Community Health Transformation:

Paths to a comprehensive and transformative community-based health system to enhance maternal, newborn, and child health equity and health system resilience in rural Ethiopia.

Akalewold Tadesse Gebremeskel

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School of International Development and Global Studies, Faculty of Social Sciences,

University of Ottawa

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Abbreviations

CASP: Critical Appraisal Skills Program
CE: Community Engagement
CHW: Community Health Work
CHCT: Community Health Coproduction and Transformation framework
CBHS: Community Based Health System
CSO: Civil Society Organization
CHW: Community Health Worker
CPHC: Comprehensive Primary Health Care
CSF: Critical Success Factor
FGD: Focus Group Discussion
FMOH/MoH: Federal Ministry of Health
GDP: Gross Domestic Product
HEWs: Health Extension Workers
HP: Health Post
HSTP: Health Sector Transformation Plan
IDI: In-depth interviews
KII: Key Informant in-depth Interview
MCH**:** Maternal and Child Health
LMICs: Low- and Middle-Income Countries
MMR: Maternal Mortality Rate
MNCH: Maternal Newborn and Child Health
MDG: Millennium Development Goal
ODA: Official Development Assistance
CPHC: Comprehensive Primary Health Care
PRISMA-P: Preferred Reporting Items for Systematic Review and Meta-analysis Protocols
RMNCH -Reproductive and Maternal Newborn and Child Health
PROSPERO: International Prospective Register of Systematic Reviews
SDGs: Sustainable Development Goals
UN: United Nations
U5MR: Under Five Mortality Rate
WHO: World Health Organization

Abstract

Background: In low- and middle-income countries (LMICs) including countries in sub-Saharan Africa (SSA), maternal, newborn, and child health (MNCH) has been a major public health problem, and this has become a key development challenge in the region and persists as an important agenda of the Sustainable Development Goals (SDGs). Over the last four decades, in LMICs community health worker (CHW) programs have been emphasized as a major strategy in promoting primary healthcare access and improving health outcomes, including MNCH in Ethiopia. Despite the contribution of the program to improve MNCH, SSA countries including Ethiopia continue to have the highest child and maternal mortality occurrences in the world. To achieve the SDGs, Ethiopia must reduce neonatal deaths from 29 to 12 per 1000 live births and maternal deaths from 412 to 70 per 100,000 live births in unreliable health system environments and with increasingly constrained health resources. In Ethiopia, the CHW-based health program continues to operate without the transformational capacity to comprehensively respond to persisting preventable and treatable MNCH challenges. The COVID-19 pandemic has amplified the problem. Evidence is limited in multiple areas to address MNCH inequity and health outcomes to scale up the best practice and to transform the CHW program to contribute to a resilient community health system in Ethiopia. The main goal of this study is to gather and analyze evidence on paths to comprehensive, equitable and transformative community-based health systems (CBHS) to enhance MNCH equity and outcomes in Ethiopia and beyond.

Methods: My thesis is a multi-phase study comprising of a systematic review and qualitative case study including Focus Group Discussions (FGD), Key Informant Interviews (KII) and document review on CHW-led MNCH program in rural Ethiopia. My data sources are two FGDs with CHWs, twelve key KII with multilevel public health policy actors, and a policy document review related to the CHW program. I conducted a thematic analysis of the systematic review and qualitative data. My study is informed by multiple theoretical frameworks including the socioecological framework, the World Health Organization's Health system framework, the state–society synergy framework, and the Multiple Streams Framework (MSF).

Findings: My thesis is article-based, in keeping with the requirements of a manuscript-based PhD thesis, comprising systematic review and qualitative case studies. Results are being published and

under review. The first two thesis papers, the systematic review and the protocol, examine the perceived barriers to and facilitators of the effectiveness of CHWs to ensure MNCH equity and a resilient community health system in SSA. The third thesis paper is based on qualitative data and examines the multilevel challenges of Ethiopia's CHWs program to deliver optimum MNCH and build a resilient community health system. The fourth thesis paper examines the critical success factors (CSFs) in developing a transformative resilient community-based health system in rural Ethiopia using COVID-19 as a policy window. Finally, the fifth thesis paper examines how multi-stakeholder engagement contributes to the co-production of optimized MNCH outcomes and a resilient community health system in rural Ethiopia.

Discussion and Implications:

In Ethiopia over the last three decades a nation-wide CHW-based program has been emphasized as an efficient, effective, and equitable strategy to address the broad ambition of primary health promotion and disease prevention for a largely rural population. However, as Ethiopia continues to have the highest child and maternal mortality occurrences in the world, the program continues to experience multiple challenges. My thesis finding emphasized the gap between the macro (national) level CHWs program and the challenge during implementation at the micro (district) level. This calls for the need to sustain opportunities and address the gaps in the CHWs program and for a paradigm shift for comprehensive, equitable and transformative CBHS.

Moving beyond the program's successes and failures over the last three decades, Ethiopia's CHW program needs a paradigm shift guided by community health co-production and transformation framework (CHCT) to ensure comprehensive, equitable and resilient CBHS. Areas that need transformational change include: Building on the existing enabling and CSF by focusing on fragmentation of the health system; Ensuring sustainability, alignment and continuum of macro-level to micro level multi-stakeholder engagement in the HEP optimization plan; Enhancing the resource alignment for results; Prioritizing the work and living condition of CHWs; Moving beyond the WHO's incomplete health system framework "one size fits all" to agile CHCT and a multidimensional framework; Enabling a powershift to enhance an embedded multipronged co-production approach to ensure comprehensive, equitable and resilient community health; Building an embedded health system resilience management system and health system change management;

Emphasizing an approach beyond donor dependency, with practical alternatives such as domestic resource generation and mobilization with an appropriate management system; Integrating a gender transformative approach in primary health (social and structural level); Strengthening health diplomacy; Context based health goal setting and prioritization (national and sub national). Research: Rural CBHS building and infrastructure; Participatory action research (PAR) with CHWs and community; private sector engagement in CBHS; Task shifting in low infrastructure setting; multidisciplinary community health approach; moving from the renovation of vertical and selective primary healthcare prevention approaches to logistically and technically well-organized comprehensive and multi-dimensional CHCT framework for comprehensive, equitable and transformative CBHS.

Conclusion: Building on the last four decades, the Ethiopian community health program needs transformation towards a comprehensive and transformative resilient CBHS to enhance MNCH equity using a CHCT framework. Closing the health equity gap in LMIC countries including Ethiopia, it is critical to ensure comprehensive equitable and transformative resilient CBHS. To ensure universal health coverage, promote health equity and achieve global health goals including SDG #3, beyond the current context of the highest MMR and Under Five Mortality Rate (U5MR) situation, the Ethiopian government must: Build comprehensive, equitable and transformative resilience by identifying and aiming to address the deep structures that cause or increase vulnerability and risk CBHs; Meaningfully engage multiple stakeholders at multiple levels in the co-production of knowledge and structures necessary for health system transformation; Enhance a synergetic approach by enabling the powershift essential for effective co-production; Utilize an integrated theoretical approach to address the multidimensional issues influencing community health transformation; Integrate a gender transformative approach in the primary health system (social and health system level); Strengthen digital technology for the community health programming; Invest in rural health infrastructure, including the working and living condition of rural CHWs.

Key terms: Community Health Transformation; health system; maternal, community health workers; Maternal newborn, and child health (MNCH) health equity; socio ecological factors; fragmentation; synergy; multi-stakeholder; resilient health system; the critical success factors (CSFs); community health co-production and transformation framework (CHCT); multipronged co-production approach; change

management; systematic review; qualitative case study; low- and middle-income countries (LMICs);sub-Saharan Africa (SSA);Ethiopia.

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Dedication

In memory of my father and to my mother with love and eternal appreciation.

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Chapter One: Introduction

1.1. Overview

In Low- and Middle-Income Countries including countries in sub-Saharan Africa (SSA) Maternal, Newborn and Child Health (MNCH) has been a major public health problem. This has become a key development challenge in the region and persists as an important agenda of the Sustainable Development Goals (SDGs). MNCH issues have been an essential part of global health initiatives since the World Health Organization (WHO) constitution entered into force in 1948, with one of its functions being 'to promote maternal and child health and welfare' (Moller et al., 2017). In the last four decades multilevel initiatives were targeted to reduce the maternal mortality rate, the infant mortality rate (IMR) and Under Five Mortality Rate (U5MR). These include the International Conference on Primary Health Care, 'the Alma-Ata Declaration' by the WHO in 1987; the Safe Motherhood Conference in Nairobi, Kenya in 1987; the World Summit for Children in New York City in 1990; and the International Conference on Population and Development in Cairo, Egypt in 1994, which labeled MNCH as basic and essential primary health care. Further, goals and targets to address MNCH issues were developed during this era of global development goals - namely the Millennium Development Goals (1990 to 2015) and the Sustainable Development Goals (2016-2030) (UN, 2015), with MNCH among the first top five goals. Despite persisting inequities, during this period there has been an improvement in reducing the global maternal mortality ratio (MMR) and U5MR from 2000 to 2020.

Despite national and international level efforts and improvements in terms of MNCH outcomes, a significant gap exists between countries and within countries, with equitable access to MNCH services rarely achieved. For instance, the Ethiopian U5MR stands at 67 deaths per 1,000 children and MMR stands at 412 per 100,000 live births (USAID,2020). Thus, to achieve the SDGs, Ethiopia must reduce neonatal deaths from 29 to 12 per 1000 live births, the U5MR to as low as 25 deaths per 1000 live births and maternal deaths to 70 per 100,000 live births in an unreliable health system with increasingly constrained health resources. This is one of the most daunting and urgent challenges facing Ethiopia, as it seeks to 'leave no one behind', affirmed by

its global commitment to achieving the development needs of its people by addressing avoidable disparities (UN, 2015).

Starting in the 1960s, CHW-based programs became a new approach to primary healthcare access and service delivery, including MNCH, in many LMICs. Health systems in LMICs countries, including SSA countries, remain unreliable and nonresilient in responding to persistent public health issues, including MNCH outcome inequalities and inequality, changing disease burdens, population growth, and demand for better healthcare services (Ayanore et al., 2019; Strasser et al., 2016). The first CHW program was recognized in China, the Farmer Scholars, later called Barefoot Doctors. They were farmers trained to take vital statistics, deliver vaccines, provide first aid, and promote basic health literacy. Gradually, the promising contribution of CHWs was recognized at the Declaration of Alma-Ata in 1978. The Declaration explicitly defined CHWs as a key resource and important providers of primary health services for underserved areas because they help to fill the shortage of primary healthcare service providers at the community level (Perry et al., 2014).

In Ethiopia the policy and practice of the CHW program dates to the Alma-Ata Conference. It introduced CHWs, the Health Extension Program (HEP), in 2003 (Teklehaimanot & Teklehaimanot, 2013) through the top-down approach to enhance disease prevention, promote health and connect the community to the formal healthcare system. The promising outcomes of this approach, including MNCH services, is noticeable in many countries, such as Brazil, Bangladesh, and Nepal, who have effectively executed CHW-led programs (Cometto et al., 2018; Hogan et al., 2010; Moller et al., 2017b; Perry et al., 2014). However, over time, given the increasing demand, emphasis on, and contribution of the CHWs, the promising program continued without a significant paradigm shift towards Comprehensive Primary Health Care (CPHC), lacking a system-strengthening approach. CPHC is characterized by multidisciplinary teamwork, a social understanding of health, meaningful community and multi-stakeholder engagement in management, advocacy for policy changes to address the social determinants of health, and services that cover rehabilitation, treatment, prevention and promotion (Labonte et al., 2017).

Although efforts and debates continue regarding how to achieve a reduction in adverse MNCH outcomes in this era of the SDGs, evidence is limited in multiple areas. In Ethiopia, the CHW-based health program continues to operate without the transformational capacity to comprehensively respond to persisting preventable and treatable MNCH challenges. The COVID-19 pandemic highlighted the importance of a transformed community-based health system. More evidence is required in order to scale-up best practice and transform the CHW program to ensure MNCH equity and a resilient community health system in Ethiopia. Areas where there is limited evidence include: changing the paradigm in community-based health systems; lack of a multi-stakeholder approach towards co-production; lack of multilevel determinates of CHW effectiveness; and lack of critical success factors (CSFs) in developing a transformative resilient community-based health system.

1.2. Dissertation organization

The main goal of this study is to gather and analyze evidence on paths to comprehensive, equitable and transformative community-based health systems (CBHS) to enhance MNCH equity and outcomes in Ethiopia and beyond.

The thesis is organized in seven chapters. Chapter #1, the introduction section, highlights the overall context of the thesis and gives an overview of the thesis organization; Chapter #2, a literature review, outlines what is already known on this topic, where there is an evidence gap; the rationale for this study; research goal, question, and objective; Chapter #3, theoretical framework; Chapter #4, research methods and materials, with this thesis based on a multi-phase research design comprising of a systematic review, an embedded multiple case study using FGD, KII and document review; Chapter #5, thesis result section, is organized as five standalone articles (#5.1, #5.2, #5.3, #5.4 and #5.5) in keeping with the requirement of the proposed manuscript-based PhD thesis; Chapter #6, integrated discussion section and Chapter #7, overall conclusion.

Articles #5.1, #5.2 and # 5.3 are already published in peer reviewed journals and articles #5.4 and #5.5 have been submitted to peer reviewed journals for publication and are currently under review.

Article#5.1: Determinants of CHWs' effectiveness in delivery of maternal and child health in sub-Saharan Africa: A systematic review protocol. The objective of this protocol is to outline the methodological process of a systematic review that will gather qualitative data to examine determinants of community health workers effectiveness for delivery of maternal and child health in sub-Saharan Africa.

Article #5.2: CHWs are increasingly being acknowledged as crucial members of the healthcare workforce in improving MNCH. However, evidence on multilevel determinants of an effective CHWs program using CHWs' perspectives is limited.

Article #5.3: In Ethiopia, the CHWs program has been an extended arm of Ethiopia's primary health system and has contributed to improved health outcomes, however, the program has been facing unique systemic challenges that stem from its fragmentation. Thus article #3 unpacks the challenges of fragmentation in community-based MNCH and health systems in rural Ethiopia.

Article #5.4: In Ethiopia, health system emergencies and shocks continue to underscore the need for a more resilient health system for equitable MNCH and other health outcomes. The program is continuing without developing the capacity to meaningfully respond to persistent preventable and treatable MNCH challenges. This paper examines critical success factors in developing a resilient community-based health system in rural Ethiopia to achieve better MNCH outcomes. We ask what critical success factors are considered in developing a transformative resilient community-based health system in rural Ethiopia.

Article #5.5: Further, despite the rhetoric around the significance of multi-stakeholder engagement as a buzzword in development theories and health policies, there is limited evidence on how multiple stakeholders intersect and mutually reinforce each other toward the co-production of improved MNCH outcomes and a resilient community health system. This article aims to examine barriers to and facilitators of co-production in the context of multi-stakeholder engagement to optimize MNCH outcomes and a resilient community health system in rural Ethiopia.

Chapter #6: Integrated discussion and implication section provides an overall summary of the key findings from each article, main points of integrated discussion, strengths and limitations, and implications of the dissertation.

Chapter Two: Review of literature

2.1. Political economy of health and health system in Ethiopia

Ethiopia is one of the most populous countries in Africa with 123 million inhabitants, which is second only to Nigeria. The World Bank classifies Ethiopia as a low-income country, but it is also one of the fastest growing economies in SSA (World Bank,2023). It still has a largely rural population; 79 percent of the population lives in rural areas, and 12–14% of the total population are pastoralists or agro-pastoralists (CSA,2020). Since the adoption of the 1994 ethno-linguistic based constitution, the government of Ethiopia is structured in the form of a federal system of government. As of August 2023, the country is administratively divided into twelve ethno-linguistic based regional states (provinces) and two chartered cities that are administered separately from states. These reginal states include Afar, Amhara, Benishangul-Gumuz, Central Ethiopia region, Gambella, Harari, Oromia, Sidama, Somali, Southwestern Ethiopia, South Ethiopia and Tigray, and two chartered cities (Addis Ababa and Dire Dawa). This study will be conducted in Oromia regional state, which is the largest of the twelve Ethiopian states, both in terms of population and landmass (Zerai, 2019).

The majority of the Ethiopian population (79 percent of the country's population) live in rural areas and base their livelihoods on subsistence agriculture. With limited technological advancement and a fragmented CHW program, they have limited access to a reliable health care system. The health system for this largely rural population is part of a complex political economy, like in many other LMICs. Disparities in MNCH outcomes continue to exist between rural and urban residents, and among different regions of Ethiopia (Gebre et al., 2018). There are wide gaps and inequality in the availability and utilization of MNCH services in rural and urban areas of the country (Woldemichael et al., 2019). The deprived areas and disadvantaged communities have difficulties in accessing means of prevention and adequate MNCH service due to reasons including

weak health systems and fragile logistics (Woldemichael et al.,2019). The most disadvantaged women are the poor, rural residents, who have no formal education, are unemployed, and with low access to information (Gebre et al., 2018; Woldemichael et al., 2019).

Ethiopia has a top-down decentralized model for the delivery of healthcare along political structures, with shared government responsibilities between the Federal Ministry of Health (MoH), the regional health bureaus, zonal health offices, and *woreda* (district) health offices. The health sector is structured into a three-tier system: tertiary care, provided at specialized hospitals; secondary care, provided at general hospitals with inpatient and ambulatory services; and primary healthcare (primary hospitals, health centers and Health Post [HP] service centers) (Wang et al., 2016). Each primary healthcare unit serves approximately 25,000 people. The CHW/HEP program is the component of the primary health system at the community level that reaches the rural majority communities. (Teklehaimanot & Teklehaimanot,2013; Croke,2020). Two female CHWs/ HEWs (agrarian area) are assigned to one HP service center to serve a population ranging from 3000 to 5000 in a village (kebele). CHWs are recruited from the community if they are high school graduates (10th grade), over the age of 18, with local language skills and a willingness to remain in the village to serve the community. Following their recruitment, CHWs attend pre-service training of 12 months duration, which includes practical placements in health centres on the health extension package offering the package of services they deliver to the community. CHWs are part of the formal primary health system and are salaried government employee. The nearby health center is responsible to support and supervise five HP (Assefa, et al.,2019). Currently, in Ethiopia CHWs and health posts are almost universally available in every village/kebele (MER (2020). Besides health promotion, CHWs are expected to recruit and train community networks, called health development armies (HDA)/model families, to train their peers, to support community outreach, health promotion and disease prevention (MER (2020).

Ethiopia has a mixed health delivery system, which was 73% public and 27% private in 2016/17 (MoH, GFF &WB, 2019). In Ethiopia the public and private sectors provide health service across all levels of healthcare, ranging from primary to secondary to tertiary level. The private health sector ranges from for-profit business oriented to non-government and CSO-supported health

facilities. In Ethiopia the CHWs program is part of government's primary health program and designed to provide basic health services free of charge, with the engagement of private sector limited (MoH, GFF &WB, 2019).

In Ethiopia, in the last three decades, there has been a significant increase in health service expansion due to the introduction of the CHW program, however, the increase in the quantity of health care has not been able to keep up with the already established and increasing demand, resulting in disappointing health outcomes, including MNCH. The health system has overwhelmingly failed to address the quantity and quality of health workers required, with an under-resourced health system, poor infrastructural development, and social determinates of health (WHO,2017; MERQ ,2020). Between 1995 and 2015 the country successfully completed the first 20-year health sector development program (HSDP) in four phases (with each phase five years). In 2015, the government introduced its second 20-year strategy, the health sector transformation plan, focusing on primary health care and aligning with SDG #3 (MoH,2015; MoH,2016; Croke,2020). Despite the challenges, Ethiopia aspires to achieve UHC by 2035 (MoH,2015; MoH,2016). Recent evidence shows that within Ethiopia, key health outcome indicators are improving over time (Misganaw, et al, 2022).

Even though health spending is increasing, Ethiopia is one of several countries in Africa which falls below international health expenditure benchmarks, with the government's contribution still far from the Abuja commitment of 15% (MoH,2019). The health expenditure of Ethiopia as a percentage of its GDP increased from 3.2% at the beginning of the HSDP in 1997 to 8.7% at its completion in 2015/16 (Teshome & Hoebink,2018; UNICEF Ethiopia,2017). Despite increased health spending, Ethiopia's health sector has been heavily dependent on external funding and characterized by high aid fragmentation (WHO,2017; Tadesse et al.,2021). The sector is financed by multiple sources including loans and donations from all over the world (46.8%), domestic resource mobilization (16.5%), out-of-pocket payments (35.8%), and others (private insurance) (0.9%) (WHO,2017; Teshome & Hoebink, 2018). Between 2000 and 2016, government expenditure for health has increased more than threefold, from 2.2 to 7.6 US dollars (USD) per capita (MoH,2019). Since 2011, the country's health plan has been guided by 'One plan - One budget - One report' devised by International Health Partnership Plus (IHP+) - since 2016 the UHC 2030. This is an approach intended to underpin the process of harmonization and alignment

in the health sector to provide coordinated, effective efforts and predictable funding in support of results-oriented national plans and health system strengthening (Waddington et al.,2012; IHP+ Results,2015; Teshome & Hoebink,2018). Ethiopia has implemented the community-based health insurance (CBHI) scheme since 2011 to provide financial protection against the costs of health care and expand access to health-care services to the informal sectors and rural residents (Zemene et al., 2020).

Evidence suggests that the Ethiopian health system is in a fragile state. Based on WHO evidence, fragility characteristics of the Ethiopian health system include a shortage, high turnover and lack of motivation of health workers; inequitable distribution of the health workforce across urban and rural areas; and limited supplies (lack of medical equipment and medicine, and deficient supply chain management and quality assurance) (WHO,2017; MERQ,2020). WHO (2015) estimates that a health workforce density of around 4.45 health workers per 1000 population corresponds to the median level of health workforce density among countries that have achieved, or have come close to achieving, UHC. The per capita health spending is still low, at 28.65 USD, with more than one-third of the total spending coming from development assistance and another third of the spending coming from out-of-pocket expenditure (MoH,2017).

Ethiopia's health sector has been heavily dependent on external funding and characterized by high aid fragmentation. Over the last four decades, government support has been reduced, as LMIC countries were forced to embrace free market reforms and to reduce their public sector financing, which included large-scale CHW programs/health services. Given Ethiopia's donor dependent health system, the poor MNCH outcome and fragile community health system could be connected to a lack of synergy among stakeholders to build an equitable and a resilient health system. Often the ongoing attempt to solve symptoms/palliative care focuses on deliverables and short term MNCH outcomes rather than fixing the source of the problem, deep-rooted institutional barriers, which must be addressed in order to transform the health system and ensure its resilience.

Further, the weak health system could be associated with the fragmentation of funding organizations' responses to emerging health challenges, with these responses being donor-

ideology driven or short-term results-oriented, an absence of coordination and lack of capacity building on innovation and technology transfers (Doyle & Patel,2008; Spicer et al.,2020; Lisk & Sehovic,2020). I argue that the existing top-down selective community health intervention model is based on ideologically driven (neoliberal) donors/international financial organizations, with limited stakeholders' empowerment and lack of a context specific CBHS framework focusing on multilevel and micro level determinants of health system effectiveness.

2.2.The status of MNCH and CHWs program in Ethiopia

In Ethiopia the policy and practice of the CHW program dates back to the Alma-Ata Declaration organized by the WHO in 1978. According to the Alma-Ata Declaration, CHWs are members of the communities in which they work, who should be selected by the communities, be supported by the health systems and have shorter training to prevent disease and promote health (Perry et al., 2014). They are more accessible and they provide the platform that ensures health education and promotion in an equitable manner (Javanparast et al., 2018;Perry et al.,2014). This is because they are well positioned to connect grass-roots communities to the formal health systems, thereby making health systems more people-centered to promote, prevent, detect and respond to primary health needs including MNCH (Javanparast et al.,2018;Oliver et al.,2015). Hence, Ethiopia started to focus on community health programs/CHWs as an extension of the health system to community level as an ambitious plan to improve access of primary education such as MNCH in 2003 (Teklehaimanot & Teklehaimanot, 2013). This is because, most importantly, the CHWs/Health Extension Program (HEP) was considered as a key resource to enhance MNCH equity and provide basic health education and health promotion for people in underserved rural areas.

