burden of disease of these health needs, and the available resources for the redesign efforts.

Five specific delivery arrangements were highly effective and should be considered for the redesign efforts whenever the conditions they address are part of the local health needs. First, all the reviews that evaluated the delivery of simple psychotherapy or psychosocial services by LHWs in addition to the standard of care for depression, anxiety, and psychotic disorders found them to be effective, particularly when the LHWs are supported by and integrated into a team. Second, LHWs can provide adequate patient support, counseling, home-based care, education, adherence support, livelihood support, screening, referral, and surveillance for NCDs and HIV care. Third, nurses can provide adequate care for diabetes, hypertension, other NCDs, and HIV when appropriately trained and receiving organizational support, both in HICs and LMICs. Fourth, services for NCDs and HIV can be provided with lesser intensity in clinics when they are mixed with services provided at home or in communities, and detection, treatment, and follow-up for HIV can be conducted in community settings when they are coordinated with outpatient services. Fifth, detection, treatment, and follow-up of HIV can be conducted in community settings when they are coordinated with outpatient services.

Additionally, even though the specific mix of providers, activities, site of service delivery, etc., that each PC platform should implement are highly contextually specific, there were several common elements identified across the delivery arrangements evaluated in the umbrella review that can be used as guiding themes to the redesign efforts, shown in Figure 12 and below.

Figure 12. Themes for the design of PC models of care



Although several of the recommendations focus on disease-specific interventions, the suggested approach to PC in this project is not the design of several parallel vertical programs for conditions. On the contrary, this review suggests the condition-specific delivery arrangements as enhancers of an existing horizontal health system capable of solving other health needs.

Involving new providers in caregiving, such as nurses and LHWs, is not intended to replace physicians or other healthcare professionals. Instead, by distributing the activities among different types of providers, the redesign approach should harness the strengths of each provider. For instance, physicians' training generally encompasses a wider scope of practice

than other professionals. By shifting some of the more standardized activities, such as follow-up for NCDs and antenatal care to other providers, like nurses, physicians could expand their time available for emerging requests for appointments for other services. Therefore, involving new providers could benefit users by having a well-trained provider with enough time to adequately conduct each of the required tasks of their routine health care, as well as having providers available for new emergent needs.

This project sets forth the idea that the provision of primary care should be designed in bundles of delivery arrangements or interventions at each step of the continuum of care, based on the best available evidence, delivered by a diverse range of providers. These bundles should be designed according to the severity and stage of each condition, and the phase of the continuum of care, adjusted to a diversity of contextual, integrated throughout the continuum of care and with the bundles of other related groups of conditions.

In conclusion, there have been major efforts in LMICs over the last decades to explore different ways in which healthcare services can be delivered in PC to maintain, restore and improve people's health, as is demonstrated by the number of reviews and studies available for this project. It is now clear that some of these efforts have produced effective delivery arrangements, some ineffective ones, and a lesser number of harmful ones. For some delivery arrangements, there is still not enough evidence to draw a clear conclusion.

It is imperative that the design of PC delivery should be guided by the best available evidence, while at the same time acknowledging the contextual nature of disease causation

and health restoration. There is a rich enough body of evidence that can provide themes and a limited set of solutions for health systems to improve the quality of their services.

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Appendices

Appendix 1. Search strategy for PubMed

Search Term	Search Query
Primary Care	“primary health care”[Mesh:noexp] OR "Community Health Services"[Mesh] OR primary health care[tiab] OR primary healthcare[tiab] OR primary health-care[tiab] OR primary medical care[tiab] OR community health service*[tiab] OR community health care[tiab] OR community healthcare[tiab] OR home*[tiab]
Delivery arrangements	"delivery of health care"[Mesh] OR model of care[tiab] OR models of care[tiab] OR models of delivery[tiab] OR model of delivery[tiab] OR models for delivery[tiab] OR model for delivery[tiab] OR service delivery[tiab] OR service delivery model[tiab] OR healthcare model[tiab] OR health care model[tiab] OR care model[tiab] OR process of care[tiab] OR processes of care[tiab] OR delivery arrangements[tiab] OR delivery of care[tiab] OR delivery of health care[tiab] OR integrated health care[tiab] OR integrated care[tiab] OR models of delivering care[tiab] OR models of delivering health care[tiab] OR medical service[tiab] OR health service[tiab] OR community care[tiab] OR community health service[tiab] OR community case management[tiab] OR home-based management[tiab] OR ambulatory care[tiab] OR integrated health care[tiab] OR integrated care[tiab] OR community case management[tiab] OR community management[tiab] OR task shift*[tiab] OR task-shift*[tiab] OR task shar*[tiab] OR task-shar*[tiab]
Low and middle-income countries	"Developing Countries"[Mesh] OR developing countr*[tiab] OR developing nation*[tiab] OR less developed countr*[tiab] OR less developed nation*[tiab] OR third world nation*[tiab] OR third world countr*[tiab] OR under developed nation*[tiab] OR underdeveloped nation*[tiab] OR under developed countr*[tiab] OR underdeveloped nation*[tiab] OR underserved countr*[tiab] OR underserved area*[tiab] OR developing econom*[tiab] OR resource poor[tiab] OR resource limit*[tiab] OR limited resource*[tiab] OR limiting resource*[tiab] OR low resource[tiab] OR resource constrain*[tiab] OR constrained resource*[tiab] OR middle income countr*[tiab] OR middle income nation*[tiab] OR low income countr*[tiab] OR low income nation*[tiab] OR poor countr*[tiab] OR poor nation*[tiab] OR lmic[tiab] OR lmics[tiab] OR "Africa"[mesh] OR "Asia"[mesh] OR "South America"[mesh] OR "Latin America"[mesh] OR "Central America"[mesh] OR africa[tiab] OR asia[tiab] OR south america*[tiab] OR latin america*[tiab] OR central america*[tiab] OR afghanistan*[tiab] OR albania*[tiab] OR algeria*[tiab] OR angola*[tiab] OR argentina*[tiab] OR armenia*[tiab] OR azerbaijan*[tiab] OR bangladesh*[tiab] OR belarus*[tiab] OR belize*[tiab] OR benin*[tiab] OR bhutan*[tiab] OR bolivia*[tiab] OR bosnia*[tiab] OR botswana*[tiab] OR brazil*[tiab] OR bulgaria*[tiab] OR burkin*[tiab] OR burundi*[tiab] OR cabo verd*[tiab] OR cape verd*[tiab] OR cambodia*[tiab] OR cameroon*[tiab] OR central african republic[tiab] OR chad*[tiab] OR china*[tiab] OR colombia*[tiab] OR comoros*[tiab] OR comorian*[tiab] OR congo*[tiab] OR costa rica*[tiab] OR cote d'ivoire*[tiab] OR ivorian*[tiab] OR cuba*[tiab] OR democratic peoples republic of korea[tiab] OR djibouti*[tiab] OR dominica*[tiab] OR ecuador*[tiab] OR egypt*[tiab] OR el salvador*[tiab] OR salvadoran*[tiab] OR eritrea*[tiab] OR eswatini*[tiab] OR