However, since the introduction of the program in Ethiopia, there is mixed evidence about the CHW program and MNCH outcomes. On one hand, since the introduction of the program, the country has been making progress in reducing the U5MR and MMR through its CHWs/HEWs program. Ethiopia achieved a 67% reduction in U5MR and a 71% decline in MMR by the end of MDGs, in 2015 (Assefa et al.,2017). On the other hand, despite the health program focus on primary health, including the CHW program to improve MNCH, the outcomes are still disappointing. Ethiopia's U5MR stands at 67 deaths per 1,000 children and MMR stands at 412

per 100,000 live births (USAID,2020). This makes Ethiopia and other SSA countries riskier for maternal and under-five child death occurrences than in all other regions in the world. Despite the progress that has been made, an MMR of 412 per 100,000 live births and U5MR of 67 per 1,000 are still too high. The achievements have not ensured sustainable MNCH equity and resilient community health system equity. The CHW program is run by CHWs who are situated at the lower levels of the hierarchy of health and in precarious working conditions (MERQ,2020).While in Ethiopia CHWs and health posts are almost universally available in every villages/kebele, most of the available HPs do not meet standards of infrastructure and physical facilities, and the majority of health posts do not have access to basic utilities including water and electricity (MER (2020).

Despite the multiple efforts, in rural Ethiopia mothers, children and newborns are at greatest risk because of lack of access to basic, life-saving health care including MNCH (Amref,2020). Based on the Ethiopian Demographic and Health Survey in 2019, there is a fragmentation in MNCH outcomes. Despite the progress that has been made, Ethiopia has a large burden of communicable diseases and still has an MMR of 412 per 100,000 live births and U5MR of 67 per 1,000 (MoH,2020). For example, while a higher proportion (74%) of mothers received the first session of antenatal care (ANC), only 43% received the recommended four or more ANC sessions. Also, Skilled Birth Attendance (SBA) during childbirth is 48%; Postnatal Care(PNC) is at 34% of women aged 15-49 (MoH 2016.; MoH, 2021). In 2019, U5MR across regions varied widely, ranging from 14.8 (12.4–17.8) in Addis Ababa to 62.9 (53.6–74.9) in Benishangul-Gumuz (Tessema et al., 2019).

2.3. The status of MNCH and health system in SSA

In order to meet the targets of the SDGs, there is a critical need for health systems in sub -Saharan Africa (SSA) to be reinforced and optimized (Kruk et al., 2018). The reason for this is to respond to the unacceptable MNCH outcomes, ensure a resilient community health response (Kruk et al., 2018) in the face of COVID-19 pandemic and achieve SDG #3, which seeks to ensure “healthy lives and to promote the wellbeing of all at all ages” (UN,2015, p.14).

Since the Alma-Ata Declaration of 1978, the promising outcomes of CHWs in providing equitable MNCH services are noticeable in SSA and internationally (Perry & Hodgins, 2021). Despite it still being very high, MMR was reduced by 38 percent and U5MR by 58 percent between 1990 and 2017 (WHO, 2015; UN,2018); Unfortunately the reduction is not closing the gap between and within countries, as countries in SSA continue to disproportionately bear the highest MMR and U5MR.

However, despite the progress and health program focus on the CHWs program to improve MNCH, SSA countries continue to have the highest MMR and U5MR occurrences in the world and this has become a key health system challenge in the region and persists as an important agenda of the SDGs (WHO,2015; Yaya & Ghose,2019). In SSA the utilization of maternal health related services was lower than other regions of the world (Yaya & Ghose, 2019). Big gaps exist between the poorest and richest households, as well as between rural and urban areas (Assefa et al.,2017; Yaya & Ghose, 2019). In 2018 about 76 children under the age of five died per 1000 live births (WHO,2018) and are more than 15 times more likely to die before the age of five than children in high-income countries (UNICEF, n.d.). Similarly, out of the global estimate of 5.42 million children who died before their fifth birthday in 2017, SSA recorded 2.8 million, representing over 51% (UNICEF, 2018). In 2017 women who died from complications of pregnancy and childbirth accounted for nearly two-thirds of approximately 196,000 of maternal deaths (UN,2015). The lifetime risk of women dying due to pregnancy-related causes as of 2017 was about 1 in 38 in SSA compared to 1 in 240 in South Asia and 1 in 4,300 in Europe and Central Asia (WHO, 2015; UNICEF, 2018).

2.4. The impact of COVID-19 on MNCH and CHWs programs in Ethiopia and SSA

The COVID-19 pandemic exacerbated the problems of an already overwhelmingly fragile health system (McKinsey, 2020; Gebremeskel et al., 2021). The pandemic reduced the overall coverage of health service utilization in multiple dimensions: workforce reduction, supplies reduction, demand reduction, access reduction. According to different recent reviews on the impact of COVID-19 on MNCH, there is a decline in MNCH service utilization including ANC, institutional deliveries and immunization (Palo et al., 2022) due to the major challenge of the health systems

and lack of policies for crises preparedness (Alabi et al., 2023). The overarching direct and indirect impact of COVID-19 include delayed or decreased care, disruption in service provision and utilization and mitigation strategies or recommendations (Adu et al., 2022). Consequently, global projections of the indirect impacts of COVID-19 propose a 38.6% rise in maternal mortality and a 44.7% increase in child mortality per month across 118 LMICs including SSA countries (Roberton et al.,2020; WHO,2020). In Ethiopia due to the pandemic, MNCH service delivery declined significantly: ANC declined by 26.35%, skilled birth attendance declined by 23.46%, PNC declined by 30%, family planning declined by 14%, and abortion care declined by 23.7% (Zewdie et al., 2022).

At the peak of the COVID-19 pandemic in 2020 in SSA countries, the MMR exceeded 1000 deaths per 100 000 livebirths, e.g., South Sudan (1223), Chad (1063), and Nigeria (1047) (WHO, 2020). Maternal health workers, such as midwives in Ethiopia, Kenya, Uganda and Tanzania, reported low numbers attending maternal health clinics, and more women coming into hospitals late, without sufficient antenatal care (Pallangyo et al., 2020). Health workers, particularly CHWs, were directly affected by COVID-19 through the need to adapt to new roles or responsibilities and the experience of stress and burnout (Turner et al.,2021; WHO,2019; NCoV,2019). The key role of the community health system CHWs during a crisis response, from Ebola to COVID-19, cannot be overstated in SSA countries including Ethiopia. Even in inconducive working environments, they offer critical surveillance, provide testing and referrals, disseminate health information/communications and maintain access to lifesaving primary care (Nkengasong & September,2021; Ejeh et al.,2020).

2.5. Areas of evidence gap

Evidence gap on multilevel CHWs and CBHS: Despite the intermediary position of CHWs as crucial in promoting public health, emerging strategic evidence is limited in multiple areas to address the persisting MNCH inequity and health outcomes in Ethiopia to scale-up the best practice and to transform the CHWs program to ensure MNCH equity and a resilient community health system in LMICs, including countries in SSA.

There is a limited evidence base on how multilevel context-based determinants at different levels affect the course of CHWs' engagement. CHWs are experiencing multiple challenges in executing their responsibilities (Gebremeskel et al.,2021; Perry et al.,2021; Puett et al.,2013; Kok et al.,2015; MERQ Consultancy PLC,2020). Since 2007, most countries' health system policies and practices shifted to follow the universal standard WHO health system framework (health system inputs and outputs), without due emphasis to the contextual factors including socioecological factors and health system thinking approaches. There is an increasing body of quantitative studies on CHW effectiveness (Blanchard et al.,2019; Scott et al.,2018; Ballard & Montgomery, 2017), with many of these studies focused on whether an intervention works to measure the outputs and outcomes; not why and how it works. Building on the work of Lassi & Bhutta (2015) and Kane et al (2016), I argue that the outputs and outcome-oriented studies do not indicate how the complex context factors affect the local engagement of CHWs. Multilevel socio-cultural context can affect CHWs performance and acceptance (USAID,2015). The ongoing COVID-19 pandemic has, among other things, highlighted the importance of the contextual factors as an influence on health system functionality. Socioecological factors have been shown to hinder the availability, functioning or use of the health system (Karamagi et al., 2021). Hence, CHWs do not consistently provide services that are likely to have substantial effects on health and the quality of their services are usually unsatisfactory.

With CHWs being the lowest village level unit of the public health structure of rural Ethiopia, there is limited evidence of an analysis framework at the micro-level to capture the multilevel determinates of CHWs engagement/program. Since 2007, most countries' health system policies and practices shifted to follow the universal standard WHO health system framework. I argue that such a 'One-Size-Fits-All' approach cannot capture the complex context of the CHW program in Ethiopia. This is a problem as there is a lack of a context-specific health system framework that pinpoints the specific barriers to and facilitators of a resilient health system (Kok et al.,2017; Kok et al.,2015; Perry et al.,2021; Sacks et al.,2019). It focuses on macro level health systems without contributing very much to understanding the micro institutional foundations on which CHWs depend. While community health programs are conceptually and operationally related to specific community settings, the framework neglects context-based community health system building. This framework is not comprehensive enough to characterize and inform health system resilience

every time and everywhere. There is no context specific approach and transformative path for the program to leverage the CHWs program's success.

Evidence gap on changing the paradigm in community-based health systems:

After four decades, despite the promising expansion of social services and the large majority of people in LMICS (including Ethiopia) living in rural areas, where there is limited access to social services including primary health, the CHW program in particular is still unreliable in providing comprehensive health care beyond health promotion and education (Murray et al. 2015). They are unable to meet current realities of health inequality and changing disease burdens (Strasser et al., 2016; Ayanore et al., 2019). This uncomprehensive and unreliable health system continues to increase the direct and indirect effects of COVID-19 on MNCH.

In the last four decades, the community-based health policy, practice and evidence has been guided by the Alma-Ata Declaration. The Alma Ata Declaration of 1987 embodied five essential principles: universal accessibility and coverage based on need; comprehensive care; inter-sectoral collaboration and action on social determinants; active community participation; and appropriate technology (Labonte et al., 2017). Despite the emphasis given to the program as an emerging broad-based efficient, effective, equitable and culturally appropriate strategy to address the broad ambition on primary health, such as UHC and the health challenges for majority populations living in rural hard-to-reach areas in LMICs (including Ethiopia), it is still very far from reaching the basic health needs of the disadvantaged and hard to reach rural communities. Labonte et al. (2017) emphasized the importance of community-based health programs in ensuring equity in multiple countries including Australia, Brazil, Democratic Republic of Congo, Iran, South Africa, and more while highlighting the importance of redistributive health and social protection measures. I argue that, either due to problems during conceptualization or challenges during implementation, the program is not significantly reducing the health outcome inequalities, including MNCH, for hard-to-reach populations. The challenge is coupled with the top-down donor approach and international hegemonic neoliberal ideology. The rise of structural adjustment policies emphasizing public sector restraint and market-driven reforms have reduced the comprehensiveness of primary health care (Baum et al., 2016). This resulted in the idea of selective

intervention of PHC as a ‘temporary’ measure due to the costs of a more integrated strategy (Baum et al., 2016). The 1990s and 2000s surge in disease-specific global health initiatives reinforced vertical interventions rather than strengthening horizontal health systems (Sanders et al., 2011). There is limited evidence emphasizing the importance of comprehensive community-based health care, the integration of rehabilitative, therapeutic, preventive, and promotive interventions, and attention to local social and environmental risks.

This unreliable health system, especially the community-based health system, continues to be a challenge for equitable MNCH health and health outcomes. As COVID-19 highlighted the fragmentation of health systems globally, in LMICs including Ethiopia this is in part associated with the top-down health system, based on short-term result focused disease specific interventions and limited resources, without focusing on health system thinking, multilevel health ecology/context and comprehensive integrated health care (Shortell et al., 2010); WHO, 2020). In Ethiopia and beyond, the achievement of universal health coverage, health equity and SDGs #3, including improved MNCH health outcomes, are determined by the transformative resilience of CBHS.

In recent decades, health system emergencies and shocks such as the 2014–16 Ebola epidemic, the Zika outbreak, and, last but not least, the ongoing COVID-19 pandemic continue to underscore the need for a more resilient health system for equitable MNCH and other health outcomes (Kruk et al., 2015; Alabi et al., 2023; Doetsch et al., 2022). While the ongoing COVID-19 pandemic has amplified the fragility of global health systems around the world, it has also highlighted the need for health system transformation to meet current and future health needs (Claro, 2023). Therefore, the issue of building a resilient community health system is attracting more attention than before as these fragile systems have previously struggled to respond to the effects of health emergencies and pandemics (Gebremeskel et al., 2021). Most of the existing literature on health system resilience focuses on the characterization of a health system that demonstrates preparedness, and the ability to deliver an absorptive and adaptive response to an emergency, without due emphasis on how to build transformative capacity and enabling factors that are necessary to build a transformative and resilient health system (World Health Organization, 2007; Binagwaho et al., 2022; Danaher et al., 2014; Gebremeskel et al., 2021c; Kruk et al., 2015). Building on the WHO

health system framework (World Health Organization, 2007) and Blachet et al. health system resilience should be framed and organized beyond the emergency response to transformative resilience through embedded health system resilience management system comprising planning, assurance and controlling mechanisms. Transformative health resilience refers to the capacity of a health system to shift to a new phase characterized by a more innovative, efficient, effective, equitable and sustainable system beyond the current health need and situation.

Comprehensive health is about health system thinking to provide a continuum of integrated services (health promotion, prevention treatment and care) while ensuring health equity, sustainability and a resilient health system. Health system resilience is about promoting responsive capacity in different contexts/situations, including absorptive capacity, adaptive capacity and transformative capacity/resilience. Absorptive capacity is the capacity to take intentional protective action and to cope with known shocks and stress. This is the capacity to 'bounce back' after a shock. It involves anticipating, planning, coping and recovering from specific, known shocks and short-term stresses. The aim is to prevent or limit the negative impact of shock (Jean et al., 2017). Adaptive capacity is the capacity to make intentional incremental adjustments in anticipation of or in response to change, in ways that creates more flexibility in the future. It is necessary because change is ongoing and uncertain, and because intentional transformation takes time and sustained engagement. Adaptation is about making appropriate changes to better manage or adjust to a changing situation (Jean et al., 2017). Transformative resilience/capacity is about fundamental health system capacity change by examining the underlining root causes of health system structural failures to address the current and future health challenges beyond absorptive and adaptive health system capacity. Transformative resilience requires identifying and aiming to address underlining in the deep structures that cause or increase vulnerability and risk in health system (Jean et al., 2017).

Evidence gaps on a multi-stakeholder approach toward co-production of improved MNCH and a resilient community health system.

There has been a marked increase in the number of actors engaging with various forms of cooperation in global health to address the health system and health outcome challenges including

MNCH (Smith & Rodriguez, 2016). The 2030 agenda necessitates a whole-of-society strategy, SDG 17 recognizes multi-stakeholder partnerships as important vehicles for mobilizing and sharing knowledge, expertise, technologies, and financial resources to support the achievement of the SDGs in all countries. The SDGs calls for the meaningful and active participation of stakeholders at all levels to realize progress and to ensure that no one is left behind (UN, DESA,2020). According to the SDGs, all stakeholders including governments, citizens (communities), Non-Governmental Organizations (NGOs), Civil Society Organizations (CSO), academia and the private sector all have roles to play in contributing to SDGs. In this thesis, I follow the widely used understanding of 'stakeholders' as individuals, groups, or organizations that affect or are affected by organizational activities such as policy making, development, implementation, or management, as described by Freeman (Freeman, 1994).

Multi-stakeholder partnership is increasingly highlighted in Ethiopia's health policy reforms (MoH, 2021; MERQ, 2020) to address the health system challenges and improve health outcomes including MNCH. But even these innovative approaches have not achieved fundamental shifts in MNCH health outcomes not only in Ethiopia but in SSA more broadly, as evidenced earlier in this literature review.

Under the paradigms of state-society synergy (Evans,1997) and co-production (Ostrom, 1996), it is becoming more common and crucial for more stakeholders to be involved in producing and improving policy outcomes. State–society synergy asserts that active government and mobilized communities can enhance each other's developmental efforts (Evans, 1996). In emerging economies where governments have limited capacity to provide public service, there is often no alternative to co-production (Linders, 2012). The production and delivery of services is difficult without the active engagement of the recipients (Ostrom, 1996). In a co-production approach, citizens are not the passive targets or beneficiaries of government activities but become vital elements in their success or failure (Sorrentino et al.,2018). The discourse and practice of co-production is increasingly being promoted as the 'emerging paradigm' (Bovaird 2007).

There is limited empirical evidence on how multi-stakeholder configurations affect the CHW/MNCH policy approaches adopted, showing what would work and what does not work under the multi-stakeholder context to boost synergies between the state and non-state actors.

Despite considerable rhetoric surrounding the multi-stakeholder approach, evidence is limited as to how this contributes to improved MNCH and a resilient community health system, in the context of and beyond COVID-19. In addition, there is no or limited evidence on how COVID-19 presents a 'window of opportunity' to transform the landscape of state-civil society synergies to ensure CHW-led MNCH programs and a resilient community health system in Ethiopia.

2.6. Rationale for the study

Despite the progress made, Ethiopia continues to have the highest child and maternal mortality occurrences in the world. There are substantial inequities in MNCH services access and health outcomes within and among regions, and COVID-19 has amplified the problems. Thus, in the last three decades improving the well-being of mothers, infants, and children continued as a key national and international public health goal.

Community health worker (CHW)-based health programs have been emphasized as a major strategy in promoting primary healthcare access and improving health outcomes, including MNCH, in Ethiopia and beyond. Despite the contribution of the program to improving MNCH, SSA countries including Ethiopia continue to have the highest child and maternal mortality occurrences in the world. The CHW-based health program continues to operate without the transformational capacity to comprehensively respond to persisting preventable and treatable MNCH challenges. This research study is an attempt to better understand and explain how to capitalize and scale up on the balanced top-down disease prevention of the CHW/MNCH program to ensure MNCH equity and a resilient community health system. Rigorous research and evidence are crucial to advance knowledge on critical paths to comprehensive and transformative comprehensive CHW program policy and practice to enhance MNCH equity and a resilient health system.

Remarkable local and global contribution of this work:

This study will be beneficial not only to the communities in which it was conducted but can be applied in other places having comparable health systems in LMIC countries, including countries

in SSA. This research project will make multiple contributions to CBHS policy and practice. First, it establishes a broad knowledge base on multilevel determinants, CSFs and coproduction of CBHS in Ethiopia and beyond to ensure health equity. Second, it will contribute to the local and global debate and research on conceptualization and framing of comprehensive, equitable and resilient community health co-production and transformation. Third, it will inform policy, practice and research interventions. Finally, it will guide research methods based on multi-level and multisectoral perspectives using integrated theoretical approaches.

2.7. Research goal, Questions and Objective

The main goal of this study is to gather and analyze evidence on paths to comprehensive, equitable and transformative community-based health systems (CBHS) to enhance MNCH equity and outcomes in Ethiopia and beyond. Four sets of research questions and objectives were addressed to achieve the main goal of this thesis project. Results have been or will be published in five peer reviewed articles in keeping with the requirement of the proposed manuscript-based PhD thesis.

Research questions and objectives

My research questions and objectives are indicated as follow:

1. What are the multilevel barriers to and facilitators of CHWs' effectiveness to ensure Maternal Newborn and Child Health (MNCH) equity and a resilient community health system in sub-Saharan Africa? Systematic review and protocol: Article #1 & #2

   Objective 1: To understand the multilevel barriers to and facilitators of CHWs' effectiveness to ensure MNCH equity and a resilient community health system in SSA.

2. What are the multilevel barriers to community-based MNCH equity and resilient health systems in rural Ethiopia? Article #3

   Objective 2: To critically examine the multifaceted fragmentation challenges of Ethiopia's CHW program to deliver optimum MNCH and build a resilient community health system.

3. What are the critical success factors in developing a transformative resilient community-based health system to ensure equitable maternal, newborn, and child health in rural Ethiopia using COVID-19 as a policy window? Article #4

   Objective 3: To critically examine critical success factors (CSFs) in developing a transformative resilient community-based health system in rural Ethiopia using COVID-19 as a policy window.

4. How do multi-stakeholders intersect and mutually reinforce each other toward the co-production of improved MNCH outcomes and a resilient community health system? Article #5

   Objective 4: To critically examine barriers to and facilitators of co-production in the context of multi-stakeholder engagement to optimize MNCH outcomes and a resilient community health system in rural Ethiopia.

Chapter Three: Theoretical framework

My study was guided by different theoretical frameworks which informed the research processes including formulating the research questions and the critical data analysis. The frameworks include the socio-ecological framework (SEF), the WHO health system framework, state and non-state synergy framework, and Kingdon's multiple streams framework.

3.1. The socio-ecological framework (SEF)

The SEF has undergone numerous updates and modifications for different applications in different fields of study. For this study, I used the SEF based on my readings in public health literature. In public health research, an ecological perspective encompasses context in the broadest sense of the word, to include physical, social, cultural, and historical aspects of context and attributes and behaviors of persons within. An ecological analysis includes interdependence and mutual interaction among persons/organisms and settings (McLaren and Hawe, 2005, p#1). I use tailored SEF (USAID 2020) to inform my description of the multilevel determinants of CHWs engagement with MNCH equity and health systems, to identify common themes of multilevel determinants and

to demonstrate the need for microlevel, context-based CHW program framing, tailored to a particular community. The socio-ecological framework posits that factors at various levels uniquely and jointly contribute to health interventions. The levels are: (i) Health workers individual level knowledge, skills and attitudes; (ii) Interpersonal factors, such as health personnel collaboration and supportive approaches; (iii) Community level factors/informal institutions, such as community acceptability/recognition, trust, and community tradition, values and beliefs; (iv) Health system and logistics related factors, such as health policy/program, human resources/training, financial and material supply chain and logistic approaches. I argue for the use of the socio-ecological framework for microlevel, context-specific planning and analysis of CHWs engagement.

3.2. The WHO health system framework

In 2007, the WHO introduced the health systems building block framework as a global standard, widely considered as a national health system planning and monitoring framework. Its six building blocks include service delivery, health workforce, information, medical products and technologies, financing, and leadership and governance (WHO, 2007). It is a universally accepted framework to measure success or failure of national health system interventions.

Since the introduction of the WHO health system framework in 2007, despite considerable variation in health system contexts and needs around the world, most health system policies and practices started to be guided by this single golden standard framework, without sufficient focus on multilevel and microlevel determinants of health system effectiveness. I argue that the approach is 'one size fits all', which assumes that all nations' health system requires the same building blocks, development paths and success factors.

3.3.The 'state–society synergy' framework

The state-society synergy framework shifts the traditional /standard dichotomies between state and society (non-state and market actors) to enhance a mutual synergetic relationship between state

and society across the blurred boundaries of the state-society divide towards a desirable change. A synergetic approach shifts the focus from state-private business co-production to ideas that involve state-society organization cooperation (Evans, 1996). The logic behind the argument is that given the magnitude of the problem and resource constraints, ensuring MNCH equity and a resilient community health system in a new era of development can only be realized if both state and society mutually take responsibility and strive to respond.

I built on the synergistic model based on the work of three different scholars. These include Peter Evans's State-Society Synergy approach, (1996), Judith Tendler's (1995) concept of blurred public-private boundaries and Elinor Ostrom's (1996) vision of "co-production". Synergy is defined by Evans as a win-win relationship, which can be achieved by "Complementarity" and "Embeddedness" (Evans, 1996). State-society synergy goes beyond the identification of complementarities and co-production between state, society and market to focus on embeddedness: relationships that bridge the state-society divide. State–society synergy asserts that active government and mobilized communities can enhance each other's developmental efforts (Evans, 1996). This synergy provides mutually supportive relations between the sectors, possibly leading to outcomes associated with improved performance and social accountability, and positive-sum interaction between the state and the society.

Ostrom (1996) emphasizes the fact that synergy cannot be achieved if public officials and citizens continue to see a great divide between themselves. Ostrom (1996) considers the great divide as a conceptual trap arising from overly rigid disciplinary walls surrounding the study of human institutions and tries to remove artificial walls surrounding disciplines. Ostrom (1996) argues that effective delivery of services apparently produced by government - such as primary education and city sewer systems - depend, in fact, on the joint activity of citizens and government, which she calls "co-production." If we look more closely at cases where public services are most effectively delivered, Ostrom argues, what we are likely to find is "co-produced" with government and citizens acting jointly as producers. Tendler's work on "blurred public and private boundaries" makes a similar argument, emphasizing the potential benefits of networks that span the divide between state and civil society (Tendler, 1997). The engagement of community groups, non-state

actors and citizens in general is one of the most important factors that explains successful performance and accountability arrangements through direct participation during planning, implementation, resource mobilization and monitoring (World Bank, 2004).

Also, social accountability strategies try to improve institutional performance by bolstering both citizen engagement and the public responsiveness through state–society synergy (Fox, 2015).

3.4. Kingdon's multiple streams framework

Public health policymaking during a pandemic, like COVID-19, can be extremely challenging. In the context of COVID-19 pandemic, its global impacts are unprecedented. Decisions are taken in a highly uncertain, complex, and rapidly changing context (Béland & Howlett, 2016). I draw on Kingdon's (1994) multiple streams framework to describe the establishment and policy windows that the COVID-19 crisis has opened for empowerment of CHWs and co-production of improved MNCH and a resilient community health system in Ethiopia. Kingdon's multiple streams framework (Kingdon, 1984) has been extensively used to analyze how and why public health policies were adopted. Kingdon's approach provides the conceptual framework for the analysis of the three streams – problems, policies, and politics – and will be applied to state-civil society synergy to co-produce improved MNCH and community health systems, and public health policy lessons from Ethiopia.

Kingdon argues that policy change occurs when there is adequate attention to a problem (the problem stream), a policy solution has been clearly articulated and reached consensus (the policy stream), and there is political will to adopt this policy (the politics stream). When all three streams converge, a policy window opens, representing an opportunity for advocates of proposals to push attention to their special problems (Kingdon, 1984). Kingdon suggests that windows can be opened by external forcing events, such as crises or accidents, or by institutionalized events, for example elections. In the case of this study, I argue that the COVID-19 crisis has opened such a window. Using the framework of Kingdon (1984), I critically examined the empirical and practical context of the window of opportunity, the extent of how lessons from the COVID-19 pandemic informed

the multitude of stakeholders to co-produce improved MNCH and community health systems and build a transformative resilient Ethiopia.

Chapter Four: Research Methods and Materials

This thesis is based on a multi-phase qualitative research method comprising of a systematic review, an embedded multiple case study comprising FGD, KII and document review. Desai and Potter (2007) stress that development study requires the use of a wide range of research methods, which enables the different techniques and their results to be compared against each other, allowing judgments to be made as to which method (or combination of methods) is the most appropriate for any particular purpose. Multiple sources allow for triangulation and provide a trustworthy groundwork for the findings and the contribution to knowledge (Yin,2018).

4.1. Systematic review

The protocol for this review is registered on PROSPERO (registration ID: CRD42020206874) and published (Gebremeskel AT, Omonaiye O, Yaya S., 2022). This review was conducted following the Cochrane Collaboration Handbook of Systematic Reviews (Cochrane Collaboration Handbook of Systematic Reviews,2008). The systematic review reported in accordance with the reporting guidance provided in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Moher et al., 2015) and the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) statement (Tong et al., 2012).

4.2. Qualitative case study: An embedded multiple case study

Case and setting: The case study site was West Shewa Zone. West Shewa is one of the zones of Oromiya region; the zone has 23 districts and is located to the west of Addis Ababa (capital city of Ethiopia). According to the Central Statistics Agency of Ethiopia (CSA), the zone has a total population of 2,058,676 (1,028,501 of which are males and 1,030,175 females). In this zone, in 2019, 84 per cent of the population lives in rural areas (Oromia Regional health Bureau, 2022). Currently, the zone has 8 hospitals, 92 health centers and 528 CHW posts (each post has 2 CHWs). The political economy of the health system, CHW program and health posts are administered and

funded by the public health system of the region of Ethiopia. Despite the progress, the West Shewa Zone is still underperforming when it comes to MNCH outcomes compared to other parts of the country.

Overview of an embedded multiple case study

I used an embedded multiple case study design (Yin, 2018) to examine the phenomenon of MNCH programs led by CHWs in rural Ethiopia. A qualitative case study is a research design that helps in exploration of a phenomenon within a real time phenomenon and its naturally occurring context. A case study approach allows in-depth, multi-faceted explorations of complex issues in their real-life settings (Crowe et al, 2011). A case study is a practical inquiry that allows the researcher to explore people, the social organizations, and systems in-depth within the real-world context (Yin, 2018). According to George and Bennett (2004), case studies enable deep contextual understanding, and they have potential for achieving high conceptual validity; case studies are a useful means to closely examine the hypothesized role of causal mechanisms in context. According to Yin (2003, 2018) a case study design should be considered when the focus of the study is to answer "how" and "why" questions.

There are different key factors determining an embedded design. First, the data collection of this qualitative case study is organized in three parts: FGDs, KIIs and document review. This case study relies on multiple sources of evidence to add breadth and depth to data collection as it has a unique strength to combine a variety of information sources including focus group discussions, interviews, and documentation. Embedded case studies are studies in which different levels or sources of data are collected (Yin, 2003). This approach allows the researcher to have multiple sources for data triangulation and provide a trustworthy groundwork for the findings and the contribution to knowledge (Yin,2018).

Secondly, I want to cover contextual conditions because I believe they are relevant to the phenomenon under study. Embedded case studies involve more than one unit of analysis (Yin, 2018). The context of CHW work is interconnected, with boundaries between the different levels of the health system unclear. For example, Ethiopia has a top-down decentralized health system policy and practice model for the delivery of healthcare including Federal Ministry of Ethiopia

(MoH), the regional health bureaus, zonal health offices, and *woreda* (district) health offices. In this case study focusing on the MNCH program led by CHWs in rural Ethiopia, the case could not be fully understood without the context, the health system, or the community health system of Ethiopia in general (onsite CHWs, district, regional and national level contexts). This is the setting in which the MNCH system - led by the CHW program - was developed and is being operationalized. It would be impossible to have the full picture without considering the different units of the health system, as indicated above.

Third, the nested nature of the case study encompasses two distinct populations including CHWs and program coordinators/experts from two districts of West Shewa Zone, and subnational and national public health policy actors. These populations are spread over three geographical areas with respect to the scope of their work: West Shewa Zone CHWs, Oromia Region (subnational) and Ethiopia (national) public health policy actors. Embedded case design illuminates the case within the sub-unit analysis and analysis between the different sub-units or across all of them (cross-case analysis). Single or multiple case studies can include embedded units of analysis (Yin, 2018).

Yin (2018) suggests multiple cases enable replication logic, allowing researchers to confirm or disconfirm inferences drawn from each case. Multiple cases enable a replication of findings across cases, allowing researchers to confirm or disconfirm inferences drawn from each case (Yin ,2018). A multiple case study enables the researcher to explore similarities or differences within and between cases. Comparisons can be drawn when the cases are carefully selected so that the researcher can predict similar results across cases, or predict contrasting results based on a theory (Yin, 2003).

I purposively selected two districts with similar context, performance, methods and procedures to conduct the FGDs. I selected HEWs/CHWs from two *woreda* (district) health offices from the West Shewa Zone public health area under the Oromia regional health bureau. The move from single case to paired comparison offers a balanced combination of descriptive depth and analytical challenge that progressively declines as more cases are added (Tarrow,2010). Comparative methods enable generalizations of findings between cases (Beach & Pedersen,2019).

4.3. Data collection

The data collection of this qualitative case study was organized in three parts: FGDs, KIIs and document review.

Data collection: Part one: Focus Group Discussions (FGDs): A FGD is a family of qualitative research techniques for understanding and documenting attitudes, behaviors and the 'meanings of people's worlds' (Desai & Potter,2006). A FGD elicits participants' own meanings attributed to their experiences and it is done in the presence of other participants who share common experiences. FGDs provide a good environment for understanding collective social action and accessing group beliefs, understandings, behaviors and attitudes that might be overlooked in an in-depth interview (Desai & Potter, 2006). In the context of development research, they can offer a more effective and rapid way of engaging with community groups than other methods (Desai & Potter, 2006). This way, participants can talk to each other, ask questions, exchange anecdotes and comment on each other's experiences. They can play an invaluable role in gaining background information on a research topic or provide an overview for more in-depth ethnographic research.

Prior to any recruitment and data collection activity, I approached Oromia regional state (provincial) health bureau and received a support letter to West Shewa Zonal health office to select two better-performing *woreda,* having a similar performance status (Appendix 1). Then, I received a support letter from West Shewa Zonal health office to the two districts (Adea Berga and Ejere health district) (Appendix 2). I sent recruitment posters to the district to share with the district CHWs through their usual communication (Appendix 3). Based on their agreement, I contacted participants to agree on a convenient time and place for them to sign the consent form (Appendix 4) and then conducted the FGDs.

I collected the data using semi-structured FGD guides developed in English (Appendix 5) and translated to the Oromo language. The guides were carefully crafted following the theoretical frameworks and relevant literature to include neutral, non-biased, and non-leading questions to avoid influencing participant responses. I acted as the facilitator to recruit participants, ensure confidentiality, and distribute and collect consent forms. I am fluent in the local languages (Amharic and Oromo).

In the FGDs, a total of 16 female health extension workers (HEWs/CHWs) participated from two district of West Shewa Zone. All the FGD participants, HEWs/CHWs, are female, and the majority (93.75 %) of them are in the age range of 25-40. The highest level of education or training that they have completed: 12 - college diploma (75%) and 4 - over one year HEW training (25%).

Part two: Key informant interviews (KIIs): In-depth semi-structured qualitative interviews were conducted with twelve (12) key informants who were health policy experts from national and subnational levels. Snowball sampling was used to recruit participants, suggested by other participants (Noy, 2008). Using snowball sampling, I sent recruitment posters to the potential participants via their email (Appendix 6). Key informants were recruited based on their known involvement in the policy process leading to the planning and the implementation of the CHW/MNCH program and empowerment of CHWs. Based on their agreement, I contacted participants to agree on a convenient time and place for them to sign the consent form (Appendix 7) and then conducted the KII. The study did not exclude experts by their gender or sex.

I collected the data using semi-structured KII guides developed in English (Appendix 8) and translated to Amharic and Oromo languages. The guides were carefully crafted following the theoretical frameworks and relevant literature to include neutral, non-biased, and non-leading questions to avoid influencing participant responses. I acted as the facilitator to recruit participants, ensure confidentiality, and distribute and collect consent forms. I am fluent in the local languages (Amharic and Oromo).

A total of twelve public health experts were recruited to participate in the Key Informant Interviews (KIIs). Eight participants (66.6%) were recruited from three levels of government health structures (three participants from MoH, two participants from ORHB, and three participants from West Shewa's two district level health offices). Four (33.3%) participants were recruited from NGOs (two from the national level and two from the regional level). In terms of gender, four (33.3%) women and eight men (66.6%) participated. Most of the participants have post graduate level (MSc) educational backgrounds in health and related study programs and they

have extensive (more than 10 years) public health related experiences in different levels of responsibilities.

Part three: Document review: I conducted a document review to enrich the findings from the FGDs and KIIs, and to understand the context and operation of the HEW/CHW program in light of the COVID-19 pandemic in Ethiopia. Policy documents, including national/regional strategies, plans, and reports were considered to represent the major priorities and directions for CHW-led MNCH and the health sector. Relevant and available documents were selected or identified in consultation with key informants working in national and subnational MNCH programs in Ethiopia. The review considered available and accessible documents in Amharic, Oromo and English languages.

4.4. Data analysis: Thematic analysis

Data analysis was conducted through multiple stages. The data was analyzed using thematic analysis to synthesize and categorize the findings of the included studies into themes (drawing from Braun and Clarke, 2014). Transcripts were transcribed verbatim from local Oromo/Amharic language to English. Data was cross-checked by listening to the original recording while reading along in English. I coded the transcription line by line manually. Themes were generated based on an iterative process of inductive and deductive approaches. Theme codes were developed deductively after an initial review of the transcripts content based on the FGD and KII guide and the theoretical framework of the study. Furthermore, emerging themes were coded inductively (Saldaña, 2013).

The themes and patterns that emerged from each case were compared. Comparative methods enable generalizations of findings between cases (Beach & Pedersen,2019). Using the multiple case and multiple units of analysis, I analyzed similarities and differences within and between cases. Comparisons can be drawn when the cases are carefully selected, so that the researcher can predict similar results across cases, or predict contrasting results based on a theory (Yin, 2003). I ensured the quality of data by running quality checks with members of the research advisory committee and graduate student assigned by my supervisor (Yaya, S.).

4.5. Researcher reflexivity and positionality statement

Qualitative research assumes that the researcher's biases and values impact the outcome of any study (Merriam, 2002). Merriam (2002) recommends reflexivity, engaging critical self-reflection by the researcher regarding assumptions, biases, and the relationship to the study, which may affect investigation. To enable any audience of qualitative studies to evaluate the validity of conclusions extrapolated from data, researchers should, as part of the study, neutralize or bracket their biases by stating them explicitly to the full extent possible (Altheide & Johnson, 1994).

Reflexivity statement: I have approximately 10 years' experience in community health program management in Ethiopia and I have socio-cultural knowledge of the study area. I have approximately five years of work experience (2007 to 2012) in West Shewa Zone, my study area. I first developed a passion for community health development and evidence organization while I worked as a sexual and reproductive health program coordinator in West Shewa Zone for Global Fund, Ethiopia. I started this role after the completion of my undergraduate studies (BA). My role in this work included training, supervising and supporting the CHW program. During this time, I began to truly understand and personally value the importance of universal community health development and health coverage. This is particularly relevant among vulnerable pregnant women, both male and female youth, as well as children in rural and urban areas – striving for equity in access to healthcare (i.e. availability, accessibility, affordability) and provision of quality health services. Then, I decided to enhance my knowledge and research skills in this area through pursuing graduate level studies. I did my MSc in population studies, sexual and reproductive health from Addis Ababa University (2010-12), with my MSc thesis on sexual and reproductive health risk behavior among youth working in West Shewa Zone. Since completion of my graduate studies, I have worked in different levels of sexual and reproductive health program coordination, research and evidence building in the public sector and with NGOs in Ethiopia.

During this time, I gained experience working with multi-levels and multi-sectors to understand and address sexual and reproductive health access inequality and determinants. I had the opportunity to work with public health experts from different levels (local, national, and international) and participate in different site visits, conferences, and professional development

opportunities. So, I effectively organized, coordinated, and evaluated community health projects quantitatively and qualitatively using established evaluation and results-based frameworks in collaboration with various actors.

My lived professional and personal experience brings both challenges and opportunities to the role of the researcher in co-creating knowledge alongside research participants. As an expert and graduate student (among other traits), I hold many identities, which variably affected my engagement in the research process. Doing field work, certain aspects of my identity, such as my knowledge of the study area and the health system, occasionally would work to my advantage. For instance, I would be able to gain access to high-level stakeholders who would make time to speak with me and forgive some of the usual formalities. Also, from this position, I can view my study area "from the insider/outsider view".

In other scenarios, however, these identities introduce complexities. My presence during fieldwork in rural areas of Ethiopia may have prompted some participants to request extra compensation for their participation, or raised expectations that, as an international researcher/student, I would bring supplies or resources to support their work.

4.6. Research Ethics

Ethical approval for the project sought from respective institutions, the University of Ottawa Research Ethics Board (REB) (Appendix 9), Ethiopian Ministry of Heath, the Ethiopian Public Health Institute (EPHI) (study site) (Appendix 10). Eligible and willing participants were enrolled without any consideration of religion, culture or language. The informed consent form describing the study includes eligibility, anonymity and confidentiality, purpose, duration, procedures, their right to decline or withdraw at any time, eventual consequences in participating, prospective research benefits, incentives, and whom to contact for questions. These were signed and documented before engaging the participant. Participants were acknowledged and were provided honorariums for their participation.

Chapter Five: Results

Preface:

In keeping with the doctoral thesis guidelines, my co-supervisors, and co-reviewers' contributions did not exceed one-third of any article.

I (ATG) co-authored Paper # 5.1 & #5.2, a systematic review and the protocol, with my supervisor, Dr. Sanni Yaya (SY), and a co-reviewer, Dr. Olamuyiwa Omonaiye (OO). Authors Contribution: ATG conceived the paper, conducted the study and drafted the manuscript. ATG developed the search strategies in collaboration with a librarian. ATG and OO conducted the screening, extraction and quality appraisal of studies. SY and OO supervised the study and guided the writing of the manuscript. OO and SY critically revised the manuscript for intellectual content. SY, the corresponding author, attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. All authors read, reviewed, and approved the final manuscript. SY had final responsibility to submit for publication.

I co-authored Papers# 5.3, #5.4 & #5.5 with my supervisor, Dr. S. Yaya (SY) and Dr. J. Etowa J (JE), and a co-reviewersO. Udenigwe (OU). Author contribution**:** ATG conceptualized the study, coded, and analyzed the data, and prepared the manuscript with input from SY, OU and JE; review SY, OU and JE; Supervision: SY. All authors read and approved the final manuscript.

5.1. Determinants of community health workers effectiveness for delivery of maternal and child health in Sub Saharan Africa

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Abstract

Background: Countries in sub-Sahara African continue to have the highest maternal and under-five child death occurrences in the world and this has become a key health challenge in the region and persists as global public health agenda. Although Community Health Workers (CHWs) are increasingly being acknowledged as crucial members of the healthcare workforce in reducing health disparity, evidence is limited to the perspective of community health workers. The objective of this protocol is to outline the methodological process of a systematic review that will gather qualitative data to examine determinants of community health workers effectiveness for delivery of maternal and child health in Sub Saharan Africa. Synthesizing the perspectives of community health workers' perceived experience is crucial to inform decision makers, policy makers, and practitioners to address barriers to and scaleup facilitators of CHWs program to ensure maternal and child health equity and a resilience community health system.

Methods: The protocol has been registered in the PROSPERO (CRD42020206874). We will systematically conduct a literature search from inception in MEDLINE complete, EMBASE, CINAHL complete and Global Health for relevant studies. Eligible studies will be reports of original research, peer reviewed articles having a qualitative component (i.e., qualitative, mixed, or multi-method studies) on empowerment of CHWs associated with maternal and child health in the sub-Saharan Africa. Eligibility will be restricted to studies published in English. Two reviewers

will independently screen all included abstracts and full-text articles. The primary outcome will be CHWs' perceived barriers to and facilitators of effectiveness of community health workers in maternal and child health in sub-Saharan Africa. Study methodological quality (or bias) will be appraised using appropriate tools. Narrative analysis will be conducted, and narrative summary of findings will be presented. We will use the 'best fit' framework method as a systematic approach to analyzing the qualitative data.

Discussion: This study will systematically and comprehensively search literature and integrate evidence on perceived barriers to and facilitators of effectiveness of community health workers led maternal and child health program in sub-Saharan Africa. Our findings will inform policy and practice on maternal and child health equity and a resilient communities health system. The resulting manuscript will be disseminated in a peer-reviewed journal and at international and national conferences

Keywords: Community health workers; Maternal and Child Health (MCH); Barriers; Facilitators; Sub Saharan Africa.

Background

Despite the reduction of inequality in the last two decades in the area of Maternal and Child Health (MCH) outcomes, the health system in sub-Saharan Africa, particularly the community based health system, is still not equitable and resilient enough to respond to existing public health issues including MCH (Maufi et al., 2021; Yaya & Ghose, 2019). Although Community Health Workers (CHWs) are increasingly being acknowledged as crucial members of the healthcare workforce in reducing health disparity, countries in sub-Saharan Africa continue to have the highest maternal and under-five child death occurrences in the world. Hence, this has become a key health challenge in the region and persists as a global public health agenda for the new Sustainable Development Goals (IDRC, n.d.; UN,2019). Multiple evidence suggests that scaling up community health program and empowerment of CHWs can lead to better health outcomes (Perry & Hodgins, 2021; Scott et al., 2018a). Over the past several years, increased attention has been given to CHWs led programs. However, challenges remain regarding ensuring adequate health systems support for CHWs (Perry & Hodgins, 2021).

The World Health Organization (WHO, 2007) defined a health system as all organizations, people and actions whose primary intent is to promote, restore, or maintain health. Health manpower is

among the essential components of a resilient health system (Ayanore et al., 2019). However, in sub-Saharan Africa the health workforce remains four times below the recommended WHO standard (UNICEF, 2020) to ensure health equity. Health equity is the state in which all people are able to reach their full health potential and receive high quality care that is fair and appropriate from each person's perspective, no matter where they live, who they are or what they have(Health Quality Ontario, n.d.). Health system resilience can be defined as the capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learned during the crisis, reorganize if conditions require it (Kruk et al., 2015). Health coverage, quality of care and continuum of care are integral part of health equity and a resilient health system.

MCH inequality persists as an important agenda of the Sustainable Development Goals (MHTF, 2017). Sustainable Development Goal 3 was aimed at reducing maternal mortality to less than 70 per 100,000 live births; reduce newborn mortality to at least as low as 12 per 1,000 live births in every country; and reducing under-five mortality to at least as low as 25 per 1,000 live births in every country (UN,2015; WHO,2015.). The Millennium Development Goal 5, which aimed to reduce maternal mortality rate by three-quarters, was not achieved in sub-Saharan Africa(UN,2015; World Bank, 2019) In sub-Saharan Africa, a larger proportion of women give birth without any skilled attendants (UN,2015) In rural areas, only 56 percent of births were attended by skilled health personnel, compared with 87 % in urban areas (UN,2015) . In low and middle income countries, many of which are in sub-Sahara Africa, the coverage of institutional delivery is as low as 50 per cent but accounts for 99 % of global maternal mortality (Yaya & Ghose, 2019). In addition, about 80% of morbidity and death in children under the age of five occur before reaching health institution and health care providers (Kruk et al., 2015). This makes sub-Saharan Africa the riskiest region for maternal and under- five child death occurrences in the world. Understandably, this has become a key health challenge in the region.

In sub-Saharan Africa the unacceptable health outcomes including MCH are associated with health system challenges (Oleribe et al., 2019). There is a shortage of 3.7 million healthcare workers to respond to the continued health crises (Liu et al., 2017). For example, the region accounts for 25% of the world's disease burden, however, spends less than 1% from Gross Domestic Product on health and has only 3% of the world's health manpower (UN, Africa Renewal, 2016). Particularly, the empowerment and availability of CHWs is not comparable to the

demand, which poses a real challenge to the already fragile health system, thereby reducing the capacity of the health system to respond to the exceptionally high maternal and child mortality rates in the region. The situation is worse in rural and remote areas where the provision of services is difficult because of limited health budgets and scattered populations living in isolated villages or islands (Henderson & Tulloch, 2008). We argue that context based effective CHWs empowerment could be a useful strategy to address the health workers challenge to ensure MCH equity and a resilient health system. Empowerment has become a dynamic mainstream action-oriented concept with a focus on removal of barriers and enhancement effective development of policy and practice (Jayakarani et al., 2012; Kabeer,2019).

Community Health Workers led programs have contributed significantly to improving public health outcomes in sub-Saharan Africa (Perry & Hodgins, 2021;M et al., 2012). The WHO has noted CHWs, as a key resource to providing basic health services for underserved areas because they help to fill the shortage of primary health service providers at the community level. Since Alma Ata's call in 1978, there have been multiple efforts towards building community health (Liu et al., 2017;UN, Africa Renewal, 2016) to play a major role in undeserved countries including countries in sub-Saharan Africa (Henderson &Tulloch,2008). According to the WHO, CHWs are members of the communities where they work, who should be selected by the communities, be supported by the health system and have shorter training than professional workers (World Bank. 2019; Oleribe et al., 2019). They are more accessible and they provide the platform that ensures health equity (Javanparast et al., 2018). CHWs provide non-heretical community-based services. This is because they are well positioned in connecting grass-root communities to the public health system, thereby making the health system more people-centered to promote, prevent, detect and respond to primary health needs including MCH (Perry et al., 2014). The promising outcomes of CHWs in providing equitable MCH services is noticeable in many countries such as Brazil, Bangladesh, and Nepal which have effectively executed CHWs led programmes (Cometto et al., 2018; Hogan et al., 2010; Moller et al., 2017b; Perry et al., 2014). However, while community health programs are conceptually and operationally related to specific community setting, there is limited evidence on context-based community health system building. A health system approach aligned to or based on the context is crucial to plan, implement and sustain a resilient community health system.