Appendix 1. (Continued)

	ethiopia*[tiab] OR fiji*[tiab] OR gabon*[tiab] OR gambia*[tiab] OR gaza[tiab] OR georgia*[tiab] OR ghana*[tiab] OR grenada*[tiab] OR grenadines*[tiab] OR guatemala*[tiab] OR guinea*[tiab] OR guyana*[tiab] OR haiti*[tiab] OR herzegovina*[tiab] OR hondura*[tiab] OR india*[tiab] OR indonesia*[tiab] OR iran*[tiab] OR iraq*[tiab] OR ivory coast*[tiab] OR jamaica*[tiab] OR jordan*[tiab] OR kazakh*[tiab] OR kenya*[tiab] OR kiribati*[tiab] OR kosovo*[tiab] OR kyrgyz*[tiab] OR lao[tiab] OR laoatian*[tiab] OR lebanon*[tiab] OR lebanese[tiab] OR lesotho*[tiab] OR liberia*[tiab] OR libya*[tiab] OR macedonia*[tiab] OR madagascar*[tiab] OR malawi*[tiab] OR malaysia*[tiab] OR maldiv*[tiab] OR mali[tiab] OR malian*[tiab] OR marshall island*[tiab] OR mauritania*[tiab] OR mauriti*[tiab] OR mexico[tiab] OR mexican*[tiab] OR micronesia*[tiab] OR moldova*[tiab] OR mongolia*[tiab] OR montenegr*[tiab] OR morocc*[tiab] OR mozambi*[tiab] OR myanmar*[tiab] OR namibia*[tiab] OR nauru*[tiab] OR nepal*[tiab] OR nicaragua*[tiab] OR niger*[tiab] OR pakistan*[tiab] OR palau*[tiab] OR papua*[tiab] OR paraguay*[tiab] OR peru*[tiab] OR philippines*[tiab] OR philippino*[tiab] OR principe[tiab] OR russia*[tiab] OR rwanda*[tiab] OR saint lucia*[tiab] OR saint vincent*[tiab] OR samoa*[tiab] OR samoa*[tiab] OR sao tome*[tiab] OR senegal*[tiab] OR serbia*[tiab] OR sierra leone*[tiab] OR solomon island*[tiab] OR somalia*[tiab] OR south africa*[tiab] OR sri lanka*[tiab] OR st lucia*[tiab] OR st vincent*[tiab] OR sudan*[tiab] OR surinam*[tiab] OR syria*[tiab] OR tajik*[tiab] OR tanzania*[tiab] OR thai*[tiab] OR timor*[tiab] OR togo*[tiab] OR tonga*[tiab] OR tunisia*[tiab] OR turkey*[tiab] OR turk*[tiab] OR tuvalu*[tiab] OR uganda*[tiab] OR ukraine*[tiab] OR uzbek*[tiab] OR vanuatu*[tiab] OR venezuela*[tiab] OR vietnam*[tiab] OR west bank*[tiab] OR yemen*[tiab] OR zambia*[tiab] OR zimbabw*[tiab]
Review articles	systematic review[pt] OR systematic[ti] OR scoping[ti] OR umbrella[ti]

Appendix 2. Search Strategy for Ovid

1 primary health care/ or exp community health services/ or ((primary or community) adj (care or healthcare or health care or medical care or health service? or medical service*)).ab,kf,kw,ti. 490995

2 exp "delivery of health care"/ or (delivery adj3 (service? or arrangment? or care or healthcare or health care)).ab,kf,kw,ti. 1236157

3 (model? adj3 (care or health care or healthcare or delivery or service?)).ab,kf,kw,ti. 40956

4 (care adj3 (process or processes)).ab,kf,kw,ti. 15637

5 ((medical or health or community) adj3 service?).ab,kf,kw,ti. 230376

6 exp community health services/ or (community adj (care or healthcare or health care or medical care or health service? or medical service* or case management or management)).ab,kf,kw,ti. 331928

7 exp home care services/ or (home adj3 (care or health care or healthcare or service? or medical care)).ab,kf,kw,ti. 72351

8 (integrat* adj3 (care or healthcare or health care or medical care or health service? or medical service*)).ab,kf,kw,ti. 34779