Although there is an increasing body of literature on the effectiveness of CHWs empowerment programs (what works) from the perspective of intervention outputs and outcome measures, health policy and beneficiary communities, there is limited evidence on the process of how CHWs programs work (how it works)from the lived or practical experience and perspective of CHWs (Perry & Hodgins, 2021). Existing studies have focused on the effectiveness of CHWs program intervention results and target from the perspective of beneficiary communities (Blanchard et al., 2019; Scott et al., 2018b; Ballard & Montgomery, 2017). Furthermore, some of these studies are in the context of global to low- and middle-income countries (Lassi & Bhutta, 2015; Kane et al.,2016) and they are not specifically in the context of sub-Saharan Africa. Additionally, these studies have reported the barriers of effectiveness of the empowerment of CHWs based on quantitative measurements, such as output and outcome measures (Liu et al., 2017;WHO,2010)

We argue that evidence based on result measures cannot tell how the empowerment strategy facilitated or disrupted the power of CHWs on their work environment, ensuring MCH equity and a resilient community health system. Hence, it would be difficult to identify and address where and when CHWs feel powerlessness and frustrated about how organizational and relational arrangements hindered them from achieving the desired impact, particularly in reducing MCH inequality and building a resilient community health system. Also, measurement of output and outcome indicator metrics do not fully capture process and quality of care and continuum of care and are limited to measuring contact with a health provider. Measuring outcomes alone does not provide insight into the causal link between the process and outcome. Hence it is insufficient in capturing whether people receive quality care or how it works (Yaya & Ghose, 2019; Kruk et al., 2017). For example, the work by Stiglitz-Sen-Fitoussi on going “Beyond GDP”, indicates that a singular focus on outcomes is insufficient to show “how the pie was sliced” (OECD,2018).

According to the WHO, there is a research gap in understanding how to ensure the sustainability of CHWs program, previous research experience on the role of community-based health workers represents a mix of varying degrees of quality (WHO, 2018). The existing reviews highlight a lack of robust evidence on contextual factors from the perspective of community health workers. Thus, to the best of our knowledge there is no systematic review that has provided in-depth insight into

the individual and contextual barriers to and enablers of the effectiveness of CHWs from the perspective of front line CHWs. In addition, to the best of our knowledge, no systematic review has been performed to unravel the contextual factors such as how, for whom and under what circumstances the CHWs' programs work.

The objective of this protocol is to outline the methodological process of a systematic review that will gather qualitative data to examine determinants of community health workers effectiveness for delivery of maternal and child health in Sub Saharan Africa.

This systematic review will be guided by the following question: What are the CHWs' perceived barriers to and facilitators of effectiveness of community health workers to ensure MCH equity and a resilient community health system in sub-Saharan Africa?

Methods

Protocol registration and reporting

The registration number of this protocol in PROSPERO is CRD42020206874. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) statement(Moher et al., 2015) guided the reporting of this protocol (see checklist in Appendix 10). The proposed systematic review will be conducted according to the Cochrane Collaboration Handbook of Systematic Reviews (Higgins & Green, 2008) and reported in accordance with the reporting guidance provided in Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) statement (Tong et al., 2012) and the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Moher et al., 2015)

Electronic searches

Four major electronic databases will be searched: MEDLINE (Ovid), EMBASE, CINAHL and Global Health for relevant peer-reviewed articles published between 2000 and 2021. The search strategies are designed to access published materials in three stages: (i) A limited search of Ovid Medline to identify relevant keywords contained in the title, abstract and subject descriptors; (ii) Terms identified in this way, and the synonyms used by Ovid Medline, EMBASE, CINAHL, and

Global Health are used in an extensive search of the literature; (iii) We will perform hand-searching of the reference lists of the review eligible full-text articles to identify and include more relevant articles. The searches will be designed and conducted by the review team which includes three experienced public health researchers, in collaboration with a Health Sciences librarian. They will help in optimizing the retrieval of relevant citations: planning, searching, citation management, source selection, and bias assessment. A comprehensive search will be conducted involving a broad range of MeSH terms and keywords related to MCH services and CHWs. A draft search strategy is provided in Appendix 11.

Study inclusion criteria

Population: We include studies involving CHWs engaged in community setting under public health system with some level of secondary education; subsequent formal training from a recognized institution training and salaried. For this study, we will use the definition of CHWs provided by the WHO (2020) and American Public Health Association (2009).

Intervention/ Exposure context: Eligible studies involve different empowerment programs designed to empower CHWs work associated with MCH services. The services include MCH promotion, follow up and linkage, family planning, antenatal, delivery, post natal care, breastfeeding, immunization/ vaccination, and newborn services for mothers and under five children in public health system in sub-Saharan Africa.

Comparison or control group: No comparison group for this study

Outcomes of interest:

The primary outcome is CHWs' perceived barriers to and facilitators of effectiveness of CHWs to ensure MCH equity and a resilient community health system in sub-Saharan Africa.

Setting: We include studies conducted on CHWs empowerment/program experience based in community setting under public health systems in countries of sub-Saharan Africa, which includes countries in Eastern, Central, Western and Southern regions of African continents.

Study design: Eligible studies are reports of original research, peer reviewed articles, dissertations, and gray literature (e.g., reports) having a qualitative component (i.e., qualitative, mixed, or multi-method studies) conducted in sub-Saharan Africa with focus on empowerment of CHWs. The study includes the lived experience of CHWs (on job training or practical experience), and their experience after the empowerment intervention. The eligible studies must be published in English language between January 2000 to September 2021. This period was selected because the Millennium Development Goals were implemented during this period. The current Sustainable Development Goals have been implemented since 2016. Both development programs placed emphasis on MCH. Hence, 2000 to 2021 represents the period where substantial international resources were channeled towards alleviating the poor state of MCH in developing countries.

Exclusion criteria: We exclude studies based on the following criteria: Studies on CHWs reporting on performance of CHWs as an output and outcome from the perspective of beneficiary community are not considered; Studies based on CHWs while in school or during training or workshop time; studies on quantitative methods; studies based on volunteers/unpaid, nurses, midwiferies; studies on empowerment not related to family planning, pregnancy and childbirth related, under five children and the like; studies on empowerment of CHWs on environmental health, and sanitation and the like; studies not reporting on CHWs' perspective on barriers to and facilitators of effectiveness of empowerment of CHWs; studies conducted before January 2000 and published in languages other than English language; and studies based on conference abstracts and commentaries and out of public health settings in sub-Saharan Africa, are not included.

Data collection and Analysis

Selection of studies: The articles retrieved from searches in each database will be uploaded into Covidence. Two authors (AG&OO) independently screen articles in Covidence. This process involves screening titles and abstracts. Afterwards, full text articles will be screened against the predefined eligibility criteria. To document the selection process, the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) flowchart is used (Panic et al., 2013).

Data extraction and management: Once, full text data screening has been completed, two authors will independently extract data from articles meeting the inclusion criteria. If there are disagreements, the third author will serve as an arbiter. A standardized data extraction form from the Cochrane library will be adapted for this the review (Higgins & Green. 2008). From each article, information such as the (i) authors and publication year, study setting, and study aim or hypothesis; (ii) CHWs empowerment/ intervention details (setting, content, format, duration); (iii) sample characteristics, design and data collection methods, outcome measures; (iv) study findings; (v) CHWs' perceived barrier to and facilitators of effectiveness of empowerment of CHWs engagement in MCH program and building a resilient community will be extracted. Primary authors of included studies will be contacted if essential information is missing or not clear.

Certainty of evidence:

To appraise and summarize confidence in key findings, the GRADE-CERQual ("Confidence in the Evidence from Reviews of Qualitative research") approach will be applied by two authors independently. GRADE-CERQual summary of qualitative findings tables will be used to present results (Li et al., 2020).

Assessment of risk of bias in included studies

Appraisal of study quality: Methodological rigor in this review will be conducted by having two (AG&OO) reviewers independently. To evaluate the qualitative, mixed, or multi-method studies, the reviewers will use the appropriate Critical Appraisal Skills Program checklists. The domains of the CASP checklists will help to assess the credibility of the findings and the rigor of the studies(CASP, n.d.). The use of these questions will aid in guiding the reviewers when critically reading the articles. The tool has ten questions that each focus on a different methodological aspect of a qualitative study. Then reviewers will determine the quality of the questions using three weighting categories: if "Yes and high" quality then the question will weight "1"; if "Yes but moderate (weight below)" quality then the question will weight 0.5; or if "below moderate and No" quality the question will weight "0". Then, to determine the quality of the study the total will be added out of ten. Accordingly, included studies will be assigned an overall score of 'high' (9-10), 'moderate' (7.5-9) or 'low' (less than 7.5) overall quality. Studies will not be excluded based on the quality of the reporting assessment. Rather the results of the appraisal will be used to inform

data interpretation. Differences in the quality assessment will be resolved by discussion among all the authors. The discrepancies will be resolved by discussion with a third reviewer (SY).

Data synthesis: We report the results according to the Cochrane Handbook of Systematic Reviews of Interventions (Higgins & Green. 2008). A PRISMA flowchart will be used to present the process of study selection for both the overview and the systematic review.

Evidence tables of an overall description of the included studies are provided. The evidence tables comprise information such as study setting, country, study type, participant characteristics, review objective and outcome, MCH services type, participant (CHWs) age and sex.

A narrative synthesis has been conducted. This approach is used for synthesis of findings from multiple study designs that depend fundamentally on the use of words and text to summarize and explain the findings of the synthesis(Jahan et al., n.d.; DeSa et al, 2020). Synthesis of data will be described in a narrative synthesis grouped by study type, participant characteristics, review objective and outcome. We will provide a narrative synthesis of the review results (CHWs' perceived barriers to and facilitators of effectiveness of empowerment of community). We will use the 'best fit' framework method as a systematic approach to analyzing the qualitative data Booth &Carroll, 2014; Gale et al. 2013). Framework-based synthesis using the 'best fit' strategy is a highly pragmatic and useful approach for a range of policy related questions and understanding complex context (Dixon-Woods,2011). Framework analysis is a five-stage process that includes familiarization with the data, identifying a thematic framework, indexing (applying the framework), charting and mapping, and interpretation (Ritchie & Spencer,1994). We determine the appropriate framework based on team discussions.

Discussion

This protocol outlines the methodological process of a systematic review that gathers data to examine the determinants of CHWs effectiveness for equitable maternal and child health, and a resilient community health system in Sub Saharan Africa.

Such an evidence base has the potential to provide an opportunity to better plan and implement MCH. Hence, this review will be of value to decision makers, policy makers, practitioners, and

members of the community with interest in supporting the MCH equity and a resilient community health system. Additionally, this review will contribute to the campaign for effective empowerment of CHWs. However, some limitations are anticipated when planning the methodology for this systematic review. Because of the exclusion of studies not published in English language, important data may be missed. This may result in publication bias. The resulting manuscript was published in a peer-reviewed journal and will be disseminated at international and national conferences.

Declarations

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Not applicable

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Author contributions

ATG and SY conceived and designed the protocol. SY and OO led the coordination of the protocol. ATG developed the search strategies in collaboration with a librarian. ATG drafted the manuscript. OO and SY critically revised the manuscript for intellectual content. ATG, OO and SY revised the manuscript and approved the final version. SY had final responsibility to submit for publication.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Competing interests

All authors declare that they have no competing interest.

5.2. Multilevel determinants of community health workers for an effective maternal and child health program in sub-Saharan Africa: Systematic review

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Abstract

Background: Countries in sub-Saharan Africa (SSA) continue to have the highest maternal and under-five child deaths in the world. The ongoing COVID-19 pandemic is amplifying the problems and overwhelming already fragile health systems. Community Health Workers (CHWs) are increasingly being acknowledged as crucial members of the healthcare workforce in improving Maternal and child health (MCH). However, evidence is limited on multilevel determinants of an effective CHWs program using CHWs perspective. The objective of this systematic review is to examine perceived barriers to and enablers of different levels of the determinants of the CHWs' engagement to enhance MCH equity and a resilient community health system in SSA.

Methods: We systematically conducted a literature search from inception in MEDLINE complete, EMBASE, CINAHL complete and Global Health for relevant studies. Qualitative studies that presented information on perceived barriers to and facilitators of effectiveness of CHWs in SSA were eligible for inclusion. Quality appraisal was conducted according to the Critical Appraisal Skills Programme qualitative study checklist. We used a framework analysis to identify key findings.

Findings: From the database search, 1561 articles were identified. Nine (9) articles met the inclusion criteria and were included in the final review. Using socioecological framework, we

identified the determinants of CHW effectiveness at 4 levels: individual/CHWs, interpersonal, community and health system logistics. Under each level we identified themes of perceived barriers such as competency gaps, lack of collaboration, fragmentation of empowerment programs. In terms of facilitators, we identified themes such as CHW empowerment, interpersonal effectiveness, community trust, integration of CHWs into health systems and technology.

Conclusion: Evidence from this review revealed that effectiveness of CHW/MCH program is determined by multilevel contextual factors. The socioecological framework can provide a lens of understanding diverse context that impedes or enhances CHWs engagement and effectiveness at different levels. Hence, there is a need for health program policy makers and practitioners to adopt a multilevel CHW/MCH program guided by the socioecological framework to transform CHW programs. The framework can help to address the barriers and scale up the facilitators to ensuring MCH equity and a resilient community health system in SSA.

PROSPERO registration number: CRD42020206874

Keywords: Community health workers; Maternal and Child Health; Socioecological framework; Multilevel determinants; Sub Saharan Africa

Background

Although there has been increased attention to Community Health Workers (CHWs) led-programs over the past four decades, challenges remain in ensuring Maternal and Child Health (MCH) equity and a resilient community health systems in low income counties including countries in sub-Saharan Africa (SSA) (Perr &Hodgins, 2021; Gebremeskel et al., 2021; Yaya & Ghose, 2021). Despite the progress made, the countries of SSA continue to have the highest child and maternal mortality occurrences in the world and there are substantial inequities in MCH services access and health outcomes within and between countries (Yaya & Ghose, 2021). In the region, health system equity and resilience are undermined when preventable and avoidable systematic conditions constrain life choices and health needs are not adequately addressed (Gebremeskel et al., 2021; Yaya & Ghose, 2021; UNICEF &WHO, 2017).

Health equity exists when all people are able to reach their full health potential and receive high-quality care that is fair and appropriate from each person's perspective, no matter where they live, who they are or what they have (Health Quality Ontario, 2016; Kinney et al.; WHO, 2016). Conversely, health inequities exist when there are preventable differences in health, (Yaya & Ghose,2021; Health Quality Ontario.2016; Kinney et al.; WHO, 2016 which include inequities in MCH outcomes. We argue that absence of resilient community health system has magnified existing substantial inequities in MCH. There are several indices that shows the fragility of the health system in SSA Gebremeskel et al., 2021; WHO, 2007, 2013). Some of these include chronic shortage of health workers, lack of investment in medical and diagnostic supplies, inadequate health information system, poor health infrastructure, and insufficient health finance (Gebremeskel et al., 2021; Yaya & Ghose, 2021; UNICEF &WHO, 2017). Hence it is crucial to ensure equitable and a resilient community health system for optimal, equities and sustainable MCH outcomes in SSA. Health system resilience has been defined as the ability of health actors, institutions, and populations to demonstrate absorptive, adaptive, accessible and transformative capacities to prepare for and effectively respond to health system shocks and disturbances (Gebremeskel et al., 2021; Kruk et al., 2015). SSA countries continue to have the highest maternal and under-five child deaths in the world (Yaya & Ghose, 2021; Ronsmans & Graham, 2010). The coverage and utilization of MCH-related services are lower compared to other regions of the world (Yaya & Ghose, 2021). The ongoing COVID-19 pandemic is amplifying the problems and overwhelming already fragile health systems.(Gebremeskel et al., 2021). A modelling study on the indirect effects of the pandemic in 118 low- and middle-income countries estimated a reduction in maternal health service by at least 18-52% (Roberton et al., 2020). In SSA, a larger proportion of women give birth without any skilled attendants (Yaya & Ghose,2021; UN, 2015).

In addition, about 80% of morbidity and death in children under the age of five occurs before reaching the health facility and health care providers (Roberton et al., 2020). This makes SSA the riskiest region for maternal and under- five child death occurrences in the world. Understandably, this has become a key health challenge in the region and persists as a global public health agenda, to meet the Sustainable Development Goal (SDG) #3. SDG #3 aims to reduce maternal mortality to less than 70 per 100,000 live births (IDRC,2020; Maternal Health Task Force.2017). Since the

Alma-Ata Declaration of 1978, (Perry & Hodgins, 2021) which aimed at achieving universal health coverage by expanding primary health care systems, there have been multiple efforts towards building community health.

These efforts have led to significant national and international action which has substantially contributed to the improvement of health outcomes including MCH, particularly in underserved areas such as SSA (Perry & Hodgins, 2021). One of the crucial cornerstones of primary health-care provision since the Alma-Ata Declaration have been CHWs. CHWs are defined by different organizations including World Health Organization (WHO). For this study we used the definition of CHWs provided by the American Public Health Association. The American Public Health Association definition states that: "A community health worker is a frontline public health worker who is a trusted member of and/or has an unusually close understanding of the community served. This trusting relationship enables the worker to serve as a liaison/link/intermediary between health/social services and the community to facilitate access to services and improve the quality and cultural competence of service delivery." (APHA, 2000, p1).

The WHO noted CHWs, as a key resource to providing basic health services for underserved areas because they help to fill the shortage of primary health service provider at the community level. The significance of CHWs providing basic, essential, and equitable MCH services has been evident in many countries(Perry & Hodgins, 2021;·Perry et al., 2021;·Puett et al., 2013) However, the literature shows that CHWs are experiencing multiple challenges in executing their responsibilities. Some barriers to CHWs' effectiveness are not a product of the health system, but rather arise from the context in which the CHWs work. One context that crucially impacts CHWs' performance and acceptance is the socio-cultural context (USAID, 2015).

There is an increasing body of quantitative literature on the effectiveness of CHWs program intervention. The studies typically focus on a single level of analysis (providers or beneficiaries' level) to measure the outputs and outcome within the context of the WHO health systems building blocks (USAID, 2015;·Blanchard et al., 2019·;Scott et al., 2018·Ballard & Montgomery, 2017) .We argue that these outputs and outcome oriented studies do not indicate how the complex contextual, socioecological factors affect the engagement of CHWs in SSA (Lassi & Bhutta, 2015; Kane et

al.2016). Building on the Center for Disease Control and Prevention (CDC) socio-ecological framework, it is important to place such multilevel determinants into different socioecological levels. The levels are: (i) Health workers individual level knowledge, skills, and attitudes; (ii) Interpersonal factors, such as health personnel collaboration and supportive approach; (iii) Community level factors, such as community acceptability/recognition, trust, and community tradition, value and beliefs; (iv) Health system and logistics related factors, such as health policy, program, human resource/training, financial and material supply chain and logistic approaches. However, in the context of CHWs program, there is limited evidence on a multilevel determinant of CHWs effectiveness based on the lived experience of CHWs perspective. The multilevel determinants include from individual (CHWs competency), to interpersonal, to community and to health system level determinants of effective CHWs program (Perry & Hodgins, 2021; Kok et al., 2015;ˈKruk et al., 2017).

Effective and sustainable CHWs interventions require multilevel context understanding and response based on the lived experience of CHWs. Despite CHWs being the lowest unit (village level) of the public health structure of SSA, there is limited evidence of an analysis framework at the microlevel to capture the multilevel determinants of CHWs engagement. This is a problem as there is a lack of a context specific health system framework that pinpoints the specific barriers to and facilitators of CHWs program (Gebremeskel et al., 2021; WHO,2017; Puett et al., 2013). In 2007, the WHO introduced the health systems building block framework as a global standard, that is widely considered as a national (macro level) health system planning and monitoring framework. The framework's six building blocks include service delivery, health workforce, information, medical products and technologies, financing, and leadership and governance. While community health programs are conceptually and operationally related to specific community settings, the framework neglects context-based community health system building.

Recently there has been growing interest in considering factors defined at multiple levels in public health research and intervention using social-ecological framework. A social-ecological, multilevel framework is particularly appropriate for research designs where data from participants are organized at more than one level. The framework is also ideal for examining how different

levels of determinant of health are interdependent (Roux, 2008;·Wold & Mittelmark, 2018; WHO, 2018; Ostrom, 2010). This kind of approach allows multilevel context understanding and response from individual, to interpersonal, to community and to system level determinants of CHWs engagement.

To our knowledge, no systematic review has addressed the perceived barriers to and enablers of different levels' determinants of the CHWs' effectiveness in SSA. The objective of this systematic review is thus to examine perceived barriers to and enablers of different levels' determinants of the CHWs' engagement in ensuring MCH equity and a resilient community health system in SSA. It is expected that such organized evidence will provide a comprehensive understanding of the multilevel determinants of CHWs' effectiveness. Also, the review findings may inform health policy actors and practitioners to adopt tailored multilevel MCH/CHWs programs guided by a socioecological framework.

This systematic review was guided by the following question: What are the CHWs' perceived barriers to and facilitators of effectiveness of CHWs to ensure MCH equity and a resilient community health system in SSA?

Methods

Registration and reporting

We registered a protocol for this review on PROSPERO (registration ID: CRD42020206874). Hence this review is reported in accordance with the reporting guidance provided in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) statement(Moher et al., 2015)(Appendix :10). This review was conducted following the Cochrane Collaboration Handbook of Systematic Reviews (Higgins & Green. 2008). Our systematic review is organized in accordance with the reporting guidance provided in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Moher et al., 2015) and the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) statement.(Tong et al., 2012)

Eligibility: inclusion and exclusion criteria

This is a qualitative review based on the lived experiences of CHWs providing MCH services in SSA. As such, we included qualitative studies published in English, between January 2000 and September 2021, and in SSA. Since the launch of Millennium Development Goals (MDGs) in 2000, the quality of interventions targeting MCH in low and middle-income countries has improved starkly. This has continued with the launch of the current SDGs in 2015. Hence, 2000 to 2021 represents the period where substantial international resources were channeled towards alleviating the poor state of MCH in developing countries. Included studies were selected based on inclusion and exclusion criteria. The eligibility criteria were organized using the Population, Intervention, Control group, Outcome and Study design (PICOS) framework (Table 1).

Information sources, searching and study selection

Electronic searches: The primary source of literature was based on a structured search of the following major electronic databases: MEDLINE (Ovid), EMBASE, CINAHL and Global Health for relevant peer-reviewed articles published between 2000 and 2021. The search strategies were designed to access published materials in three stages. (i) A limited search of Ovid Medline to identify relevant keywords contained in the title, abstract and subject descriptors. (ii) Terms identified in this way, and the synonyms used by Ovid Medline, EMBASE, CINAHL, and Global Health are used in an extensive search of the literature. (iii) We perused the reference lists of the review eligible full-text articles to identify and include more relevant articles that may have been missed by the databases (e.g., not indexed). The search was designed and conducted by the review team, which includes three experienced public health researchers, in collaboration with a Health Sciences librarian. This team composition and collaboration with the information specialist helped to optimize the searching, retrieval of relevant citations, citation management, source selection, and bias assessment. The search included a broad range of MeSH terms and keywords related to MCH services, CHWs, facilitators/enablers, barriers/challenges, effectiveness, qualitative and mixed method study, and SSA countries, See file 2 for more information on the search strategy.

Screening and selection of studies

The articles retrieved from searches in each database were first uploaded into the Covidence article online management system. Then, two authors (AG&OO) screened the articles in Covidence database for their relevance and eligibility to the review. Specifically, this included title and abstract screening, followed by full-text screening against the eligibility criteria for studies deemed potentially eligible. At both stages, disputes were resolved through discussion. The PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) flowchart was used to document the selection process (Panic et al., 2013).