9 (task shift* or task shar*).ab,kf,kw,ti. 1994

10 or/2-9 1612048

11 exp developing countries/ or ((developing or less developed or third world or under developed or middle income or low income or underserved or under served or deprived or poor*) adj1 (countr* or nation* or state*)).ab,kf,kw,ti. or (resource* adj2 (poor or limiting or limited or low or constrain*)).ab,kf,kw,ti. or exp africa/ or exp asia/ or exp south America/ or exp latin America/ or exp central america/ or (lmic or lmics or africa or asia or south america* or latin america* or central america* or afghanistan* or albania* or algeria* or samoa* or angola* or argentina* or

armenia* or azerbaijan* or bangladesh* or belarus* or belize* or benin* or bhutan* or bolivia* or bosnia* or herzegovina* or botswana* or brazil* or bulgaria* or burkin* or burundi* or cabo verde* or cape verde* or cambodia* or cameroon* or central africa* or chad* or china or chinese or colombia* or comoros or comorian* or congo* or costa rica* or cote d ivoire or ivorian* or ivory coast or cuba* or djibouti* or dominica* or ecuador* or egypt* or el salvador or salvadoran* or guinea* or eritrea* or eswatini* or swaziland* or ethiopia* or fiji* or gabon* or gambia* or "republic of georgia" or ghana* or grenada* or guatemala* or guyana* or haiti* or honduras* or india* or indonesia* or iran* or iraq* or jamaica* or jordan* or kazakhstan* or kenya* or kiribati* or "democratic people s republic of korea" or north korea* or kosovo or kosovar* or kyrgyz* or lao or laos or laotian* or lebanon* or lesotho or liberia* or libya* or madagascar* or malawi* or malaysia* or maldives* or mali or malian or malians or marshall island* or mauritania* or mexico or mexican* or micronesia* or moldova* or mongolia* or montenegr* or morocc* or mozambi* or myanmar* or namibia* or nepal* or nicaragua* or niger or nigerien* or nigeria* or macedonia* or palau* or pakistan* or paragua* or peru* or philippines or filipino* or russia* or rwanda* or "sao tome and principe" or senegal* or serbia* or sierra leone* or solomon island* or somalia* or south africa* or sudan* or sri lank* or surinam* or st lucia* or saint lucia* or st vincent* or saint vincent* or grenadines or syria* or tajikistan* or tanzania* or thailand or thai or thais or timor* or togo or togolese* or tonga* or tunisia* or turkey or turks or turkish or turkmenistan* or tuvalu* or uganda* or ukrain* or uzbekistan* or vanuatu* or venezuela* or vietnam* or viet nam* or west bank or gaza or gazan* or yemen* or zambia* or zimbabwe*).ab,kf,kw,ti. 2604316

12 1 and 10 and 11 71674

13 (systematic review or meta-analysis).pt. or systematic.ti. or scoping.ti. or umbrella.ti. 373539

14 12 and 13 1181

Appendix 3. Critical Appraisal Checklist

Critical Appraisal Checklist

Reviewer _____ Date _____

Author_____ Year_____ Journal_____ Record N.____

Reference_____

	YES	NO	UNCLEAR	N/A
1. Is the review question/objectives clearly and explicitly stated?	☐	☐	☐	☐
2. Were the inclusion criteria appropriate for the review question?	☐	☐	☐	☐
3. Was the search strategy appropriate?	☐	☐	☐	☐
4. Were the sources and resources used to search for studies adequate?	☐	☐	☐	☐
5. Was critical appraisal conducted by two or more reviewers independently?	☐	☐	☐	☐
6. Were there methods to minimize errors in data extraction?	☐	☐	☐	☐
7. Were the methods used to combine studies appropriate?	☐	☐	☐	☐
8. Was the likelihood of publication bias assessed?	☐	☐	☐	☐
9. Were recommendations for policy and/or practice Supported by the reported data?	☐	☐	☐	☐
10. Were the specific directives for new research appropriate?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Notes: _____

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Appendix 4. Description of the included reviews.

Review Code	Journal	Year	Author(s)	Review Type	Description of Interventions
FTI 001	EClinicalMedicine	2022	Abrokwa, Seth Kofi; Ruby, Lisa C.; Heuvelings, Charlotte C.; Belard, Sabine	Systematic Review	POCUS (Point of care ultrasound) training to providers limited to the studies
FTI 002	The Cochrane database of systematic reviews	2021	Agarwal, Smisha; Glenton, Claire; Tamrat, Tigest; Henschke, Nicholas; Maayan, Nicola; Fonhus, Marita S.; Mehl, Garrett L.; Lewin, Simon	Systematic Review	Digital, decision-support tools were developed for use primarily on a mobile device, and were used by health workers for the purpose of service delivery
FTI 005	BMC psychiatry	2017	Asher, Laura; Patel, Vikram; De Silva, Mary J.	Systematic Review and Meta-analysis	Three groups of interventions in general: A. single-faceted psychoeducation interventions only. B. Multi-faceted interventions (family interventions, support developing social and independent living skills, medication adherence support, crisis intervention and dealing with stigma). C. Engagement with care following discharge from inpatient facilities, social skills training.
FTI 006	BMC public health	2011	Atun, Rifat; de Jongh, Thyra E.; Secci, Federica V.; Ohiri, Kelechi; Adeyi, Olusoji; Car, Josip	Systematic Review	Interventions focused on health care integration improvement refer to changes in organisation, management, planning and decision making in health care resulting in delivery of a range of services at a particular service delivery point, in provision of preventive and curative health care to a particular group of patients and in continuity of health care over time.
FTI 007	Human resources for health	2022	Ayuk, Besong Eric; Yankam, Brenda Mbouamba; Saah, Farrukh Ishaque; Bain, Luchuo Engelbert	Systematic Review	Provision of injectable contraceptives (specifically depot-medroxyprogesterone acetate, DMPA) by community health workers

Appendix 4. (Continued)