Assessment of methodological quality

Methodological rigor in this review was conducted by two (AG & OO) independent reviewers to critically appraise the methodological validity of the included studies using the appropriate Critical Appraisal Skills Programme (CASP) checklists. The domains of the CASP checklists was used to assess the credibility of the findings and the rigor of the studies (casp, n.d.). The use of these questions guided the reviewers when critically appraising the articles. The tool has ten questions that each focus on a different methodological aspect of a qualitative study. We used the scoring system developed by Butler et al. (2016) to rate studies as high-, moderate-, or low-quality and report individual study assessments score (see table 3) (Butler et al., 2016). Reviewers determined the quality of the questions using three weighting categories: 1 point for each "yes", 0.5 points for "can't tell" and 0 points for "no". Accordingly, included studies were assigned an overall score of 'high' (9-10), 'moderate' (7.5-9) or 'low' (less than 7.5) overall quality. We did not exclude or weight based on their quality. The results of the appraisal instead were used to inform data interpretation and help confirm the validity of review findings and conclusions. Differences in the quality assessment were first resolved through discussion between AG and OO. In the absence of consensus, the disagreements were reviewed and resolved through discussion with the third reviewer (SY).

Data extraction and management

Following full-text screening, data was independently extracted from the retrieved eligible studies by two of the reviewers (ATG and OO). Disagreements were settled through discussion with a third reviewer (SY). The authors adapted a data collection from a standardized Cochrane library form, based on the needs of the review (Li et al., 2020).

ATG and OO extracted data, including all details specific to the review question required fulfill the requirements for a framework analysis. These details included the following information from each article: authors and publication year, study setting, study objective, data collection methods, number of CHWs participant; different levels of CHWs' perceived barriers to and facilitators of effectiveness of CHWs engagement in MCH program and in building a resilient community health system.

Data synthesis

We used the Cochrane Handbook of Systematic Reviews of Interventions to report the results. A PRISMA flowchart is used to present the process of study selection for both the overview and the systematic review. Evidence tables of an overall description of the included studies, including data from each paper that provided details of study characteristics like included the authors and year, setting, objective, country, study type and participant characteristics/gender are used to build evidence tables for eligible studies to provide an overall description of included studies.

We used the 'best fit' framework method as a systematic and flexible approach in analyzing the qualitative data (Booth & Carroll, 2015;Gale et al., 2013). Framework-based synthesis using the 'best fit' strategy is a highly pragmatic and useful approach for a range of policy related questions and for understanding complex context.(Dixon-Woods, 2011; Flemming et al., 2019). Framework analysis is a five-stage process that includes familiarization with the data, identifying a thematic framework, indexing (applying the framework), charting and mapping, and interpretation(Ritchie & Spencer, 1994). Based on multiple team discussions, we selected the socioecological framework,(Roux, 2008; Wold & Mittelmark, 2018) due to its unique emphasis on multilevel determinants of health intervention success or failure. The socio-ecological framework posits that factors at various levels uniquely and jointly contribute to health interventions. The socio-ecological framework identifies the multilevel determinants perceived barriers to and enablers of CHWs/MCH effectiveness into different levels: individual (CHWs competency), to interpersonal,

to community and to health system level determinants of effective CHWs program (Kok et al., 2015; Roux, 2008; Wold & Mittelmark, 2018; CDC,2020).

A reviewer coded the data into the four levels/ domains of the Socioecological framework (table 4), using a matrix spreadsheet to facilitate analysis; this was verified by a second reviewer. Mapping involved examining the concordant findings, disconformity data, and associations between themes and subthemes. Interpretations were guided by our review objectives as well as the emerging themes. Mapping and interpretation were done through discussion with the entire review team.

Patient and public involvement

As our study is based on secondary data sources, there was no direct patient or public involvement in this research.

Confidence in the Evidence

We used the Confidence in the Evidence from Reviews of Qualitative research (CERQual) tool(Lewin et al., 2018) to assess the confidence of the key findings of this review. We defined a key finding as the analytic output (e.g., multilevel theme, facilitators and barriers) from our qualitative evidence synthesis, based on data from primary studies. CERQual evaluation is based on four criteria: the methodological limitations of the included studies that support a review finding, the relevance of the included studies to the review question, the coherence of the review findings, and the adequacy of the data that contributes to a review finding.

Results

Characteristics of included articles

Figure 1 is the PRISMA flow chart representing the stages of study selection, screening and inclusion process for this review. We imported 1561 references for screening in Covidence, which automatically removed 230 duplicates, leaving us with 1331 studies to screen for title and abstract screening. We assessed 72 studies for full-text eligibility, of which only nine were included

(Musabyimana et al., 2018; Okuga et al., 2015; Naidoo et al., 2019; Dillip et al., 2017; Jackson & Hailemariam, 2016; Giugliani et al., 2014; Kok et al., 2015; Mwendwa, 2016; Ludwick et al., 2018).

Table 2 shows the characteristics of the included studies. Included studies were from six SSA countries: Uganda (2), South Africa (1), Tanzania (1), Ethiopia (2), Angola (1) and Rwanda (2). Most of the studies were conducted in rural health settings and most of the participants (CHWs) were female.

Quality appraisal

Overall, 8 of the studies had a high methodological quality, while 1 had a moderate methodological quality (see table 3). Studies with a moderate quality did not adequately explain the potential bias and the theme analysis process.

Framework analysis: Multilevel perceived barriers to and facilitators of CHWs' effectiveness

Using Socioecological framework analysis (table 4), we identified four levels of determinant of CHWs/MCH effectiveness: individual/CHWs, interpersonal, community and health stream and logistics. The summary of the key themes and subthemes of perceived barriers to and facilitators of multilevel determinants of CHWs' are presented below, for the details see table 4.

Key findings

Our review identified four levels of determinant of CHWs/MCH program effectiveness in SSA. Under each level we identified perceived barriers to and facilitators of CHWs/MCH program effectiveness.

Multilevel perceived barriers to CHWs effectiveness

Our review identified four key themes and eight sub-themes of perceived barriers to CHWs/MCH program effectiveness.

Individual level

Lack of competence

The sub-themes include: (i) Knowledge and skill gap: CHWs had low satisfaction because of the limited trainings content and quality (Musabyimana et al., 2018; Okuga et al., 2015; Naidoo et al., 2019; Dillip et al., 2017; Jackson & Hailemariam, 2016; Kok et al., 2015; Mwendwa, 2016).

*"…we call the Traditional Birth Attendants (TBAs) to assist labour due to the skill gap and [low] confidence we have. …we attend the deliveries with their help" (Kok et al., 2015, p6) (*Kok et al., 2015).

(ii) Lack of motivation: Because of their inadequate training and competence demotivation was noted among the CHWs (Musabyimana et al., 2018; Okuga et al., 2015; Naidoo et al., 2019; Kok et al., 2015).

"CHWs need more motivation, motivation is dropping with time. I think this lack of motivation may increase the turnover rate." (Musabyimana et al., 2018, p5; Musabyimana et al., 2018)

Interpersonal level

Lack of collaboration

The sub-themes include: (i) Weak teambuilding: There was a weak supportive team approach that hindered CHWs deliverables;(Okuga et al., 2015; Naidoo et al., 2019; Dillip et al., 2017; Ludwick et al., 2018).

"The healthcare workers don't support our work at all…they don't respect us at all. They don't think the referrals are important to them; they just throw them away and don't even want to hear about them. They even ask patients whether they think it is the referral we give them that will treat them." (Ludwick et al., 2018, p6; Ludwick et al., 2018)

(ii) Weak communication strategies: There was an absence of effective interpersonnel communication strategies in both personal and Professional settings (Naidoo et al., 2019; Dillip et al., 2017; Ludwick et al., 2018).

"I think we have to know where exactly we must refer a person … or who we must call …" (Naidoo et al., 2019, p8; Naidoo et al., 2019).

Community level

The socio-cultural influence

The sub-themes include:

(i) Cultural beliefs and practices: Pregnancy and newborns are surrounded by many cultural beliefs and traditional practices (Okuga et al., 2015; Naidoo et al., 2019; Jackson & Hailemariam, 2016).

"… sometimes the mother doesn`t open the home for you…, and sometimes even if you go to the home, rocks are thrown at you" (Naidoo et al., 2019, p6; Naidoo et al., 2019).

(ii) Gender prejudice: *Gender* is a sociocultural construct that refers to the characteristics of women and men. Gender norms and roles affected MCH service utilization in some cases. For instance, pregnancy and newborn are surrounded by many cultural beliefs and traditional practices.(Kok et al., 2015; Jackson & Hailemariam, 2016) Some pregnant women prefer to give birth at the health post where the female CHWs work, but those CHWs have no training and equipment to provide delivery service (Kok et al., 2015; Jackson & Hailemariam, 2016).

"At the health post (where a female CHWs work), they can tell us their secrets like a sister—they can't talk about these things to people they don't know …" (Jackson et al., 2016, p 475; Jackson & Hailemariam, 2016).

Health system and logistics level

Fragile health and logistics system

The sub-themes include: (i) Fragmentation of empowerment of CHWs program: Fragmentation of empowerment of CHWs program was due to various factors: insufficient and lack of continuity of coordination of CHWs/MCH program; training and professional development strategy; motivation strategies; referral and supportive supervision that can directly or indirectly affect the MCH service accessibility and health outcome policy/system (Musabyimana et al., 2018;Okuga et al., 2015;Naidoo et al., 2019;Dillip et al., 2017;Jackson & Hailemariam, 2016;Giugliani et al., 2014;Kok et al., 2015;Mwendwa, 2016;Ludwick et al., 2018).

"Almost one year now and I do not have a referral book; sometimes I just write the referral on a piece of paper…" (Naidoo et al., 2019, p.5; Naidoo et al., 2019).

(ii) Logistics and basic supply/resource challenge: CHWs experienced multiple challenges to undertake their work and their effectiveness. These challenges include lack of essential medical devices, lack of office materials for the job, limited access to ambulance service, transportation challenge and absence of health facility in the neighborhood and the like (Musabyimana et al., 2018; Okuga et al., 2015; Dillip et al., 2017;Jackson & Hailemariam, 2016;Giugliani et al., 2014;Kok et al., 2015; Mwendwa, 2016).

"When you make promises and do not deliver on these promises, this begins to discredit our work. "Give me a mosquito net?" "No, next week we'll bring" successively and we start to lose that confidence from our families." (Giudlian et al., 2014, p8; Giugliani et al., 2014).

"Mothers at times deliver on the way to the health centre before an ambulance comes.'' (Mwendwa 2016, p11; Mwendwa, 2016).

Multilevel perceived facilitators of CHWs effectiveness

Our review identified four key themes and eight sub-themes of perceived facilitators of CHWs/MCH program effectiveness.

Individual level

CHWs empowerment

The sub-themes include: (i) Continuous training and professional development strategy: *Continuous training and* professional development empowered CHWs by raising their competency, job satisfaction and work outcomes (Naidoo et al., 2019; Dillip et al., 2017; Giugliani et al., 2014). (ii) Mobile technology access and use: CHWs were very pleased to use technology to enhance their performance on MCH(Musabyimana et al., 2018; Mwendwa, 2016).

"Using RapidSMS "We can send a message in case the mother has a problem because there is a code for that" (Mwendwa,2016, p5; Mwendwa, 2016)

(iii) Positive attitude: Our review revealed CHWs love their job and are willing to provide service for their community (Musabyimana et al., 2018; Naidoo et al., 2019; Kok et al., 2015).

"…they [the clients] are our mothers as well, and we are serving our own community. Their children are our children, and the community is my community." (Kok et al, 2015, p4; Kok et al., 2015).

Interpersonal level

Interpersonal effectiveness

The sub-themes include: (i) Interpersonal Trust: CHWs are *trusted* by the community they serve, there is a mutual trust between CHWs and the community (Okuga et al., 2015'; Dillip et al., 2017; Jackson & Hailemariam, 2016).

"… The kebele officials and the community give a witness about their satisfaction." (Kok et al., 2015, p6; Kok et al., 2015).

(ii) Supportive supervision: CHWs had a positive attitude towards supportive supervision, as it provided opportunity for constructive feedback, mentoring and motivation(Kok et al., 2015; Ludwick et al., 2018).

"If the woreda (district) supervisors come and see our work, we will be happy. We need encouragement from the woreda officials. We will be encouraged by the appreciation for our good work, but our morale will be affected if our good work is ignored." Kok et al., 2015, p7; Kok et al., 2015).

Community level

Institutionalization of community engagement

The sub-themes include: (i) Community participation: Community ownership developed through engaging the various social structures that exist in the community; (Okuga et al., 2015; Jackson & Hailemariam, 2016; Kok et al., 2015).

"Sometimes the community with the kebel (village) administration gather and evaluate our performance… The kebele officials and the community give a witness about their satisfaction." (Kok et al.,2015, p6; Kok et al., 2015).

(ii) Culturally relevant health access: CHWs capitalized on social networks to identify pregnant women who would become new clients, learn about births and child heath (Okuga et al., 2015; Jackson & Hailemariam, 2016; Kok et al., 2015).

"We are like family. … I learnt that they prefer us to the others at the health center. We go home to home, and we know how people live...Women feel comfortable with us…once I explained to a

woman that she should go to the health center because it is a good facility. She replied that she preferred the friendly approach and not the facility" (Jackson et al.,2016, p 475; Jackson & Hailemariam, 2016).

Health system and logistic level

Integration and Technology

The sub-themes include:

(i) Integration of CHWs into health systems: This describes different interconnecting levels' of health system service, supply chain, data sources for better health access and outcome;(Okuga et al., 2015;Dillip et al., 2017;Jackson & Hailemariam, 2016).

"Now the community recognizes us because in the past we were only providing service to specific program, but now we are dealing with almost every health system" (Dillip et al., 2017, p6; Dillip et al., 2017).

(ii) Digital initiatives: It was an initiative that demonstrated the integration of technology into CHWs program to enhance MCH service outcome and information access. RapidSMS is helping in achieving location, information, context and time challenges.(Musabyimana et al., 2018; Mwendwa, 2016).

"RapidSMS has helped a lot to prevent maternal, child and neonatal death…"(Musabyimana et al., 2018, p.5;Musabyimana et al., 2018).

Confidence in the evidence: We did an assessment of confidence using the four CERQual components: Methodological, coherence, adequacy and relevance as indicated on the protocol. Summarized description related to methodological, adequacy and relevancy related concerns are indicated on table 5 (see table 5). The GRADE-CERQual confidence in this finding ranged from very low confidence moderate confidence (see table 5). Confidence levels were downgraded due

to methodological limitations, lack of multilevel design and analysis of determinant of CHWs effectiveness based on the lived experience of CHWs.

Discussion

To our knowledge, this is the first review that has attempted to examine the multilevel determinants of CHWs/ MCH effectiveness to enhance MCH equity and a resilient community health system in SSA. Using socioecological framework analysis (table 4), we identified four levels' of CHWs/MCH program determinants: individual/CHWs, interpersonal, community and health stream and logistics. Under each level we identified perceived barriers to and facilitators of CHWs/MCH program effectiveness. Despite the significant body of research on the topic, few studies examined multilevel determinants of CHWs based on lived experience of CHWs/MCH in SSA. There is a need to capture the CHWs experience and voice in order to better inform CHWs and a resilient community health system based on context.

Addressing the multilevel barriers

The perceived barriers at the individual level, indicate that CHWs felt incompetent due to lack of knowledge, skill and motivation to provide MCH service effectively and confidently (Musabyimana et al., 2018; Okuga et al., 2015; Naidoo et al., 2019; Dillip et al., 2017; Jackson & Hailemariam, 2016; Kok et al., 2015; Mwendwa, 2016; Ludwick et al., 2018).

This finding is mostly consistent with previous primary and secondary studies conducted in Africa and internationally.(Gebremeskel et al., 2021; Long et al., 2018; Kok et al., 2017). Despite the importance of CHWs as frontline workers in the primary health system, evidence from CHW programs shows that these health workers often lack the knowledge necessary to safely and effectively perform their responsibilities (Puett et al.,2013). However, there is no universal standard regarding the level of training required for CHWs and their scope of service. CHWs find it difficult to adopt and use digital health solutions due to insufficient training on new digital tools, weak technical support, issues of internet connectivity, and other administrative related challenges(Gebremeskel et al., 2021;Feroz et al., 2021). As evidenced in this review, a high workload was reported by CHWs, and this resulted in lower motivation and ultimately lower performance (Kok et al., 2015). Hence, sustainable empowerment is crucial to address the challenge of CHWs' empowerment. In particular, sustainable empowerment can help to provide

CHWs with the resources, authority, opportunity, and motivation to enhance their performance, as well as hold them accountable for their actions and improve their proficiency.

In terms of perceived barriers to the interpersonal level, our review identified poor team work, poor collaboration and insufficient communication mechanisms between health system actors and CHWs(Okuga et al., 2015;Naidoo et al., 2019;Dillip et al., 2017;Ludwick et al., 2018). Our finding is consistent with a study conducted in South Africa, where some CHWs described a good relationship between CHWs and professional health workers. Other CHWs in the study reported that their referrals were not accepted by clinic staff, and that some clinic staff lacked confidence and trust in CHWs ability to provide appropriate services(Tseng et al., 2019). CHWs need to collaborate and communicate with other health system workers in ways that promote connectivity and enhance MCH outcomes. Also, as health brokers between the community and health systems, CHWs need effective communication skill. Building a strong collaboration among all level health workers can enhance CHWs inclusiveness and increases their job motivation(Tseng et al., 2019). Developing shared and common goals, building effective working relationships, reducing the ambiguity of team members' role and mutual accountability are some of the ways in which an effective team building between CHWs and other members of the health system can be achieved (Kok et al., 2015; Kok et al., 2017). Despite the importance of effective communication to build trust, there is a lack of specific evidence on the interpersonal skills CHWs necessary for their interaction within the health system and collaboration with community and other stakeholders.

In terms of perceived barriers to the community level determinants of CHW's effectiveness, socio-cultural context was identified as key influencer of MCH service utilization (Naidoo et al., 2019; Okuga et al., 2015; Jackson & Hailemariam, 2016; Naidoo et al., 2019; Okuga et al., 2015; Jackson & Hailemariam, 2016) . Some barriers to CHW's effectiveness are not a product of the health system itself, but rather arise from the context in which the CHWs work. Socio-cultural context can affect CHWs' performance and acceptance (Long et al., 2018;Kok et al., 2017). According to a study conducted in Ethiopia, a number of women in the community preferred to give birth at home assisted by TBAs, rather than soliciting the support of CHWs during labour or birth (Jackson & Hailemariam, 2016). TBAs were more culturally accepted. In addition, gender prejudice is another impediment to access MCH. Our findings show that pregnant women

expressed preference for female CHWs to attend to their health needs and had low interest to be seen by male health workers at the health center(Jackson & Hailemariam, 2016;Kok M.C. et al., 2015). From the health service supply perspective, addressing the community level barriers requires a strong state-society synergy to focus on a resilient community health system building and to focus beyond specific short term CHWs program outcomes. In addition, from the health service demand perspective, such problems also need to be addressed in the framework of social determinants of MCH(Hamal et al., 2020).

At the structural level, fragmentation of empowerment strategies relating to CHW/MCH programs was identified as a key barrier of CHWs program effectiveness in this review(Musabyimana et al., 2018;Okuga et al., 2015;Naidoo et al., 2019; Dillip et al., 2017;Jackson & Hailemariam, 2016; Giugliani et al., 2014;Kok et al., 2015;Mwendwa, 2016;Ludwick et al., 2018) . Previous studies have identified those manifestation as a lack of empowerment and cause of underperformance of CHWs(Long et al., 2018;Gebremeskel et al., 2021; Kruk et al.,13; Puett et al., 2013;Chandani et al., 2012;Atuoye et al., 2015).

However, we argue that it is not the lack of empowerment, but rather the fragmentation of empowerment strategies that undermines the efforts and performance of CHWs and MCH outcomes. Thus, the fragmentation of empowerment strategies relating to CHW/MCH programs is one of the major causes of the fragile health and logistics system in SSA. Fragility is the insufficient capacity of the state, system and/or communities to manage, absorb or mitigate risks(Gebremeskel et al., 2021).

The fragmentation of CHWs empowerment strategies is linked with the lack of health system level thinking and insufficient budget allocation by countries in SSA and international donors. Therefore, there is a need for countries in SSA and international health initiatives to streamline their funding to build a resilient health system and ensure that CHWs programs are well funded. There is also a need for actors in the CHWs program to implement a strong context-based CHWs' program planning and monitoring system to ensure the creation of a more resilient community health system.

Enhancing the multilevel facilitators

Scaling up the success factor of CHWs program is a path to transforming CHWs programs while ensuring MCH equity in the era of SDG and beyond. At the individual level CHWs need sustainable empowerment to enhance their professional capability and to deliver improved MCH services through continuous on professional development strategy, and digitally supported approach(Musabyimana et al., 2018;Naidoo et al., 2019; Dillip et al., 2017;Giugliani et al., 2014;Mwendwa, 2016). This review showed that effectiveness of CHWs engagement is associated with discrete incentives and intrinsic motivation that corresponds with their job demands, complexity, number of hours worked, training, and the roles they undertake(Kok et al., 2015;Perry et al., 2021;Schaaf et al., 2020;Colvin et al., 2021)

The perceived facilitator of CHWs effectiveness relating to the interpersonal level including interpersonal trust, peer support and supervision were positively related to CHWs performance (Okuga et al., 2015;Dillip et al., 2017;Jackson & Hailemariam, 2016;Kok et al., 2015;Ludwick et al., 2018). CHWs are enthusiastic about providing related services, and pregnant women and their families are willing to listen to the CHWs and to respond to referral. CHWs are a trusted members of the communities they serve (Enguita-Fernandez C. et al., 202;Singh et al., 2015). In the literature mutual trust between CHWs and patients has proven to facilitate smooth delivery of CHWs' work, and to lead to better satisfaction(Kok et al., 2017;Singh et al., 2015). Hence, CHWs have the potential to serve as catalyst to improve health service utilization. Some community members do not trust the CHWs for the reason that they are not adequately trained to handle some health related confidentiality (Grant et al., 2017). In a multi-site study based in Bangladesh, Ethiopia, Indonesia, Kenya, Malawi and Mozambique, the authors found that the lack of trust led to lower CHW motivation and performance. Supportive on-site visits, mentoring and feedback can enhance the motivation and performance of CHWs. In South Africa, supervisors raised communication skill of CHWs through mentoring and feedback (Tseng et al., 2019).

In terms of perceived facilitators at the community level, the review highlights the importance of institutionalization of community engagement for better CHW/MCH program effectiveness (Okuga et al., 2015;Jackson & Hailemariam, 2016; Kok et al., 2015). CHWs have an intermediate

position, bridging the community and the health system, and act as cultural brokers and social change agent (Schaaf et al., 2020). Institutionalization of community engagement is key to enhancing community participation while planning, promoting, and monitoring community-based health systems. In several studies, embedment of CHWs in community was found to improve the health system performance and outcome performance and credibility (Kok et al., 2015a;,Perry et al., 2014). Such engagement could help the realization of social accountability, culturally relevant health access and overcoming some of the sociocultural barriers identified by this review (Jackson & Hailemariam, 2016;Kok et al., 2015b) For example CHWs in Uganda felt that they needed increased support from community leaders in order to alleviate community stigma toward family planning(USAID,2015). However, there is insufficient evidence on institutionalization of community engagement, in the context of a strong state-society relations to scale up the success lessons and address the failure at local community health system.

Regarding structural level of determinants of CHWs, our review identified integration of CHWs program into health systems and digital technology initiatives as a perceived facilitator of CHWs effectiveness in improving MCH access (Dillip et al., 2017;,Jackson & Hailemariam, 2016;,Okuga et al., 2015). Integration of CHWs into the health system is among the key factors of a successful CHW program (Lehmann et al., 2019). Increasingly, health systems are shifting tasks formerly performed by clinic staff to CHWs as a strategy to resolve human resources shortages (USAID,2015). On the other hand, effective integration of CHWs into the health system requires working with multisectoral stakeholders. For example in Tanzania integration has not been optimal because of inadequate planning, logistic and technical resource constraints (Mgawe & Maluka, 2021). More evidence are needed on integration of CHWs into the health system for evidence based policy and scaling up the good practices(Cometto et al., 2018). In addition, our review highlights empowering CHWs with technology solutions is showing a promising result; mHealth has considerable potential to reach many individuals, even in settings with limited infrastructure and human resources(Musabyimana et al., 2018;,Mwendwa, 2016). Our finding is consistent with other findings (Buehler et al., 2013;,Feroz et al., 2021). Digitally supported CHW programs have been shown to increase CHW performance across a range of geographical locations and contexts.