FTI 008	The Cochrane database of systematic reviews	2011	Bain-Brickley, Deborah; Butler, Lisa M.; Kennedy, Gail E.; Rutherford, George W.	Systematic Review	Multiple interventions forimproving adherence to antiretroviral therapy in children with HIV: 1) home-based intensive nursing consisting of 8 structured home visits by a single nurse over three months), 2) The provision of medication diaries for use by caregivers to improve children's adherence to ART, 3) A Peer support group therapy for adolescents with HIV attending an outpatient clinic
FTI 009	Administration and policy in mental health	2018	Barnett, Miya L.; Gonzalez, Araceli; Miranda, Jeanne; Chavira, Denise A.; Lau, Anna S.	Systematic Review (Narrative Synthesis)	Community Health Workers providing mental health care
FTI 011	Family practice	2019	Berryhill, M. Blake; Halli-Tierney, Anne; Culmer, Nathan; Williams, Nelle; Betancourt, Alex; King, Michael; Ruggles, Hannah	Systematic Review	Videoconferencing psychological therapy for anxiety (one-on-one). Psychological interventions included CBT, behavioral activation, problem solving therapy, acceptance-based behavioral therapy, proprietary invervention, mixed.
FTI 012	BMC health services research	2011	Bhanbhro, Sadiq; Drennan, Vari M.; Grant, Robert; Harris, Ruth	Systematic (Integrative) Review	Prescribing in Primary care by nurses and professionals allied to medicine (non-medical prescribing, NMP)
FTI 015	PLoS medicine	2021	Bulstra, Caroline A.; Hontelez, Jan A. C.; Otto, Moritz; Stepanova, Anna; Lamontagne, Erik; Yakusik, Anna; El-Sadr, Wafaa M.; Apollo, Tsitsi; Rabkin, Miriam; Integration, Unaids Expert Group on; Atun, Rifat; Barnighausen, Till	Systematic Review and Meta-analysis	Integration of HIV services and other non-HIV services

Appendix 4. (Continued)

FTI 016	The Lancet. Public health	2021	Burke, Rachael M.; Nliwasa, Marriott; Feasey, Helena R. A.; Chaisson, Lelia H.; Golub, Jonathan E.; Naufal, Fahd; Shapiro, Adrienne E.; Ruperez, Maria; Telisinghe, Lily; Ayles, Helen; Corbett, Elizabeth L.; MacPherson, Peter	Systematic Review	Community-based active case-finding for tuberculosis
FTI 017	PloS one	2014	Byrne, Abbey; Hodge, Andrew; Jimenez-Soto, Eliana; Morgan, Alison	Systematic Review	Several interventions evaluated
FTI 019	Human resources for health	2010	Callaghan, Mike; Ford, Nathan; Schneider, Helen	Systematic Review	Task-shifting for HIV treatment and care
FTI 021	Journal of cancer survivorship: research and practice	2021	Chan, Raymond J.; Crawford-Williams, Fiona; Crichton, Megan; Joseph, Ria; Hart, Nicolas H.; Milley, Kristi; Druce, Paige; Zhang, Jianrong; Jefford, Michael; Lisy, Karolina; Emery, Jon; Nekhlyudov, Larissa	Overview of Systematic Reviews	Models of cancer survivorship care
FTI 022	Journal of human lactation : official journal of International Lactation Consultant Association	2010	Chapman, Donna J.; Morel, Katherine; Anderson, Alex Kojo; Damio, Grace; Perez-Escamilla, Rafael	Systematic Review	Breastfeeding Peer Counseling (by breastfeeding peer counselors)
FTI 024	Archives of physical medicine and rehabilitation	2020	Chi, Nai-Fang; Huang, Yi-Chieh; Chiu, Hsiao-Yean; Chang, Hsiu-Ju; Huang, Hui-Chuan	Systematic Review and Meta-analysis	
FTI 025	BMC public health	2014	Chishinga, Nathaniel; Godfrey-Faussett, Peter; Fielding, Katherine; Ayles, Helen	Systematic Review and Meta-analysis	Home-based support to HIV treatment (variable)

Appendix 4. (Continued)

FTI 028	African journal of AIDS research : AJAR	2016	Cobbing, Saul; Hanass-Hancock, Jill; Myezwa, Hellen	Scoping Review	Home-based rehabilitation
FTI 029	Bulletin of the World Health Organization	2021	Connolly, Suzanne M.; Vanchu-Orosco, Michelle; Warner, Jan; Seidi, Pegah A.; Edwards, Jenny; Boath, Elisabeth; Irgens, A. C.	Systematic Review and Meta-analysis	Mental health interventions by lay counsellors living in the local community
FTI 030	BMC health services research	2015	Davy, Carol; Bleasel, Jonathan; Liu, Hueiming; Tchan, Maria; Ponniah, Sharon; Brown, Alex	Systematic Review	Self-management support, delivery system design, clinical information systems, decision support, case management, health system, community support, family support
FTI 031	Journal of global health	2016	de Jongh, Thyra E.; Gurol-Urganci, Ipek; Allen, Elizabeth; Zhu, Nina Jiayue; Atun, Rifat	Systematic Review	Integration of antenatal care with other services
FTI 034	JBI database of systematic reviews and implementation reports	2019	Dol, Justine; Richardson, Brianna; Tomblin Murphy, Gail; Aston, Megan; McMillan, Douglas; Campbell-Yeo, Marsha	Systematic Review	mHealth interventionsduring the perinatal period
FTI 035	The Cochrane database of systematic reviews	2011	Dudley, Lilian; Garner, Paul	Systematic Review	Strategies for integrating primary health services in low- and middle-income countries at the point of delivery
FTI 036	PLoS medicine	2021	Eshun-Wilson, Ingrid; Awotiwon, Ajibola A.; Germann, Ashley; Amankwaa, Sophia A.; Ford, Nathan; Schwartz, Sheree; Baral, Stefan; Geng, Elvin H.	Systematic Review and Meta-analysis	Community-based antiretroviral therapy initiation models
FTI 037	General hospital psychiatry	2022	Fang, Qian; Lin, Lu; Chen, Qiuyun; Yuan, Yang; Wang, Shaotong; Zhang, Yueyue; Liu, Tingting; Cheng, Hui; Tian, Li	Systematic Review and Meta-analysis	Peer-support interventions on perinatal depression

Appendix 4. (Continued)

FTI 038	BMC public health	2022	Fernández, Lucia González; Firima, Emmanuel; Robinson, Elena; Ursprung, Fabiola; Huber, Jacqueline; Amstutz, Alain; Gupta, Ravi; Gerber, Felix; Mokhohlane, Joalane; Lejone, Thabo; Ayakaka, Irene; Xu, Hongyi; Labhardt, Niklaus Daniel	Scoping Review	Community-based care models for arterial hypertension management in non-pregnant adults in sub-Saharan Africa
FTI 039	Journal of rehabilitation medicine	2018	Furlan, Andrea D.; Irvin, Emma; Munhall, Claire; Giraldo-Prieto, Mario; Fullerton, Laura; McMaster, Robert; Danak, Shivang; Costante, Alicia; Pitzul, Kristen; Bhide, Rohit P.; Marchenko, Stanislav; Mahood, Quenby; David, Judy A.; Flannery, John F.; Bayley, Mark	Systematic Review	Rehabilitation service models for people with physical and/or mental disability living in low- and middle-income countries
FTI 040	International journal for equity in health	2021	Ganle, John Kuumuori; Baatiema, Leonard; Ayamah, Paul; Ofori, Charlotte Abra Esime; Ameyaw, Edward Kwabena; Seidu, Abdul-Aziz; Ankomah, Augustine	Scoping Review	Family planning intervention models for urban slums in low- and middle-income countries
FTI 041	Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association	2020	Gelaw, Asmare Yitayeh; Janakiraman, Balamurugan; Gebremeskel, Berihu Fisseha; Ravichandran, Hariharasudhan	Systematic Review	Home-based rehabilitation

Appendix 4. (Continued)

FTI 042	AIDS and behavior	2016	Genberg, Becky L.; Shangani, Sylvia; Sabatino, Kelly; Rachlis, Beth; Wachira, Juddy; Braitstein, Paula; Operario, Don	Systematic Review	Involving people living with HIV as peers
FTI 043	BMC public health	2013	Gilmore, Brynne; McAuliffe, Eilish	Systematic Review	Preventive interventions for maternal and child health delivered by community health workers
FTI 044	Tropical medicine & international health : TM & IH	2011	Glenton, Claire; Scheel, Inger B.; Lewin, Simon; Swingler, George H.	Systematic Review	LHWs providing informations at homes, in groups, wupported by nurses or providing the vaccinations themselves.
FTI 046	Journal of perinatology : official journal of the California Perinatal Association	2016	Gogia, S.; Sachdev, H. P. S.	Systematic Review	Home-based neonatal care provided by community health workers (CHWs) for preventing neonatal, infant and perinatal mortality
FTI 048	Tropical medicine & international health : TM & IH	2016	Graham, Hamish; Tokhi, Mariam; Duke, Trevor	Scoping review	Strategies of providing care for children with chronic health conditions in low- and middle-income countries
FTI 049	Health promotion international	2019	Gyawali, Bishal; Bloch, Joakim; Vaidya, Abhinav; Kallestrup, Per	Systematic Reviews	Community-based interventions for prevention of Type 2 diabetes in low- and middle-income countrie
FTI 050	AIDS care	2018	Hagey, Jill M.; Li, Xuan; Barr-Walker, Jill; Penner, Jeremy; Kadima, Julie; Oyaro, Patrick; Cohen, Craig R.	Scoping Review	Differentiated HIV Care (Differentiated HIV care tailors provision of ART for patients based on their level of acuity, providing alternatives for where, by whom, and how often care occurs)
FTI 051	International journal of nursing studies	2019	Han, Emeline; Quek, Rina Yu Chin; Tan, See Mieng; Singh, Shweta R.; Shiraz, Farah; Gea-Sanchez, Montserrat; Legido-Quigley, Helena	Systematic Reviews	Community-based nursing interventions for cardiovascular disease

Appendix 4. (Continued)

FTI 052	The Journal of rural health : official journal of the American Rural Health Association and the National Rural Health Care Association	2018	Hoeft, Theresa J.; Fortney, John C.; Patel, Vikram; Unutzer, Jurgen	Systematic Review	Task Sharing approaches to improve mental health
FTI 053	Malaria journal	2007	Hopkins, Heidi; Talisuna, Ambrose; Whitty, Christopher Jm; Staedke, Sarah G.	Systematic Review	Home-based management of Malaria delivered by local community members with no formal training
FTI 054	AIDS and behavior	2022	Ibiloye, Olujuwon; Masquillier, Caroline; Jwanle, Plang; Van Belle, Sara; van Olmen, Josefien; Lynen, Lut; Decroo, Tom	Scoping Review	Community-based delivery of anti-retroviral therapy
FTI 056	Nutrients	2020	Janmohamed, Amynah; Sohani, Nazia; Lassi, Zohra S.; Bhutta, Zulfiqar A.	Systematic Review and Meta-analysis	Community health worker (CHW) home visits and mother/peer group delivery platforms
FTI 057	BMJ (Clinical research ed.)	2012	Jolly, Kate; Ingram, Lucy; Khan, Khalid S.; Deeks, Jonathan J.; Freemantle, Nick; MacArthur, Christine	Systematic review and metaregression	Peer support for breastfeeding continuation
FTI 058	PloS one	2014	Joshi, Rohina; Alim, Mohammed; Kengne, Andre Pascal; Jan, Stephen; Maulik, Pallab K.; Peiris, David; Patel, Anushka A.	Systematic Review	Task-shifting to lay health workers (no formal medical training or nurses).
FTI 059	Journal of community health	2009	Kangovi, Shreya; Mukherjee, Joia; Bohmer, Richard; Fitzmaurice, Garret	Systematic Review and Meta-analysis	Community-based directly observed therapy programs for tuberculosis treatment in developing countries
FTI 060	The Cochrane database of systematic reviews	2015	Karumbi, Jamlick; Garner, Paul	Intervention review	Direct observed therapy (DOT) for tuberculosis