For example, escalating mobile-based reminders resulted in an 86% reduction in the number of days a CHW's routine visits were overdue(Feroz, Khoja & Saleem,2021;DeRenzi et al., 2012).

Overall, the socioecological framework provided a lens for understanding the diverse context that impedes or enhance CHWs engagement and effectiveness at different levels.

Limitation and strengths

This study has multiple limitations that can create publication bias. First, we excluded CHWs studies not reported in the English language, which can result in the exclusion of valuable data from research based in other languages, such as French, Swahili or Arabic. We have no studies from West African countries. The second limitation is that data for the study was only retrieved from four online databases, including MEDLINE, Global Health, Web of Science, and EMBASE. Despite using a rigorous search strategy, our review resulted in few qualitative studies based on the lived experiences of CHWs.

Nevertheless, our systematic review has identified multilevel perceived barriers to and facilitators of CHWs/MCH effectiveness. One of the strengths of this review is that the process undertaken was systematically documented, enabling the audience to assess for bias and credibility. The iterative step by step process adhered to when conducting this study, as stipulated in the methodology section of this review, enabled the minimization of possible bias at the various stages involved. Such an evidence base has the potential to provide an opportunity to better plan and implement and improve MCH. Hence, this review would be of value to decision makers, policy makers, practitioners, and members of the community with interest in supporting the MCH equity and a resilient community health. Additionally, this review would contribute to the campaign for transformation of CHWs through tailored multilevel intervention and sustainable CHWs empowerment strategies to address the barriers and enhance the facilitators of MCH equity and a resilient community health system.

Conclusion

In SSA, the transformation of CHWs programs should be a priority to ensure MCH equity and a resilient health system in the era of SDG and beyond through adopting tailored multilevel MCH/CHW program guided by the socioecological framework. Our study has revealed that the effectiveness of CHWs is determined beyond a particular WHO health system building blocks; multilevel reinforcing and interdependent contextual factors determine the effectiveness of CHWs. Effective CHWs programs require an understanding of the multilevel socioecological context of the CHWs to address the system-wide contextual barriers and to scale up the facilitators. The findings from this review have several implications for future policy and research on CHWs/MCH program planning, empowering, and monitoring. However, from a socio-ecological perspective and what can be inferred from the studies included in this review, future research should focus on multilevel interventions, impact of fragmentation of empowerment on CHW/MCH program, trust building, culturally relevant MCH access, and improving poor referral systems to enhance MCH equity and a resilient community health system.

Declarations

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Author contributions

ATG conceived the paper, conducted the study and wrote the manuscript as part of his doctoral project that aims to organize evidence on paths to transform CHWs program to enhance MCH equity and a resilient community health system in Ethiopia/SSA; ATG developed the search strategies in collaboration with a librarian; ATG and OO conducted the screening, extraction and quality appraisal of studies; SY and OO supervised the study, guided the writing of the manuscript and critically reviewed the manuscript for intellectual content; All authors read, reviewed and approved the final manuscript; SY had final responsibility to submit for publication.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Competing interests

All authors declare that they have no competing interest

5.3. **Unpacking the challenges of fragmentation in community-based maternal newborn and child health and health system in rural Ethiopia.**

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Abstract

Introduction

In Ethiopia, country-wide community-based primary health programs have been in effect for about two decades. Despite the program's significant contribution to advancing Maternal Newborn and Child Health (MNCH), Ethiopia's maternal and child mortality is still one of the highest in the world. The aim of this manuscript is to critically examine the multifaceted fragmentation challenges of Ethiopia's Community Health Works (CHWs) program to deliver optimum MNCH and build a resilient community health system.

Methods

We conducted a qualitative case study in West Shewa Zone, rural Ethiopia. A purposive sampling technique was used to recruit participants. Data sources were two Focus Groups Discussions with sixteen CHWs, twelve Key Informant Interviews with multilevel public health policy actors, and a policy document review related to the CHW program to triangulate the finding. Thematic analysis of the qualitative data was conducted. The World Health Organization's building block framework and socio-ecological model guided the data collection, analysis, and interpretation.

Results

The CHWs led program has been an extended arm of the primary health system and has contributed to improved health outcomes. However, the program has been facing unique systems challenges that stem from the fragmentation of: health finance; medical and equipment supply; working and living infrastructures; CHWs empowerment and motivation, monitoring, supervision, and information; coordination and governance, and community and stakeholder engagement. The ongoing COVID-19 and volatile political and security issues are exacerbating these fragmentation challenges.

Conclusion

This study emphasized the gap between the macro (national) level policy and the challenge during implementation at the micro (district)level. Fragmentation is a blind spot for the community-based health system in rural Ethiopia. We argue that the challenges of community health program components fragmentation are exacerbating the fragility of the health system and driving the fragmentation of MNCH health outcomes. This is a threat to sustain the MNCH outcome gains, the realization of national health goals, and the resilience of the primary health system in rural Ethiopia. We recommend that beyond the current business-as-usual approach, it is important to better understand the complexity of the community-based health system fragmentation challenges. The challenges can be addressed through the adoption of transformative and innovative approaches including capitalizing on multi-stakeholder engagement and health in all policies in the framework of co-production.

Keywords: Maternal Newborn and Child Health (MNCH), Health Extension Program, Community Health program, Fragmentation, Ethiopia, sub-Saharan Africa

Introduction

Improving Maternal, Newborn, and Child health (MNCH) outcomes has been an essential part of global health initiatives such as the Millennium Development Goals and the Sustainable Development Goals (SDGs) (UN,2015; Brizuela & Tunçalp, 2017). There is a critical need to reinforce and optimize health systems in Sub-Saharan Africa (SSA)The reason for this is to respond to poor MNCH outcomes, achieve SDG #3, and ensure a resilient community health response (Kruk et al., 2018) in the face of the ongoing COVID-19 pandemic and other public health emergencies (UN,2015; Brizuela & Tunçalp, 2017). SDG # 3 seeks to ensure "healthy lives and to promote the well-being of all at all ages" (UN,2015, p.14). Specifically, major targets of this goal are devoted to MNCH: to reduce maternal mortality to less than 70 per 100,000 live births; to reduce newborn mortality to as low as 12 per 1,000 live births in every country; and to reduce Under-5 Mortality Rate (U5MR) to as low as 25 per 1,000 live births in every country(UN,2015; Brizuela & Tunçalp, 2017).

Despite significant progress in expanding community health services, gaps remain in improving access to MNCH for populations in resource-poor countries, particularly in SSA countries including Ethiopia. The global Maternal Mortality Ratio (MMR) saw a reduction of 34 percent between 2000 to 2020 and U5MR reduction of 59 percent between 1990 and 2021 (UN IGME,2021). However, despite the progress, SSA countries continue to have the highest MMR and U5MR occurrences in the world and this has become a key health systems challenge in the region (WHO et al., 2015; Yaya & Ghose, 2019).

Ethiopian U5MR stands at 67 deaths per 1,000 children and MMR stands at 412 per 100,000 live births (USAID,2020). To achieve the SDGs, Ethiopia must reduce neonatal deaths from 67 to 12 per 1000 live births and maternal deaths from 412 to 70 per 100,000 live births in an environment of increasingly constrained health resources. This is one of the most daunting and urgent

challenges facing the country as it seeks to ensure equitable MNCH and a resilient community health system. Worldwide, the pandemic is amplifying the problems of an already overwhelmingly fragile health system (USAID,2020). According to World Health Organization (WHO,2020), COVID-19 could reverse decades of progress toward eliminating preventable maternal and child deaths. Without a resilient health system, it will be impossible to achieve needed levels of MNCH outcomes during this era of the SDGs (USAID,2020).

Ethiopia was one of the early adopters of the Alma Ata Declaration of primary health care in 1978(WHO,1978). The declaration emerged as a milestone towards addressing health system challenges and gross health inequalities between and within countries. The WHO identified Community Health Workers (CHWs) as a key resource to providing basic health services for underserved areas because they help to fill the shortage of primary health service providers at the community level (WHO,1978).

Since this time, CHWs programs have made significant contributions to enhancing access to basic primary health, especially for the disadvantaged, remote, and rural population. The promising outcomes of CHWs in providing equitable MNCH services is noticeable in SSA and internationally(Perry & Hodgins, 2021) as dramatic mortality and morbidity reductions have been achieved in MNCH.

In the last two decades, Ethiopia has made various attempts to achieve universal primary health care and aspires to achieve Universal Health Coverage (UHC) by 2035 (MoH, 2021). Between 1995 and 2015, the country successfully completed the first 20-year Health Sector Development Programme (HSDP). This program shifted the health system focus from predominantly curative to more preventive and promotive care, and it prioritized the needs of rural inhabitants, who make up 83% of the Ethiopian population (Health, 2021). In 2015, the government introduced its second 20-year strategy, the health sector transformation plan, focusing on primary health care aligning with SDG #3 (Teklehaimanot & Teklehaimanot, 2013).

Ethiopia launched the CHWs' Health Extension Program (HEP) in 2003 (Teklehaimanot & Teklehaimanot, 2013) as a key resource to enhance MNCH equity and provide basic health

services for people in underserved rural areas where most of the population lives. The CHWs/ HEP is a nationwide community-based health program that integrates health workers into the national health system through two to three years of collage level training. CHWs are full-time employees. In agrarian areas of the country two salaried HEWs, who are women, cater to an average of 3000 to 5000 people per village (*kebele*) and have designated equipped Health Post (HP). The program was originally designed to provide over 16 packages of essential health promotion, disease prevention and selected curative services (Assefa et al., 2019a). Most of the CHWs' role is associated with the provision of MNCH services including screening pregnant women, referring them to health centres for ANC services, delivery, Postnatal Care (PNC), breastfeeding, vaccination/ immunization, family planning, hygiene and sanitation(Werner et al.,2023). In Ethiopia, CHWs are also known as health extension workers (HEWs). HEWs are the frontline health workers for Ethiopia's primary health care system(Assefa et al., 2019a; Werner et al.,2023; Teklehaimanot & Teklehaimanot, 2013). We will use HEWs and CHWs interchangeably in this manuscript.

Over the course of two decades, multiple efforts have been made to enhance the responsiveness of the CHWs program including expansion to pastoralist and urban settings, improving community participation, and expansion to provide treatment of uncomplicated conditions. In 2020 the Federal Ministry of Health (MoH) launched a roadmap for optimizing the HEP through redefining health service packages, task shifting, and changing the professional mix to join Lower Middle-Income Countries (LMICs) in the goal to achieve UHC by 2025. The program has grown to encompass 18 essential health service packages with a work force of 40,000 HEWs working from more than 17,000 HP (Assefa et al., 2019a; Werner et al.,2023; Teklehaimanot & Teklehaimanot, 2013). Throughout history, although often under a different name, HEWs/CHWs have been instrumental in providing communities with education on a myriad of issues. They also serve as key connections to various social services and healthcare resources (Werner et al.,2023). A fundamental characteristic exuded by CHWs is their capacity to bring cultural relevance and sensitivity to each interaction. Because CHWs tend to come from the same communities they serve, they play a key role in insular settings where communities may experience fear and lack of trust. CHWs have the unique ability to distill the complexities for community members as they attempt to enter the healthcare system(Werner et al.,2023; Gebremeskel et al., 2021; Health, 2021; WHO et al., 2015).

The Ethiopian CHWs/HEP program is the component of the primary health system at the community level that reaches rural communities by recruiting and training paid CHWs (Teklehaimanot & Teklehaimanot, 2013). The primary healthcare units is designed to serve approximately 25,000 people. The country has a top-down decentralized model for the delivery of healthcare along political structures, with shared government responsibilities between the Federal MoH, the regional health bureaus, zonal health offices, and woreda(district) health offices. The health sector is structured into a three-tier system: tertiary care, provided at specialized hospitals; secondary care, provided at general hospitals with inpatient and ambulatory services; and primary healthcare (primary hospitals, health centers, rural regions, CHWs)(Assefa et al., 2019a; Teklehaimanot & Teklehaimanot, 2013).

Ethiopia has achieved remarkable health outcomes in the last two decades and CHWs/ HEWs are one of the major contributors of the success. The achievements include a 5% increase (from 39% in 2016 to 44% in 2019) in the percentage of children age 12-23 months who received all basic vaccinations; the reduction of neonatal mortality rates from 49 per 1000 live births in 2000 to 30 per 1,000 live births in 2019; a decline in U5MR from 123 deaths per 1,000 live births in 2005 to 59 deaths per 1,000 live births in 2019. Receipt of Antenatal Care (ANC) and institutional delivery has gone up from 27% and 5% in 2005 to 74% and 48% in 2019 respectively. The proportion of women with the recommended four or more ANC visits increased from 12% in 2005 to 43% in 2019 (EPHI,2019).

Despite the progress that has been made, in Ethiopia's MNCH outcomes are still the worst compared to other countries, including SSA countries. Based on the Demographic and Health Survey in 2019(18), there is a fragmentation in MNCH outcomes. Ethiopia has a large burden of communicable diseases and still has a MMR of 412 per 100,000 live births and U5MR of 67 per 1,000 (USAID. 2020). For example, while a higher proportion (74%) of mothers received the first ANC, only 43% received the recommended four or more ANC. Also, Skilled Birth Attendance (SBA) during childbirth is 48% PNC is at 34% of women age15-49(EPHI, 2019).

We argue that the CHWs program was organized to improve MNCH health outcomes while ignoring the need to build a sustainable and a resilient health system. Evidence suggests that the Ethiopian health system is in a fragile state (WHO, 2017). The system is not providing sustainable quality service, nor has it evolved to meet increased demands. High rates of inequities persist within the country in terms of health access and health outcomes. In Ethiopia, like in many other LMICs, the rural community health program has a complex political economy, consequently, huge disparities in the availability and utilization of MNCH services, and MNCH outcomes exist between rural and urban residents (Woldemichael et al., 2019;WHO, 2017). Inequality in MNCH outcomes is increasing over time, the demand side factors that drive inequality in MNCH outcomes in Ethiopia include low-economic status, illiteracy, rural residence, no occupation, and lack of access to mass media(Woldemichael et al., 2019; WHO, 2017). The most disadvantaged women are the poor, rural residents, uneducated, unemployed, and those with low access to information(Woldemichael et al., 2019; World Health Organization & Research, 2017).The health program has overwhelmingly failed to address the quantity and quality of health workers (MERQ, 2020;WHO,2017). The CHWs program continues to experience multiple challenges to enhance health outcomes (Assefa et al., 2019b; Gebremeskel et al., 2021; Liu et al., 2011; Mhlongo et al., 2020; WHO, 2021; Perry & Hodgins, 2021).

We argue that health system, primary health program fragmentation is becoming a common challenge, but its magnitude and primary causes may differ. Fragmentation could be described in different ways from different aspects of the health sector and beyond. For example, from a healthcare perspective, fragmentation means having multiple decision-makers make a set of healthcare decisions that would be made better through unified decision-making (Elhauge, 2010). In the context of the CHWs program, ‘fragmentation’ is the interruption, glitches, and aborts of means of delivery of optimum MNCH and foundations of CHWs. Fragmentation manifests itself as a lack of coordination and consistency among the different levels, settings, organizations, functions, coordinated financial and resource management/governance systems, comprehensive engagement approach, and system thinking to ensure reliable and sustainable service and outcomes(Barr et al., 2019; PAHO/WHO,2011; PAHO/WHO,2022). It may occur in settings where public health decisions are made based on limited or lack of evidence(Dureab et al., 2021).

Many health systems in LMICs remain fragmented(Global Cancer Institute, d.-a), however community based health program fragmentation is less acknowledged among researchers and policy actors. Fragmentation has been discussed in global health literature, agendas, between prominent global health actors, and even in strong economies but often from a high-level perspective (Dureab et al.,2021). Fragmentation is an underlying problem, it is a barrier to advancing UHC and a challenge to achieving SDGs(Spicer et al., 2020; Stange, 2009; WHO, 2018). Fragmentation by itself or in conjunction with other factors can lead to complications in access to services or delivery of services, inefficient use of resources and increases in production costs (PAHO/WHO,2011).

The fragmentation of essential pillars of the CHWs program is disruptive and problematic. Although efforts and debates continue regarding how to achieve reduction in adverse MNCH outcomes inline with the SDGs, there is little but necessary evidence on what drives or causes fragmentation in health system. While the challenges of the CHWs program are multilevel and multidimensional, the existing evidence focuses on CHWs outcome, knowledge, and performance/role of HEWs, and effectiveness of CHWs. There are also quantitative and qualitative studies based on particular projects or sites, however, they do not consider the multilevel and multidimensional context of the CHWs program (Gebremeskel et al., 2021; Woldemichael et al., 2019; WHO, 2017; Yitayal et al., 2014; Gebrehiwot et al., 2015; Jackson & Hailemariam, 2016; Medhanyie et al., 2012). Comprehensive evidence on the multilevel and multifaceted challenges affecting the CHWs program effectiveness is limited. Furthermore, there is limited evidence on the ways in which the CHWs program fragmentation challenges have harmed and continue to harm MNCH, and the resilience of the community health program. The aim of this manuscript is to critically examine the multifaceted fragmentation challenges of Ethiopia's CHWs program to deliver optimum MNCH and build a resilient community health system.

Theoretical framework

Our study was guided by different theoretical frameworks which informed the research processes and research questions. First, we used the Socio-Ecological Model (SEM) to inform the description of the multilevel determinants of the CHWs program's effectiveness (Gebremeskel et al., 2021;

CDC,2020). The SEM posits that factors at various levels uniquely and jointly contribute to health interventions. The levels are: (i) Health workers individual level which includes their knowledge, skills and attitudes; (ii) Interpersonal factors, such as health personnel collaboration and supportive approaches; (iii) Community level factors/informal institutions, such as community acceptability/recognition, trust, and community tradition, value and beliefs; (iv) Health system and logistics related factors, such as health policy, program, human resource/training, financial and material supply chain and logistic approaches (Gebremeskel et al., 2021; Roux, 2008; Wold & Mittelmark, 2018).

Second, our study was informed by the WHO's (2007) health system framework, a leading structure of discourse on health systems building. The framework comprises six operational building blocks—service delivery, health workforce, information, medical products and technologies, financing, and leadership and governance, it however falls short in including macrolevel community context and engagement. Despite this limitation, the framework's relevance is recognised by policymakers, programmers and researchers in national and global health and has become common for planning, implementation, and evaluation(Gebremeskel et al., 2021).

Our findings were reported based on the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Appendix 14).

Methods

Study design

This study is a qualitative case study using document reviews, Focus Group Discussions (FGDs)) and Key Informant Interviews (KII). Qualitative case study is a research methodology that helps in the exploration of a phenomenon within some particular context. Desai and Potter (2017) stressed that development study requires the use of a wide range of research methods: the mix of methods enables the different techniques and their results to be compared against each other, allowing judgements to be made as to which method (or combination of methods) is the most appropriate for any particular purpose.

Yin (2018) proposes that a case study inquiry should rely on multiple sources of evidence, because data source triangulation allows the researchers to have a trustworthy groundwork for the findings

and the contribution of knowledge According to George and Bennett (2012), case studies enables deep contextual understanding and they have potential for achieving high conceptual validity. Case studies are a useful means to closely examine the hypothesized role of causal mechanisms in the context of individual cases. The move from single-case to paired comparison offers a balanced combination of descriptive depth and analytical challenge that progressively declines as more cases are added (Tarrow, 2010). In a case study, a real time phenomenon is explored within its naturally occurring context, with the aim of answering the "how" and "why" questions (King et al., 1994; Yin, 2018).

The case centered on MNCH programs led by CHWs/ HEWs in rural Ethiopia. The choice to pursue this research as a case study is an attempt to better understand and explain how to capitalize and scale up on CHWs/ HEWs-led MNCH program to optimize the health outcome and a resilient health system in rural Ethiopia. The selected case study site is selected not because it is representative of other cases, but because of the convenience of this particular context to examine within its naturally occurring, which is of genuine interest to the researchers, particularly AG has extensive knowledge and work experience in the area and program to better understand and explain the case(Crowe et al., 2011).

Research setting

Ethiopia is one of the most populous countries in Africa with 123 million inhabitants, which is second only to Nigeria. The World Bank (WB,2023) classifies Ethiopia as a low-income country, but it is also one of the fastest growing economies in SSA. It still has a largely rural population, above 80% of the population lives in rural areas, and 12–14% of the total population are pastoralists or agro-pastoralists (CSA,2023). Since the adoption of the 1994 ethnic based constitution, the government of Ethiopia has been structured in the form of a federal system of government. The country is administratively divided into eleven ethnic based regional states (provinces) and two chartered cities that are administered separately from states (Mendo & Mansukhani, 2022). This study was conducted in Oromia regional state, which is the largest of the eleven Ethiopian states, both in terms of population and landmass(Mendo & Mansukhani, 2022).

Ethiopia has a top-down decentralized model for the delivery of healthcare along political structures. The health sector is structured into a three-tier system: tertiary care, provided at specialized hospitals; secondary care, provided at general hospitals with inpatient and ambulatory services; and primary healthcare (primary hospitals, health centers and HEWs post)(Merq, 2020). Each primary healthcare units serve approximately 25,000 people. The CHWs/HEW program is the primary health system component at the community level that reaches the rural majority communities by recruiting and training paid community based HEWs(Teklehaimanot & Teklehaimanot, 2013).

In this research, the nested nature of the case study encompasses two distinct populations including HEWs/CHWs (16 FGD participant), and subnational and national public health policy actors (12 KII participant). These populations are spread over three geographical areas with respect to the scope of their work: West Shewa Zone CHWs, Oromia Region (subnational) and Ethiopia (national) public health policy actors.

The FGD data was collected from HEWs in West Shewa Zone. West Shewa is one of the zones of Oromiya region, the zone has 23 districts and is located to the west of Addis Ababa (capital city of Ethiopia). The zone has a human population of 2,058,676, of which 1,028,501 are males and 1,030,175 are females. In this Zone, in 2019, 84 percent of the population lived in rural areas (UNICEF. 2020). Currently, the zone has 8 hospitals, 92 health centers and 528 CHW posts (each post has an average of 2 HEWs). The CHW program and health posts are administered and funded under the public health system. Despite the progress in other parts of the country, the West Shewa zone is still underperforming when it comes to MNCH outcomes.

Characteristics of participants

FGD participant (Inclusion criteria)

Participants, CHWs/HEWs, had to be adults above the age of 21 who had been residents of the district (work site). The participants must have had one-year experience working as a CHW in MNCH before COVID-19; three and more years of CHW/MNCH work experience in rural area; over one year of HEWs national training and must be a full-time salaried employee. The study did not exclude HEWs/CHWs by their gender or sex.

Key informants

Key informants were recruited based on their known involvement in the policy process leading to the planning and the implementation of CHWs/ MNCH program. Snowball sampling was used to recruit participants whereby participants were suggested and recruited by other participants (Noy, 2008). The principal investigator (AG) estimated the saturation of data between 10-12 interviews and 2 focus groups and 6-8 individuals based on previous similar approaches(Guest et al., 2020).

Participant recruitment

Focus group participants.

Using purposive sampling, AG worked with the Oromia Regional Health Bureau (ORHB) and zone health administration in an attempt to select the two districts. Then AG contacted and worked with the district health office in an attempt to recruit potential FGD participants to send the recruitment poster to potential participants via the districts' regular means of communication, telegram, email and announcements during review meetings.

Key informants

The principal investigator, AG, worked with the MoH, ORHB, zone health administration in an attempt to select the first potential participant in the KII. The AG started by sending an invitation email with information about the study and the KII recruitment poster. The source of the referral (the referee) was confidential. The potential invited participant had the right to accept or decline the invitation, and this response was confidential too.

We used a first-come-first-served basis for enrolment. Prior to participating in this study, participants were asked to provide their free and informed consent by signing a consent form.