Appendix 4. (Continued)

FTI 061	JAMA psychiatry	2022	Karyotaki, Eirini; Araya, Ricardo; Kessler, Ronald C.; Waqas, Ahmed; Bhana, Arvin; Rahman, Atif; Matsuzaka, Camila T.; Miguel, Clara; Lund, Crick; Garman, Emily C.; Nakimuli-Mpungu, Etheldreda; Petersen, Inge; Naslund, John A.; Schneider, Marguerite; Sikander, Siham; Jordans, Mark J. D.; Abas, Melanie; Slade, Pauline; Walters, Stephen; Brugha, Traolach S.; Furukawa, Toshi A.; Amanvermez, Yagmur; Mello, Marcelo F.; Wainberg, Milton L.; Cuijpers, Pim; Patel, Vikram	Systematic Review and Meta-analysis	Task-Shared Psychological Interventions for depression
FTI 062	Trauma, violence & abuse	2019	Katsonga-Phiri, Tiamo; Grant, Kathryn E.; Brown, Molly	Systematic Review	
FTI 064	Paediatric and perinatal epidemiology	1998	Khan-Neelofur, D.; Gülmezoglu, M.; Villar, J.	Systematic Review	Different providers and and variable number of antenatal care visits
FTI 065	BMC pregnancy and childbirth	2009	Kidney, Elaine; Winter, Heather R.; Khan, Khalid S.; Gulmezoglu, A. Metin; Meads, Catherine A.; Deeks, Jonathan J.; Macarthur, Christine	Systematic Review and Meta-analysis	Community-level interventions to reduce maternal mortality

Appendix 4. (Continued)

FTI 066	PloS one	2015	Kikuchi, Kimiyo; Ansah, Evelyn Korkor; Okawa, Sumiyo; Enuameh, Yeetey; Yasuoka, Junko; Nanishi, Keiko; Shibanuma, Akira; Gyapong, Margaret; Owusu-Agyei, Seth; Oduro, Abraham Rexford; Asare, Gloria Quansah; Hodgson, Abraham; Jimba, Masamine; Ghana, Embrace Implementation Research Project Team	Systematic Review and Meta-analysis	Continuum of Care linkages
FTI 067	The Cochrane database of systematic reviews	2014	Kredo, Tamara; Adeniyi, Folasade B.; Bateganya, Moses; Pienaar, Elizabeth D.	Systematic Review	Task shifting from doctors to non-doctors for initiation and maintenance of antiretroviral therapy
FTI 068	The Cochrane database of systematic reviews	2013	Kredo, Tamara; Ford, Nathan; Adeniyi, Folasade B.; Garner, Paul	Systematic Review	Decentralising HIV treatment in lower- and middle-income countries
FTI 071	The Cochrane database of systematic reviews	2019	Lassi, Zohra S.; Kedzior, Sophie Ge; Bhutta, Zulfiqar A.	Systematic Review	Community health educational strategies
FTI 072	The Cochrane database of systematic reviews	2018	Laurant, Miranda; van der Biezen, Mieke; Wijers, Nancy; Watananirun, Kanokwaroon; Kontopantelis, Evangelos; van Vught, Anneke Jah	Systematic Review	Nurses as substitutes for doctors in primary care

Appendix 4. (Continued)

FTI 073	Journal of the International AIDS Society	2021	Laurenzi, Christina A.; du Toit, Stefani; Ameyan, Wole; Melendez-Torres, G. J.; Kara, Tashmira; Brand, Amanda; Chideya, Yeukai; Abrahams, Nina; Bradshaw, Melissa; Page, Daniel T.; Ford, Nathan; Sam-Agudu, Nadia A.; Mark, Daniella; Vitoria, Marco; Penazzato, Martina; Willis, Nicola; Armstrong, Alice; Skeen, Sarah	Systematic Review and Meta-analysis	Psychosocial interventions for adolescents with HIV
FTI 075	Journal of global health	2016	Lee, Siew Hwa; Nurmatov, Ulugbek B.; Nwaru, Bright I.; Mukherjee, Mome; Grant, Liz; Pagliari, Claudia	Systematic Review and Meta-Analysis	mHealth Interventions (wireless, portable Information and Communication Technologies (ICT) to support health and health care)
FTI 080	Human vaccines & immunotherapeutics	2018	Lukusa, Lungeni Auguy; Ndze, Valantine Ngum; Mbeye, Nyanyiwe Masingi; Wiysonge, Charles Shey	Systematic Review and Meta-analysis	Educating parents on the benefits and schedules of childhood vaccinations
FTI 082	Journal of acquired immune deficiency syndromes (1999)	2015	Medley, Amy; Bachanas, Pamela; Grillo, Michael; Hasen, Nina; Amanyeiwe, Ugochukwu	Systematic Review	Integrating Prevention Interventions for People Living With HIV Into Care and Treatment Programs
FTI 086	Nigerian journal of medicine : journal of the National Association of Resident Doctors of Nigeria	2014	Musa, Baba Maiyaki; Iliyasu, Zubairu; Yusuf, Shehu Muhammad; Uloko, Andy E.	Systematic Review and Meta-analysis	Provision of TB care in communities by lay health workers
FTI 087	Diabetes technology & therapeutics	2015	Mushcab, Hayat; Kernohan, W. George; Wallace, Jonathan; Martin, Suzanne	Systematic Review	Web-Based Remote Monitoring Systems for Self-Managing Type 2 Diabetes

Appendix 4. (Continued)

FTI 088	BMC health services research	2013	Mutamba, Byamah Brian; van Ginneken, Nadja; Smith Paintain, Lucy; Wandiembe, Simon; Schellenberg, David	Systematic Review	Involving lay community health workers in the prevention of mental, neurological and substance use disorders
FTI 089	Journal of the International AIDS Society	2013	Mwai, Grace W.; Mburu, Gitau; Torpey, Kwasi; Frost, Peter; Ford, Nathan; Seeley, Janet	Systematic Review	CHWs in HIV Care (patient support (counselling, home-based care, education, adherence support and livelihood support) and health service support (screening, referral and health service organization and surveillance))
FTI 091	The International journal of social psychiatry	2019	Nguyen, Trang; Holton, Sara; Tran, Thach; Fisher, Jane	Systematic Review	Mental health interventions delivered by informal community care providers (ICCP included teachers, traditional healers, police, lay health workers, paraprofessionals level 1, lay people, peers, self-help groups, and caregivers)
FTI 093	BMJ open	2014	Ogedegbe, Gbenga; Gyamfi, Joyce; Plange-Rhule, Jacob; Surkis, Alisa; Rosenthal, Diana Margot; Airhihenbuwa, Collins; Iwelunmor, Juliet; Cooper, Richard	Systematic Review	task-shifting strategy in the management of CVD
FTI 094	The Cochrane database of systematic reviews	2021	Oliphant, Nicholas P.; Manda, Samuel; Daniels, Karen; Odendaal, Willem A.; Besada, Donela; Kinney, Mary; White Johansson, Emily; Doherty, Tanya	Systematic Review (intervention Review)	Integrated community case management (iCCM) for childhood illnesses
FTI 097	The Cochrane database of systematic reviews	2021	Melissa J Palmer, Kazuyo Machiyama, Susannah Woodd, Anasztazia Gubijev, Sharmani Barnard, Sophie Russell, Pablo Perel, Caroline Free	Systematic Review	Mhealth interventions to improve adherence to medication in adults with CVD

Appendix 4. (Continued)

FTI 098	The Cochrane database of systematic reviews	2020	Palmer, Melissa J.; Henschke, Nicholas; Bergman, Hanna; Villanueva, Gemma; Maayan, Nicola; Tamrat, Tigest; Mehl, Garrett L.; Glenton, Claire; Lewin, Simon; Fonhus, Marita S.; Free, Caroline	Systematic Review	Targeted client communication (TCC) via mobile devices (MD)
FTI 102	Bulletin of the World Health Organization	2013	Rahman, Atif; Fisher, Jane; Bower, Peter; Luchters, Stanley; Tran, Thach; Yasamy, M. Taghi; Saxena, Shekhar; Waheed, Waquas	Systematic Review and Meta-analysis	Supervised, non-specialist health and community workers delivering mental health care
FTI 105	BMJ open	2021	Rohwer, Anke; Uwimana Nicol, Jeannine; Toews, Ingrid; Young, Taryn; Bavuma, Charlotte M.; Meerpohl, Joerg	Systematic Review and Meta-analysis	Integrated models of care for people with multimorbidity (Fully integrated care is seen as a 'one-stop-shop' model whereby a patient receives all necessary care or services under one roof by one or more healthcare professionals)
FTI 106	PloS one	2019	Rose-Clarke, Kelly; Bentley, Abigail; Marston, Cicely; Prost, Audrey	Systematic Review	Peer-facilitated community-based interventions for adolescent
FTI 107	Aging clinical and experimental research	2021	Saito, Takashi; Izawa, Kazuhiro P.	Systematic Review	Home-based telerehabilitation for the elderly
FTI 108	BMC public health	2015	Sarkar, Archana; Chandra-Mouli, Venkatraman; Jain, Kushal; Behera, Jagannath; Mishra, Surendra Kumar; Mehra, Sunil	Systematic Review	The interventions were on:(i) pregnancy care (antenatal, birth and postnatal),contraception/family planning and abortion care,and (ii) delivered by community/frontline workers,volunteers, paramedics and health workers.

Appendix 4. (Continued)

FTI 109	PloS one	2019	Schmitz, Kathrin; Basera, Tariro Jayson; Egbujie, Bonaventure; Mistri, Preethi; Naidoo, Nireshni; Mapanga, Witness; Goudge, Jane; Mbule, Majorie; Burtt, Fiona; Scheepers, Esca; Igumbor, Jude	Scoping Review	Lay health worker HIV programs
FTI 112	Studies in family planning	2015	Scott, Valerie K.; Gottschalk, Lindsey B.; Wright, Kelsey Q.; Twose, Claire; Bohren, Meghan A.; Schmitt, Megan E.; Ortayli, Nuriye	Systematic Review	CHW providing family planning services (. Community health workers were defined in this review as those who provided outreach health care services but who lacked extensive medical training (nurses, midwives, and traditional birth attendants)
FTI 115	International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics	2014	Sonalkar, Sarita; Mody, Sheila; Gaffield, Mary E.	Systematic Review	Outreach and integration programs to promote family planning in the extended postpartum period
FTI 116	PloS one	2016	Sondaal, Stephanie Felicie Victoria; Browne, Joyce Linda; Amoakoh-Coleman, Mary; Borgstein, Alexander; Miltenburg, Andrea Solnes; Verwijs, Mirjam; Klipstein-Grobusch, Kerstin	Systematic Review	mHealth Interventions for Maternal and Newborn Health
FTI 118	The Cochrane database of systematic reviews	2019	Steed, Liz; Sohanpal, Ratna; Todd, Adam; Madurasinghe, Vichithranie W.; Rivas, Carol; Edwards, Elizabeth A.; Summerbell, Carolyn D.; Taylor, Stephanie Jc; Walton, R. T.	Systematic Review	Health-promotion interventions in the community pharmacy (Mostinterventions were educational orincorporated skills training)