Data collection

The data collection was organized in three parts: FGDs, KIIs and document reviews. AG collected the data using semi structured FGD guides developed in English and translated to Oromo language and KII guides developed in English and translated to Amharic and Oromo language. The guides were carefully crafted following the theoretical frameworks and relevant literatures to include neutral, non-biased, and non-leading questions to avoid influencing participant responses. AG is fluent in the local language. Based on their agreement, AG contacted participants for their convenient time and place to sign the consent form and then conducted the FGD and KII. AG acted

as the facilitator to recruit participant, ensure confidentiality, and distribute and collect consent forms.

At the beginning of each FGD and KII, AG briefly described the purpose of the study to the participants. All FGDs and eleven KII were conducted face-to-face, one KII was conducted using zoom. After consent was given, each FGD and KII was audio recorded. The focus group sessions lasted between 80 to 90 minutes and the KII lasted between 60 to 90 minutes. A research assistant was assigned to take notes during the FGDs after a brief training on research ethics and process provided by AG. The research assistant was fluent in local Oromo language, possesses a BSc degree and research-related experience.

As a token of appreciation, all FGD and eight KII participants were compensated with a small honorarium, for their time and effort and to cover their lunch related expenses. In the context of COVID-19, participants adhered to public health guidelines including wearing masks.

Most of the data collection was conducted face-to-face in Afan Oromo and Amharic, based on participants' language preferences. Two FGDs were conducted with CHWs working in two different districts - Weredas (Adea Berga and Ejere) of West Shewa Zone. In-depth semi-structured KIIs were conducted with twelve key informants from national and subnational level health systems. Data collection period was between mid September 2022 to end of November 2022.

Data collection took place at different locations depending on participants. The FGDs were conducted in a rented hotel hall while KIIs with policy makers were conducted in convenient locations for participants such as their offices.

We conducted a document review to enrich the finding from the FGD and KII, and to understand the context and operation of the HEWs/CHWs program. Policy documents, including national/regional strategies and plans were considered to represent the major priorities for CHWs-led MNCH. The relevant and available document were selected and accessed through the recommendation of the key informants working in National and subnational HEP/MNCH program in Ethiopia.

Data analysis

The data analysis process began with the development of a coding framework informed by the KII and FGD guides, the WHO building block framework and SEM and review of the existing literatures. We followed Braun and Clarke's (Braun & Clarke, 2022) six step thematic analysis that includes: (1) familiarizing ourselves with the data; (2) generating initial codes; (3) developing a coding tree to guide the coding of transcripts; (4) identifying themes; (5) reviewing, defining and naming themes; (6) interpreting the narratives and stories and producing the report – a concise, coherent, logical, and non-repetitive account supported by vivid examples. FGDs and the KIIs were audio-recorded and AG (the principal investigator, PI) transcribed them verbatim. Verbatim transcription was done by listening to audio-recorded material. The two FGDs and four KIIs were in Oromo language, and eight KII in Amaharic language. They were transcribed into word documents. Then, the transcribed documents in both languages were translated to English language. Data were also cross-checked by listening to the original recording while reading along in English.

The transcript content was coded manually to ensure the quality, accuracy and any discrepancies of coding transcript. Codes were developed after an initial review of the transcripts. The transcript content was analyzed inductively to get familiar with the data. First, after familiarization with the transcript, AG & OU coded one transcript from each FGD and KII, they coded individually and compared their codes. After debriefing and consensus, the transcript was coded accordingly. After debriefing, JE and SY randomly chosen and compared to check alignment or discrepancies of the coding of the transcript. Emerged themes were based on an iterative process of inductive and deductive approaches. Deductive coding approaches drew from existing literature including the systematic review on the same topic, and the study's theoretical frameworks. In inductive approaches, themes emerged from the data and were not be forced to fit into preconceived categories (Saldaña, 2013). The analyses used triangulated data from multiple sources and multilevel government and nongovernment health policy experts and frontline CHWs, and document analysis. Given the small size of the data, we decided to code manually without employing any qualitative data analysis software.

Policy documents

Policy documents were significant to the study, and were used mainly from a realist perspective(Thorogood, 2018), that is, as a means to understanding the CHWs/HEP policy/ program in the context of rural Ethiopia. Hence, policy documents were essential in providing background information to the study and in defining the questions and trajectories that were pursued in the FGD and KII. The analysis was also enriched by useful insights from the policy document. Using thematic analysis, we sought documents that mention the major themes that emerged from the KII and FGD, based on inductive and deductive approaches. Major Health policy documents used in this study include second Health Sector Transformation Plan (HSTP-II) (Health, 2021), A roadmap for optimizing the Ethiopian HEP(2020-2035)(MERQ, 2020) and more, see the list of policy documents(Appendix 15).

Trustworthiness

Trustworthiness, a qualitative validation criteria, was applied in this study in line with established guidelines (Yin, 2017). Therefore, the researcher's inherent bias was controlled partly by being self-aware and giving the participants the opportunity to generate data based on their own perceptions. We used data validation strategy to enhance the trustworthiness of the study's findings and to establish the credibility of the study findings(Merriam, 2002). We used different techniques recommended by renowned qualitative researchers including member checks/review AND triangulating the data by using multiple sources of data to confirm emerging codes and themes(Merriam, 2002; Creswell,2022).

Ethical considerations

The research proposal was carefully evaluated, and the ethics of the study subsequently reviewed and approved by two respective institutions, the University of Ottawa Research Ethics Board, ethics clearance certificate (Ethics File Number S-06-22-8072) (Appendix 9) and the Ethiopian Public Health Institute, Institutional Review Board (EPHI-RIB) certificate of approval (protocol number: EPHI-IRB-462-2022, minute No:109)(Appendix 10). In addition, to strengthen the importance of the study, support letters were received from School of International Development and Global Studies, University of Ottawa, and from the study area, Ethiopian MoH, ORHB and West Shewa health office.

Participants gave their free and informed consent to be enrolled in the study. Participants provided written informed consent prior to participating in this study. They were also informed that once they chose to participate, they could withdraw at any time or chose not to answer any questions, to which there would be no negative consequences.

Reflexivity and positionality

To enable any audience of qualitative studies to evaluate the validity of conclusions extrapolated from data, researchers should, as part of the study, neutralize or bracket their biases by stating them explicitly to the full extent possible(Merriam, 2002). AG, OU, JE and SY have extensive experience as global health experts and have multiple publications and work on MNCH and related policy and programs in SSA including Ethiopia. AG has more than eight years in community health program management in Ethiopia and worked in different contexts of health programs implementation and evaluation in Ethiopia and internationally.

Results

Characteristics of participants

The socio-demographic characteristics of FGDs participants is summarized as follows*:* In the FGDs, there were a total of 16 female HEWs/CHWs from two districts (Adea Berga and Ejere) of West Shewa Zone. All the FGD participants are female and the majority of them 15 (93.75 %) are in the age range of 25-40. The highest level of education or training that they have completed were as follows: college diploma 12 (75%) and over one year HEWs training 4 (25%). Participants' total work experience as a HEW (in years): six and above 14 (87.5%) and four to five years 2 (12.5%). For all the participants, walking was their most commonly used mode of transportation during field work/ outreach activities. The average distance between their work site and field work/outreach site in kilometers: above 5km, 9(56.25); 3km to 5 km 5 (31.25%); and less than 3 km 2 (12.5%). The most commonly used forms of communication was face-to-face with clients during home visits for all the participants. In the past 12 months, 9 (56.25%) of the HEWs participants had an estimated monthly personal income of 5001 ETB (Ethiopian Birr((currency) and above in Ethiopian Birr (ETB) and the rest earned an income below 5000 ETB.

A total of twelve public health policy/program experts were recruited to participate in the KIIs. Eight participants (66.6%) were recruited from the three levels of government health structures. These include three participants who were recruited from MoH, they act as national primary health system and HEP experts; two participants who were recruited from ORHB, they act as regional primary health and HEP expert; and three participants who were recruited from West Shewa Zone (one Zonal level health MNCH expert) and two district level health office HEP experts. Four (33.3%) participants were recruited from NGOs: two National level experts (one program director and one M&E expert) and two from the regional level program manger/expert. In terms of gender, four (33.3%) women and eight men (66.6%) participated. Most of the participants have post graduate level (MSc) educational background in health and related study programs and they have extensive (more than 10 years) public health program policy management related experiences in different levels of responsibilities.

Using multilevel data and thematic approaches, our analysis uncovered underlying challenges for adequate MNCH service and outcomes, and fragmentation of community health program pillars (enabling situations). Participants indicated that despite the widespread belief that they are an extended arm of the health care system, multiple challenges in the CHWs program structure diminish their roles. We identified seven distinct yet interconnected sub themes (sets) of fragmentation challenges in the community health program pillars and system. The results suggest that all the multilevel participants perceived multidimensional challenges of fragmentation in the CHWs program. These fragmentation challenges hindered the delivery of equitable, sustainable, and quality MNCH in rural Ethiopia. The multidimensional challenges of fragmentation include fragmented health finance, fragmented medical and equipment supply, fragmented working and living infrastructures, fragmented CHWs empowerment and motivation, fragmented monitoring, supervision and information, fragmented coordination and governance, and fragmented community and stakeholder engagement. The ongoing COVID-19 pandemic and volatile political and security challenges of the country are exposing and exacerbating the fragmentation challenges. We present the seven distinct yet interconnected sub themes(sets) of fragmentation challenges in community health program pillars as follows and for more perspective.

Fragmented health finance

Fragmented and inadequate health finance and resource allocation are the most critical challenges facing CHWs program optimization. Health financing includes how all money/ resources are mobilized and used to improve the health and well being of individuals. Health financing systems can affect access to healthcare in terms of quantity and quality. Government and non-Government actors are responsible for the larger share in financing CHWs program in Ethiopia.

However, participants revealed a lack of prioritization of health financing and a budget shortage from the government treasury. They also described fragmented funding from donors for MNCH and other community based planned activities.

> *"The overall health sector budget is limited; If we look at health finance, it is not better than other sectors; there is inadequate funding or budget allocated for CHW program." (KII 2, National level NGO, Program Director)*
>
> *"…But there is a budget shortage and capacity limitation, it is very difficult to accomplish what you have planned, including maternal and child health. It requires a big budget." (KII 5, Regional health bureau, Primary health expert)*

Participants explained that the Ethiopian health system is dependent on donor support. Despite the higher demand of funding due to prevailing problems including high maternal and child morbidity and mortality, the available fundings are fragmentated, small, declining and project specific. Also, there is a lack of transparency and duplication in the management of available funds.

> *"Funds have declined significantly. The health extension program is particularly affected. That is where most of the problems come from. The health extension program is at the primary scale because they think it is a successful program. This funding is said to have decreased. I think the reason for the decline is related to the existing political crisis in the country (the war in the northern part of the country). It is not only impacting the health sector, but other sectors have been affected." (KII-1, MoH, National level primary health program expert)*

> *"Okay, compared to other sector, there is a large number of NGOS working on maternal health and family health, reproductive health. But this is not comparable to the level of problem and demand, they are few in number, the problem of the society is large and severe. Even the NGOs' budget amount is not comparable, there is a gap between the level of the problem and the budge. We need more support internally and internationally. Our people especially in the two Borean administrative zones, Guji, East Bale and the two Hararge are in a difficult situation (draught), even to access food and basic service, the current drought is exacerbating this. They are in a very difficult situation; their cattle have died." (KII 5, Regional health bureau, Primary health expert).*

Fragmented *medicine and medical equipment and supplies*

Essential supplies like vaccine, delivery beds, gloves, mask, and other products are essential to provide quality service, and enhance MNCH outcomes. CHWs in rural Ethiopia indicated that they are providing vaccines for children under five and Integrated Community Case Management to reduce child deaths from malaria, pneumonia, and diarrhea. However, participants said that most health posts have no vaccine storage/refrigerator as they do not have appropriate rooms and electricity. A district village CHW shared their perspective:

> *"The major issues that I can raise as problems are: We did not have electricity for vaccination services for women and children. We have no refrigerators. So, mothers and children have to wait for a week until we go to the health center and bring the vaccines for weekly supply. Some mothers come from long distance, maybe they use public transport. If they are not getting the vaccine the first day they have to come back, which would incur more expenses. Pregnant women cannot be vaccinated unless they visit health centers by going far. Also, there is a time when Iron supply is short. Pregnant women need timely TT* (Tetanus Toxoid) *and Iron but the supply is not consistent. "FGD participant, Ejere District)*

Participants emphasised fragmentation challenges as shortages on the required medicine and interruption of medicine supply for under five children due to the absence of basic utilities like refrigerators and electricity.

> *"We have no refrigerators and electricity to store vaccines. There is an interruption of supply, sometimes, we experience shortage on the required medicine as we are working on treating children five and under. For example, in the case of supplies for treating children five and under, you may not always have zinc and ORS at the same time, the supply is inconsistent." (FGD participant, From Adea Berga District)*

CHWs are typically supplied with these equipment and drugs by a primary health center to which they are linked, with this came several major risk factors or underlying challenges, for example shortage in inventory and poor transportation have come into focus for community health program logistics and supply chains.

Fragmented infrastructures of working and living environment

Infrastructure development can determine the access, coverage and utilization of basic social services including community health programs. In rural Ethiopia, despite the improvement in infrastructural development over time, disadvantaged rural majority population are not effectively accessing basic primary health due to fragmented development of basic infrastructures like road, electricity, clean water supply and communications technology. In those areas, access to MNCH

services is still limited. Even where services are available, they most likely do not have adequate basic infrastructural prerequisites to function at the very basic level to provide essential services including MNCH services.

Our finding reveals the challenge of infrastructural development fragmentation for effective essential health services. Level four HEWs are supposed to be capable of providing skilled delivery services, but they do not have the appropriate working place and equipment. There were similar perspectives from participants at different levels. Perspectives from regional experts provide further insight:

> *"To sum up, majority of the health posts are old or decaying. In conflict/war areas, they are destroyed. Previously constructed health posts are not appropriate to provide the current service demand and a standardized service. They do not have appropriate and adequate room for storage, treatment, environmental sanitation, ventilation, electricity, water, or fridges to store vaccines. Renovation of the health posts, equipping the heath posts with standard equipment, improved infrastructure, water and electricity is very crucial. Some health extension workers are leaving their jobs which should be addressed."* ***(****KII 5, Regional health bureau, Primary health expert)*

> *"Those HEWs that have reached level four can perform delivery and other curative services. However, there are no proper logistics to provide the service. There are no proper rooms and equipment to provide delivery services. To perform a delivery, it requires comfortable rooms and a supply of medicine. Maybe, it is being considered for the future because they need more supply. For example, they need water, electricity, roads and so on." (KII 9, Zonal level health MNCH expert)*

Health posts are inadequate to provide optimum services, the working situation is not favourable. CHWs are practicing their work in precarious conditions including having to navigate difficult terrain and walking long distances to reach the scattered community residence/area.

> "*There are HEWs without residential homes, some of the HPs (health posts) are decaying, some of them have construction quality issues from the beginning due to poor materials (mud and wood). There is progress in improving the health posts, but not enough yet. The health posts are not adequate to address the current service demands, there are inadequate materials and equipment to provide service, all the fridges are not functioning or inadequate. HEWs are expected to go to the nearby health center to store or pick up vaccines, this is also impacting the potency of the vaccines. The constant move from health posts to health centers, health posts to homes is challenging." (KII 5, Regional health bureau, Primary health expert)*

> *"Some of us got the level four collage diploma. We are trained to provide delivery services.*

Now, we are supposed to provide delivery service, but in practice, we are not doing that. There is inadequate supply to manage delivery at health posts. We don't have enough delivery equipment, there is no water, there is no electricity to undertake delivery. Sometimes there is an urgent case and shortage of ambulance service. At this time, they[women] give birth on the hands of HEWs at health posts. Some women come to the health posts at the point of delivery, if you refer them to the health posts, they might give birth while traveling, but this has a risk. So, to properly serve them there should be enough supply of the required equipment available at the health posts. (FGD, Adea Berga District." FGD, Adea Berga District)

Fragmented HEWs/CHWs empowerment

CHWs are amongst the frontline drivers of linking communities, especially disadvantaged communities, with the health system to access essential primary health including MNCH, thereby improving health outcomes. Our analysis indicates that CHWs are experiencing multiple challenges related to fragmentation in the quantity and quality of knowledge, skill, incentive, benefits/ motivations, and job satisfaction. Furthermore, opportunities to upgrade their skills and on-the-job refresher trainings are limited. CHWs have mixed levels of college training, some are on level four and others are still on level three college training.

"It is impossible to say that their knowledge is sufficient. When the program was started, they didn't have enough training, it was said 'Better than nothing'. This was to prevent the spread of diseases. It was said to be sufficient for teaching or promotional work. However, now they are also doing treatment work with limited capacity." (KII 9, Zonal level health MNCH expert)

However,

"The training is not enough. All HEWs are not equal. Some HEWs are still on level 3. The upgrading approach is not fast and transparent. They abuse us based on our limited work experience, when you ask for trainings or upgrading opportunities, they require long work experience. No upgrading means no salary improvement or promotion." (FGD participant, Ejere District)

"The on-the-job training opportunities are not consistent. For example, while there are two HEWs at the HP, training opportunity is given to only one HEW. Then, this would create disagreements between the person who got the training during practice and the person who did not. When the person who got the training is absent the service would not be accessed. Such approach would negatively impact the job. So, it is better if both can be trained equally." FGD participant, Adea Berga District

Also, CHWs experience restrictions for upgrading or diversifying their training and career progression and long year service at their current sites. They also experience lack of important benefits, incentives and motivation. Furthermore, a fragmented empowerment approach, lack of conducive working and living conditions are negatively impacting their job satisfaction and performance.

Fragmented monitoring, supervision, and information system

Supportive supervision is a vital program management mechanism through transparent communication and team building approaches while monitoring the quality and quantity of the service to promote compliance with standards of practice. CHWs acknowledge the essentiality of supervision and monitoring to enhance their communication with the health system, and update and upgrade their knowledge, skill, productivity, and performance. However, participants highlighted the potential fragmentation challenges in monitoring and supervision in CHWs program and primary health program. The major challenge includes lack of appropriate planning, budget, and transportation/ infrastructures. The current security and politically unstable situation and COVID-19 are worsening these challenges.

There are systemic fragmentation challenges in monitoring and supervision in the CHWs program.

> *"I think there is a systemic gap regarding supervision and supportive mechanism, follow up is low from the regional health bureau to zonal, to the district to our level. Every time there is an initiative to start, but it is not sustained. When the region makes supervision an issue the lower-level health offices makes it serious. When it is ignored from the top, it also ignored at the lower level. Regular cooperative planning and implementation of supervision of can led to better achievement."* ***(****KII 1, MoH, Primary health program expert).*

> *"Supervision is important for our work. But it is not regular, it is off and on! From my experience there is no proper supervision. Sometimes they come from the health office for other work, not specifically to review our work in detail and to give us constructive feedback. Sometimes, they come to coordinate campaigns." (FGD participant, Ejere District)*

Participants indicated that supportive supervision is not yet fully programmed in all levels of the CHWs primary health system. There is no proper plan, it is just performed for formality as an administrative task to audit performance. It is performed by the higher officer or hierarchy order or pushed to the lower structure.

> *"Supervisors expect force, push factors from top officials. Supervision schedules are only frequent when there is a detection from above the higher-level officials. The supervision*

schedule is not equal for all packages. The supervision approach is not based on regular schedule," (FGD participant, Ejere District)

"In my experience, the supervision is a kind of feeling check list, it is not to support us. Even the existing supervision is only scheduled and conducted during conducive weather, they do not come during rainy seasons, it doesn't include winter season (between June to September)." (FGD participant, Ejere District)

The volatile security and political issues are exacerbating the challenge of inadequate supervision. Some Health facilities have no complete or some have inadequate supervision. Participants indicated lack of budget for the fragmented monitoring and supervision. Currently, there is no specific person responsible for the CHWs program supervision at the district level. Participants opined that the issue of supportive supervision should be emphasized and maintained to enhance better performance and health outcome.

Fragmented coordination and governance and security

Health system governance requires health sector and non health sectors decisive support to ensure the health and safety, and productivity of the people. Systematic health management and leadership is important to ensure appropriate policy framework, allocation of all forms of resource and collaboration at all levels. Proper health management and leadership will also ensure safe working environments, improve productivity and impact using appropriate planning, monitoring and evaluation framework. Participants highlighted multiple challenges of fragmentation while applying the policy to practice.

Participants highlighted the fragmented health system wide governance and coordination challenges. The existing approach is not effective and there is a challenge to ensure uniform health leadership throughout the health system.

"This is what makes our country so unique. I have seen the experiences of other countries and I say ours is good. But I can't say out loud that the coordination platform is uniform and functional up to the district level. It is not possible to say that 100 percent will be implemented as agreed here, because the structure below may burden the interests; Or the partners may also make their own interest payments. As you said, people who are incentivized in connection with poverty and incentives can twist some things, so I can't say that it has been fully implemented." (KII 7, MoH, Primary health system expert)

"I don't think that there is much of a commitment problem at the leadership level. The thing is, how do we bring it down? In what kind of strategy are we going to participate? It requires a lot of work." (KII 2, National level NGO, Program Director)

The recruitment, assignment, and overburdening of HEWs/CHWs in multiple tasks is a challenge. For example, according to the HEWs policy, CHWs should be recruited from the village they are going to serve and after training they should go back to their village. But in reality, the recruitment and assignment of CHWs does not always go according to the policy. CHWs/HEWs are also experiencing higher workload and are engaged in multiple health related and non- health related sector tasks.

> *There is a problem on the recruitment and assignment of CHWs. The strategy says CHWs should come from the village she is going to serve. However, the recruitment and assignment is not according to the guidelines. Also, once they graduate from their training and are assigned to any vacant/open village, they don't want to stay there. They want to live with their families or in their towns. (KII 4, District health office, HEP experts)*
>
> *"Yes, the HEP packages are 18, that is many given their number but HEWs are sometimes one or two. About 7out of the 18 focus on maternal and child health. Of course, overpacking will slow down the performance quality and quantity. In addition to those packages, they are also working on other government tasks unrelated to health sector activities. For example, health extensions are part of the local cabinet. It also brings problems; it creates additional workload. I think the solution could be increasing the number of HEWs and separating MNCH as a specific program. Given the number of activities in MNCH, separation of the program is very important." (KII 9, Zonal level health MNCH expert)*

Political leaders are inattentive to the working conditions of CHWs and are failing to prioritize improvements in the CHWs program. Participants indicated that the prevailing political crisis and instability has been affecting the health sector. Participants also indicated the challenge during planning and performance evaluation.

Fragmented community and stakeholders' engagement

Community and stakeholder engagement is about partnership building, it is becoming a buzz word in different aspects of social and environmental development issues. Engagement is increasingly highlighted in Ethiopia's health policy reforms, HSTP-II (Health, 2021), HEP optimization(MERQ, 2020) and more. Despite the contribution of engagement in the improved health outcomes, the findings indicate that there is a fragmentation and lack of sustainability in the existing engagement approach.

Fragmented Community Engagement (CE)

Participants from different levels shared the same perspective, they uncovered the fragmentation challenge in community engagement. At the federal level, they described how political instability and conflict has set back a lot of things including CE, with this comes certain gaps that need to be addressed. At the regional, zonal and district levels, they describe weak community participation due to lack of attention, COVID-19 and volatile security issues.

> *"For example, the conflict that started two years ago has set back a lot of things. It has had a big effect. We can clearly see that it has pressure not only on health but also on other sectors. However, our community engagement work has been good, especially since the health extension program was launched. Given the current challenge, there are certain gaps that need to be addressed." (KII 7, MoH, Primary health system expert)*
>
> *"Currently, community participation is very weak. To* speak honestly*, unstable security is an issue, it is a big challenge now. The attention of the community is on security issues, not on the health or other public service." (KII 5, Regional health bureau, Primary health expert)*

Currently, the community structure is not functioning as it was intended. It is characterized by considerable dropouts or interruption. Its strategic direction is not well organized, planned, and regular.