Appendix 4. (Continued)

FTI 120	Journal of advanced nursing	2020	Tan, See M.; Han, Emeline; Quek, Rina Yu Chin; Singh, Shweta R.; Gea-Sanchez, Montserrat; Legido-Quigley, Helena	Systematic Review	Community nursing interventions focusing on individuals with CVD risk
FTI 121	Health technology assessment (Winchester, England)	2012	Tappenden, P.; Campbell, F.; Rawdin, A.; Wong, R.; Kalita, N.	Systematic Review	Home-based, nurse-led health promotion for older people
FTI 123	The international journal of tuberculosis and lung disease: the official journal of the International Union against Tuberculosis and Lung Disease	2014	Tian, J. H.; Lu, Z. X.; Bachmann, M. O.; Song, F. J.	Systematic Review	Directly observed treatment of tuberculosis
FTI 124	BMC pregnancy and childbirth	2019	Tiruneh, Gizachew Tadele; Shiferaw, Chalachew Bekele; Worku, Alemayehu	Systematic Review and Meta-analysis	Home-based postpartum care
FTI 127	The Cochrane database of systematic reviews	2016	Weeks, Greg; George, Johnson; Maclure, Katie; Stewart, Derek	Systematic Review	Non-medical prescribing versus medical prescribing for acute and chronic disease management

Appendix 5. PC-SDR Matrix

Health need(s) group	Care continuum stage	Activity	Degree of procedure standardization	Complexity degree	Delivery arrengements						Implementation considerations				Context			
					Right provider(s)	Right place(s)	Right timing	Individual / Group care	Right ICT support	Right coordination and management	Right dose	Training	Right support / supervision	Right team	Low income		Middle income	
															Rural	Urban	Rural	Urban
Type II diabetes / hypertension / other NCDs	Screening	Active outreach	High	Low	LHWs	Home, community		Individual										
	Diagnosis	Diagnosis algorithm reliability	High	Low	Nurses, physicians	Facility-based		Individual				be specifically	other providers			X	X	X
	Treatment Initiation	TI according to guidelines	Moderate	Moderate	Nurses, physicians	Clinic-based		Individual				be specifically	other providers			X	X	X
	Follow-up	Follow-up-according to guidelines	Moderate	Moderate	Nurses, Physicians	Clinic-based		Group mixed with individual	Telemedicine mixed with in-person			be specifically trained for	other providers for other needs					
		Adherence support	High	Low	LHWs	Home, community				clinic care								
Common mental health disorders	Screening	Outreach / prevention services	Moderate	Moderate	LHWs	Home, community, clinic				other caregivers		lest a month			X	X	X	X
	Treatment Initiation	Brief psychotherapy and psychosocial services	Moderate	Moderate	LHWs, Peers	Home, community, clinic		Individual and		Coordinated with other caregivers		specific psychotherapy	professional providers	As a part of a team	nce for:	X	X	X
		Psychotherapy	Moderate	Moderate	LHWs, Peers	Home, community, clinic		Individual		other caregivers		training for at	professional			X	X	X
	Follow-up	Adherence support	Moderate	Low	LHWs, Peers	Home, community, clinic		Individual		other caregivers		training for at	professional			X	X	X
		Psychosocial support	Moderate	Moderate	LHWs, Peers	Home, community, clinic		Group and Individual		other caregivers		training for at	professional			X	X	X
		Social Inclusion	Moderate	Moderate	LHWs, Peers	Home, community, clinic		Group and Individual		other caregivers		training for at	professional			X	X	X
HIV / Tuberculosis	Diagnosis	DOTS	High	Low	LHWs, nurses	Home, community	As early as possible	Individual							X		X	
		HIV TI according to guidelines	Moderate	Moderate	Nurses													
	Treatment Initiation	DOTS	High	Low	LHWs, nurses	Home, community	As early as possible	Individual							X		X	
	Follow-up	Substitution of some in-clinic visits with home visits	Moderate	Low	LHWs	Home, community	At least every 3 to 6 months	Individual care		Coordinated with in-clinic care			Supported by specialists or professionals	Coordinated with in-clinic care by profession				
		Adherence support	High	Low	LHWs	Home, community				clinic care								
		Psychosocial support	Moderate	Moderate	LHWs													
Malaria / Child pneumonia / Other acute infectious disorders	Screening	Active outreach	High	Low	LHWs	Home, community	Early start of symptoms	Individual	instruments	clinic		specific	supervision		X	X		
	Diagnosis	Active outreach	High	Low	LHWs	Home, community	Early start of symptoms	Individual	instruments	clinic			supervision		X	X		
	Treatment Initiation	Active outreach	High	Low	LHWs	Home, community	Early start of symptoms	Individual	instruments	clinic			supervision		X	X		
	Follow-up	Active outreach	High	Low	LHWs	Home, community	Early start of symptoms	Individual	instruments	there is no			supervision		X	X		
Maternal and Newborn health	Family planning	contraceptives	High	Low	LHWs	Home												
		Group education	Moderate	Moderate	LHWs, nurses	Community, clinic	After delivery	Group care		clinic services			staff in-charge in		X	X	X	X
	Antenatal Care	Group-based educational strategies	Moderate	Moderate	Peers, LHWs	Community	since pregnancy	Group care		the main provider of					X	X	X	X
		Follow-up support	High	Low	LHWs	Home, community												
	Postnatal care	Post-delivery follow-up	High	Low	LHWs	Home, community				antenatal and					X		X	
		Breastfeeding counseling	Moderate	Low	counselors	Home, community				antenatal and					X	X	X	
		Peer Support for perinatal depression	Moderate	Moderate	Peers	Home, community	Before and after delivery	No difference between individual or group based care	In-person or in-person, not combined		At least once a week				X	X	X	
		Post-partum family planning support	High	Low	LHWs	Home	delivery	Individual							X		X	