> *"Nowadays, community structure is not functioning well as it was intended. It is characterized by considerable dropouts or interruptions. Now, it is interrupted and there is a dropout as the people developed negative attitudes towards such structure as some times the way of organization and participation is attached to political activities and orientation." (FGD participant, Adea Berga District)*
>
> *"This time the focus of the leadership is on the current political conflict issue and there is no organized approach from the community. In some areas communities have great motivation, they are contributing resource to build health centers. In some districts, the community bought 2 -3 ambulances. There is a big motivation in some areas to meet their service demand. (KII 5, Regional health bureau, Primary health expert)*
>
> *"The community raises many concerns on health center and hospitals, they say there is not enough service there. When we mobilize the community to organize crop for delivery and Community based health insurance, they are not willing to actively participate, because they have a concern about the service they are getting from health centers and above. As a solution, quality service should be ensured for all community members to enhance community participation in health programs."(FGD participant, Adea Berga District)*

Fragmented stakeholders' engagement

In Ethiopia, despite the commitment to strengthen multi-stakeholder engagement and optimize the community health program in the national level health policy, our findings reveal multiple challenges at the implementation level. For example, there is a lack of system strengthening or

holistic support from stakeholders or actors. Engagement of the private sectors is minimum in the CHWs program. These have resulted in gaps between policy and the practice.

> *"There are limited NGOs/CSOs in our area compared to the need. Due to security challenges, some of them are leaving their site including public health facility workers. Some partners have resource constraints. Some of them shifted their resources to COVID-19 response." (KII 10, Regional NGO, Program manger*)
>
> *"A partner who comes to support the whole health extension program is very limited. Partners are interested in specific intervention to provide onsite or offsite trainings. There is a mismatch in actors' programs. For example, HEP requires holistic intervention. However, NGO actors come with specific program. They could come just for EPI; they have the challenges to support the whole program. When a partner comes without system supporting capacity, it doesn't strengthen the program. The government does not want this, and that is one of the challenges. And one of the discussions was that things like this should be fixed." (KII 1, MoH, Primary health program expert)*

In the macro-level policy documents, like HSTP-II (MoH, 2021), a roadmap for optimizing the Ethiopian HEP(2020-2035)(MERQ, 2020) and more (Appendix:15) health finance, medical and equipment supply, health infrastructures, HEWs/CHWs empowerment, supervision, information system, governance, and community and stakeholder engagement are among the major issues of the health sector. However, participant emphasised that despite having these themes as major issues to be addressed by the government in policy documents, they were not changed in practice.

Discussion and policy implication

In LMICs including countries like Ethiopia, community-based health programs are a cost-effective way to extend health services to hardest-to-reach communities and improve their health outcomes. They are also essential to accelerate progress toward national and global health goals including MNCH. In Ethiopia, the CHWs program is a part of the primary health care system and has been instrumental to the disadvantaged rural communities with essential primary health services and in the recent improvement of health outcomes including MNCH. In the country, despite significant progress in expanding community health services, gaps remain in improving access to MNCH for populations. We conducted a qualitative case study in Ethiopia to analyze comprehensive evidence on the paths to transform the CHWs program to enhance MNCH equity and a resilient community health system in rural Ethiopia.

Using thematic analysis major themes on challenges of fragmentation of community health program pillars emerged. We identified seven distinct yet interconnected sub-themes (sets) of fragmentation challenges in the community health program pillars and systems. These multidimensional challenges of fragmentation include fragmented health finance, fragmented medical and equipment supply, fragmented working and living infrastructures, fragmented CHWs empowerment and motivation, fragmented monitoring, supervision and information, fragmented coordination and governance, and fragmented community and stakeholder engagement. Our finding underscored fragmentation as a blind spot for most of the ambitious primary health polices and strategies of Ethiopia. The study emphasised the gap between the policy at the macro (national) level and the challenge during implementation at the micro (district) level. The ongoing COVID-19 pandemic and volatile political and security challenges of the country are exposing and exacerbating the fragmentation challenges.

The result suggests that all the multilevel participants perceived multidimensional challenges of fragmentation in the CHWs program to deliver equitable, sustainable, and quality MNCH in rural Ethiopia. Here, it is necessary to interrogate what we mean by "fragmentation" in the CHWs program. Health system can be compromised in a fragmented system, health service users experience lack of access to optimum and comprehensive services, loss of continuity of care, and the failure of health services to meet their satisfaction (PAHO/WHO,2011). Fragmentation may undermine health system quality and efficiency. Fragmentation could be occur due to fragmented actors, inadequate governance arrangements, inadequate financial planning, misalignment of empowerment, and duplication and mistargeting of services(Siqueira et al., 2021). It can create health system gaps and adversely affect economically disadvantaged communities (Dureab et al., 2021).

The CHWs program supply side fragmentation challenges have affected and continues to affect the MNCH and primary health access in rural Ethiopia and beyond. Our analysis reveals that the CHW program is inadequately funded. Inadequate health financing is the most common challenge that is keeping national CHW programmes from reaching their full potential. Although fragmentation of health financing is well documented in the literature(Dureab et al., 2021; Mhlongo et al., 2020; Spicer et al., 2020; Tang et al., 2019), financing of national health

programmes has been a critical element that has not received sufficient emphasis among decision and policy makers.

In 2020, the WHO reported that the critical health system challenge for this decade is that global leaders are failing to invest enough resources in core health priorities and system (WHO,2020). A recent study in Zambia and Ethiopia (USAID, 2017) shows that inadequate health financing is a critical challenge to strengthen CHWs program and ensure MNCH and a resilient community-based health system. Sixty percent of funding for CHW programmes in SSA is from donors, and most of this is for vertical disease-specific programmes(Perry et al., 2021). In Ethiopia, there are inconsistences in government spending in primary health. Similarly, in the country the proportion of HEP expenditure out of the total expenditure and total primary health level spending has dropped(Merq, 2020). In SSA national spending on health is still low, only four of 55 countries in the African Union have reached the 15% commitment, which was set in the Abuja Declaration in 2001(Lal et al., 2021). LMICs aiming to build health systems that are publicly funded are largely influenced by external aid objectives and under the power of donor-driven funding delivered in a fragmented way (Lal et al., 2021; Ozano et al., 2018; Perry et al., 2021).

Genuine and practical political commitment is a key prerequisite to address the health financial challenge and scale up the available resource mobilization options. Leveraging evidence based, systemic and practical domestic resource mobilization including scaling up of the different insurance scheme initiatives aligned with the divers living and working context of the general population and rural community. It is also important to organize evidence on corporate social responsibility model(Nwobu, 2021) for private sectors to take the responsibility in community health, while refocusing funding from the external resource on whole health system strengthening. Fragmentation of health financing is the existence of a large number of separate funding mechanisms (e.g. many small insurance schemes) and a wide range of health-care providers paid from different funding pools(Mladovsky, 2020).

Lack of necessary supplies can compromise health quality and causes disruption. Participants in the study also reported that fragmented medicinal and equipment supply are serious challenges to delivering optimum MNCH. FGDs participants, CHWs revealed that most health posts have no

vaccine storage/refrigerator as they do not have appropriate rooms, basic utilities like refrigerator and electricity. Evidence from different countries including Ethiopia and Sierra Leone shows that the crumbling state of supply of such essential medicines and equipment are a major impediment to their effectiveness and motivation(Assefa et al., 2019c; Barr et al., 2019; MERQ, 2020; Olaniran et al., 2022). Lack of investment in medical and diagnostic supplies has made it harder for African nations to effectively respond to MNCH and other essential health issues(Barr et al., 2019; Gebremeskel et al., 2021).

In rural Ethiopia, despite the improvement in infrastructural development over time, disadvantaged rural majority population are not effectively accessing basic primary health due to fragmented development of basic infrastructures like road, electricity, clean water supply and communications technology. In those area access to MNCH services is still limited. In SSA, one of the biggest healthcare challenges rural residents face is the lack of reliable transportation and ambulance service, a low level of infrastructural support and the absence of adequate health facility in the neighbourhood (Gebremeskel et al., 2021; Olaniran et al., 2022). In SSA the poor level of health infrastructure in countries such as Tanzania, Zimbabwe, Kenya and Nigeria has been linked to lack of long-term investment (ILO, 2015; Gebremeskel et al., 2021).

Multilevel barriers to CHWs' effectiveness in SSA include fragmentation of empowerment of CHWs programmes (ILO, 2015; Gebremeskel et al., 2021). In Ethiopia, there is a shortage of the required capacity of CHWs to effectively deliver expanded HEP packages(MERQ, 2020). Recent studies in Bangladesh, India, Kenya, Malawi, and Nigeria report similar findings and indicate that inadequate knowledge affected service delivery and raised questions about the quality of CHW services. CHWs' insufficient knowledge was partly explained by inadequate training opportunities and the inability to apply new knowledge due to equipment unavailability (Olaniran et al., 2022). A study in Cambodia (Ozano et al., 2018) and Iran reveals CHWs experience high workload and the lack of a support system were mentioned as barriers to effective performance(Javanparast et al., 2011). There is a need to review and revise their scope of practice to reflect the varied duration of training(Olaniran et al., 2019). CHWs require the formulation and implementation of polices that support their work, as well as financial and nonfinancial incentives, motivation, collaborative and supportive supervision, and a manageable workload(Asweto et al., 2016).

Insufficient and lack of continuity of coordination and governance are a common challenge of CHWs led-MNCH programme in SSA (Gebremeskel et al., 2021). This include existence of multiple actors engaged in supporting CHWs program without national or local mechanisms for coordination(Tulenko et al., 2013). For example, actors/donors promote vertical programs and disease-specific programs (PAHO/WHO, 2011;Tulenko et al., 2013). There are multiple actors acting on the parts without adequately appreciating their relation to the evolving whole(Stange, 2009b). Schneider and Nxumalo (2017)(Schneider & Nxumalo, 2017) explored the leadership and governance tasks of large-scale CHW programmes at sub-national level in South Africa's CHWs strategy. In their finding, to overcome leadership and governance in CHWs program: alignment of national mandates to provincial and to district strategies; integrating planning, human resource, financing and information systems; redesigning organisational and accountability relationships between community based CHW program, local health services, communities and CSOs(Schneider & Nxumalo, 2017).

Participants opined that the issue of supportive supervision and data system should be emphasized and maintained to enhance better performance and health outcome. A recent systematic review and synthesis of the literature on the HEP in Ethiopia between 2003 and 2018(Assefa et al., 2019) has indicated the lack of adequate supportive supervision(Assefa et al., 2019c). Fragmented supervisory support could be associated with lack of motivation and capacity gaps in supervision(Karuga et al., 2019; Ludwick et al., 2018). Fragmented supervision of CHWs has been a challenge of large-scale national programmes due to lack of systemic supportive supervision approach(Naimoli et al., 2015). A review synthesising the evidence of CHWs' experiences of supervision in LMIC emphasized best practices of effective supervision time, resources, and supervisors' skill and knowledge. Employing supervisors whose sole responsibility is to supervise CHWs may be a good strategy to alleviate aforementioned issues faced by CHWs(Stansert Katzen et al., 2022).

Stakeholders engagement is increasingly highlighted in Ethiopia's health policy reforms(Health, 2021; MERQ, 2020). Participants reported that there are a growing multiple platforms of community and stakeholder engagement in community health, however there is lack of consistent

engagement during planning, implementation, and evaluation across the different packages of community health programs and different health administration structures. In addition, we argue that despite the multiple fragmented platform of engagement(MERQ, 2020), there is inadequate emphasis on meaningful engagement towards a coproduction framework including co planning, co-implementing, and co evaluation of health programs at all levels.

Currently, optimization of HEP is acknowledged and increasingly recognized as an important issue in primary health policy agenda through task shifting and professional mix to achieve the SDG and UHC #3(MERQ, 2020), however the fragmented situation has not changed yet. Our finding shows that there is a high risk that if the situation continuous in a business-as-usual mood, community health program pillars fragmentation will continue to impede community based MNCH outcomes and health system resilience efforts.

Policy implications

Fragmentation by itself or in conjunction with other factors can lead to complications to access optimum and comprehensive services(PAHO/WHO, 2011). Fragmentation may undermine health system quality and efficiency, exacerbate health extreme inequalities, and inequitable access to healthcare (PAHO/WHO, 2011). In rural Ethiopia in part due to fragmentation and absence of adequate fragmentation monitoring, it is continuing as a threat to CHWs program/ MNCH outcomes gains, sustainability, and primary health program resilience.

Remedial solutions for overcoming fragmentation blind spots in CHWs program should consider the following: Understanding and acknowledging the problematic nature of fragmentation in primary health policy and practice. Developing systemic fragmentation monitoring and responsive approach to sustain the gains, achieve better MNCH outcome, ensure a resilient community health system, and achieve UHC and the SDG #3. Finally, there is an urgent need for transformative and innovative approaches that capitalizes on stakeholders' engagement in the context of coproduction and transformative system thinking to address the fragmentation challenge in health system. These are especially pertinent in light of the challenges faced and lessons learned in the context of COVID-19 pandemic, which showed that fragmentation is one of the main institutional barriers to addressing the population's health problems.

Strengths and limitations

To the best of our knowledge, no study has examined the multifaceted challenges in CHWs/MNCH program in Ethiopia using multilevel and multidimensional data. This is the first qualitative case study using multilevel perspectives of national, regional zonal, district and onsite CHWs actors. The research team has extensive experience as global health experts and have multiple publications and work on MNCH and related policy and programs in SSA including Ethiopia.

This study has two potential limitations. First, this is a case study, which will not be generalized for all the CHW program in urban and rural areas of Ethiopia. Second, the community health program in Ethiopia is predominately designed to be run by females only, hence this study did not address men's and urban HEW's perspectives. Due to prevailing security issues and political mistrust within the community, KII participants from zonal and district levels and some HEWs/CHWs appeared to show some level of frustration and caution in fully expressing their opinions, therefore key perspective might have been omitted from their responses.

Conclusion

In Ethiopia, although national wide community-based health program is available in every rural village, the health program has been facing unique system challenges and fragmentation. The study emphasised the systemic gap between the policy at the macro (national) level and the challenge during implementation at the micro (district) level. Fragmentation is a blind spot for most of the ambitious primary health policy strategies of Ethiopia. This is a threat to sustain the MNCH outcome gains and resilience of primary health access in rural Ethiopia. We argue that that the challenges of the program fragmentation are exacerbating the fragility of the health system and fragmentation of MNCH health outcomes like ANC, SBA and PNC. This can aggravate extreme health inequalities and health inequities between rural (area covered by CHWs) and urban. Rural communities especially mothers and children, on average, would get less access to optimum and quality healthcare services than their urban counterparts.

We suggest that beyond efforts to expand the service coverage, the government (health system) and the public health partners (actors) need to problematize and understand the challenges of

fragmentation in community health system and respond to the challenge through enhanced multi-stakeholder's engagement in the context of a coproduction framework. Additionally, a SEM and an intersectionality lens should be given priority to guide the understanding of the causes of fragmentation challenges and the complex ways in which multilevel barriers to equitable, resilient, and universal CHWs/MNCH service relates, intersects, and mutually reinforces one another.

National health program fragmentation is less acknowledged among researchers and policy actors although often from a high-level perspective, it has been discussed in the global health literature, agendas and between prominent global health actors.

Declarations

Competing interests
The authors have declared that no competing interests exist.

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Author contributions
AG and SY conceptualized the study. AG coded and analyzed the data and prepared the first draft of the manuscript. OO, JE and SY helped with data analysis, provided technical support in interpretation of results and critically reviewed the manuscript for its intellectual content. SY had final responsibility to submit. All authors read and revised drafts of the paper and approved the final version.

Availability of data and materials
The interview data cannot be shared publicly as they hold potentially attributable sensitive information regarding the participants and their roles. It would therefore be unethical to make them public and would undermine the ethical committee agreement and consent process. Requests for data can be made to the Research Ethics Boards (REB) at the University of Ottawa at ethics@uottawa.ca by researchers who meet the criteria for access to confidential data. All other relevant data are presented within the article.

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5.4. Critical success factors in developing a transformative resilient community-based health system to ensure equitable maternal, newborn, and child health in rural Ethiopia using COVID-19 as a policy window.

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Abstract

Background: Over the last three decades, community-based health programs have been emphasized as a major strategy in promoting primary healthcare access and improving health outcomes in Ethiopia and beyond. However, these programs continued without the transformational capacity to comprehensively respond to persisting preventable and treatable Maternal, Newborn, and Child Health (MNCH) challenges. Health system emergencies and shocks continue to underscore the need for a more resilient health system for equitable MNCH and other health outcomes. The aim of this manuscript is to critically examine critical success factors (CSFs) in developing a transformative resilient community-based health system in rural Ethiopia using COVID-19 as a policy window.

Methods: We conducted a qualitative case study in West Shewa Zone, rural Ethiopia. A purposive sampling technique was used to recruit participants. Data sources were two focus group discussions with CHWs, twelve key informant interviews with multilevel public health policy actors, and a policy document review related to the CHW program to triangulate the findings. Thematic analysis of the qualitative data was conducted. Our study was informed by multiple theoretical frameworks including the World Health Organization's Health system framework and the Multiple Streams Framework (MSF) to inform the research processes and analysis.

Findings: Our analysis highlighted ten CSF within the WHO's health system framework in developing an equitable MNCH and a resilient community-based health system in rural Ethiopia. CSF within the WHO's framework include CHWs program optimization and comprehensive care, health finance optimization, diversification and sustainability, reliable health system evidence-building and translation, reliable access to essential medical and diagnostic supplies, community

health workers' living and working conditions, and transformational governance and leadership. CSF beyond WHO's health system include alignment of multi-stakeholder engagement towards co-production, reliable security and health infrastructure development, reliable digital transformation of the community health program, and a *gender transformative approach in the health system.*

Conclusion: Our finding emphasizes CSFs to ensure MNCH equity and build a transformative and resilient health system for the disadvantaged rural majority population in Ethiopia. The analyzed CSFs are success conditions and prerequisites that must exist to realize equitable MNCH and beyond. The WHO's health systems strengthening framework contains necessary core building blocks that contribute to ensuring a robust health system, but they are not sufficient. Using COVID-19 as a policy window, Ethiopia's CHWs program needs a paradigm shift to comprehensive and transformative community-based health systems in multiple areas to accelerate health outcomes and optimum response to the continued MNCH inequity gap while addressing current and future generations' health needs within a fast-changing health environment. Areas that need transformational change include moving from standard WHO's and incomplete health system building blocks to agile critical success factors and a context-based approach; shifting from fragmented government control and donor-driven short-term disease-specific support approaches to a systematic and synergized multi-stakeholder co-production approach; moving from the renovation of a vertical and selective basic health prevention approach to logistically and technically embedded comprehensive community healthcare co-production, transformation, and resilient health framework to addresses the complex health system challenges, including MNCH.

Keywords: Critical success factors (CSFs); Maternal Newborn and Child Health (MNCH); Health Extension Program; comprehensive community healthcare, Community Health program; Ethiopia, equity, transformative resilience; sub-Saharan Africa, WHO health systems framework; community health co-production, transformation, and resilient framework

Introduction

In sub-Saharan Africa (SSA), the state of inequities in access to and outcomes of maternal, newborn, and child health (MNCH) services persists, and is higher than all other regions in the world (Kinney et al., 2010; Sidze et al., 2022; WHO,2016). Consequently, the SSA region has continued as the riskiest region for maternal and under-five child death occurrences and this has become a key health challenge in the region (Owili et al.2016.; UN,2021; Roser & Ritchie, 2013). Despite multiple efforts of the Ethiopian government to address this challenge, like in many other Low- and Middle-Income Countries (LMICs), rural Ethiopian mothers, children and newborns face the greatest risk of ill health due to unreliable access to basic health services including MNCH (Amref, 2022; Hogan et al., 2010; Sidze et al., 2022). Ethiopia must reduce neonatal deaths from 29 to 12 per 1,000 live births and maternal deaths from 412 to 70 per 100,000 live births to achieve the Sustainable Development Goals (SDGs) amid a fragmented health system and increasingly constrained health resources. Thus, this paper examines critical success factors in developing a resilient community-based health system in rural Ethiopia to achieve better MNCH outcomes. We ask what critical success factors are considered in developing a resilient community-based health system in rural Ethiopia?

The World Health Organization (WHO) defines a health system as "all organizations, people and actions whose primary intent is to promote, restore, or maintain health'' (WHO, 2007). Health system resilience can be defined as the capacity of health actors, institutions, and populations to have absorptive, adaptive and transformative capacities to prepare for and effectively respond to health crises without major disruption to socioeconomic well-being (Danaher et al., 2014; Gebremeskel et al., 2021; Kruk et al., 2015). Health system emergencies and shocks like the ongoing COVID-19 continue to underscore the need for a more resilient health system for equitable MNCH and other health outcomes (Alabi et al., 2023; Doetsch et al., 2022). The COVID-19 pandemic has amplified the fragility of global health systems around the world and enhanced the discussion about the necessity of resilience in global health (Claro, 2023). Health system resilience has gained considerable attention in global health discussions since the Ebola outbreak in West Africa in 2014–2015 (Kruk et al., 2015). Most of the existing literature on health system resilience focuses on the characterization of a health system that demonstrates preparedness, absorptive, and adaptive response to an emergency, without due emphasis on how to build transformative capacity and enabling factors that are necessary to build a transformative and

resilient health system (Binagwaho et al., 2022; Danaher et al., 2014; Gebremeskel et al., 2021; Kruk et al., 2015; WHO, 2007). Building on the WHO health system framework (WHO, 2007;Blachet et al.,2017) health system resilience should be framed and organized beyond the emergency response to transformative resilience through addressing and understanding the root cause and aiming to address the health system challenges. It is also crucial to embed resilience into the health management system, comprising planning, assurance and controlling mechanisms. Transformative health resilience refers to the capacity of a health system to shift to a new phase characterized by a more innovative, efficient, effective, equitable and sustainable system beyond the current situation and health needs.

Health systems in LMICs, including SSA countries, remain unreliable and lack resilience in responding to persistent and emerging public health issues including inequalities in MNCH outcomes and changing disease burdens (Ayanore et al., 2019; GDB,2015; Strasser et al., 2016). Major challenges to MNCH in SSA countries include health system, structural and social determinants of health (Kinney et al., 2010). This indicates how health equity is undermined when preventable and avoidable systematic conditions constrain life choices and do not significantly respond to MNCH needs (PMNCH, 2015).

Since the Alma-Ata Declaration by the WHO in 1978 (1978), community health workers (CHWs) programs have become an important strategy to ensure MNCH. The promising outcomes of including CHWs in MNCH services are noticeable in many countries such as Brazil, Bangladesh, and Nepal (Perry et al., 2017; Lewin et al., 2005). These countries have effectively executed CHWs-led programmes (Cometto et al., 2018; Hogan et al., 2010; Moller et al., 2017; Perry et al., 2014). According to the WHO, CHWs are members of the communities where they work, who should be selected by the communities, be supported by the health system and have shorter training than professional health workers (Perry et al., 2014). CHWs provide non-heretical community-based services, they are accessible and they provide the platform that ensures health equity (Javanparast et al., 2018; Perry et al., 2014). Given their unique potential to generate positive health outcomes, CHWs are increasingly being acknowledged as valuable members of the healthcare workforce (Javanparast et al., 2018). This is because they are well positioned in connecting grassroot communities to the formal health systems thereby making health systems more people-

centered in promoting, preventing, detecting and responding to primary health needs including MCH (Javanparast et al., 2018; Oliver et al., 2015).

Ethiopia launched a community-based health program in 2003. Ethiopia's flagship CHW program has been instrumental in expanding the coverage of primary health access and improving MNCH outcomes in rural communities and hard-to-reach remote areas (HSG, 2021). Ethiopia introduced this ambitious nationwide community health program to improve access to primary health promotion and essential MNCH for disadvantaged rural communities (Teklehaimanot & Teklehaimanot, 2013; MERQ,2020). Despite the multiple challenges including the top-down selective disease prevention and health promotion approach and fragmented logistics challenge, the current level of better health outcomes, including MNCH, is attributed to the CHWs program. The CHWs program is integral to the national health system and is run by CHWs who are situated at the lower levels of the hierarchy of the health system (HSG, 2021). Throughout history, although often under a different name, Health Extension workers (HEWs)/CHWs have been instrumental in providing communities with education on a myriad of issues. They also serve as key connections to various social services and healthcare resources (CDC, 2017). A fundamental characteristic exuded by CHWs is their capacity to bring cultural relevance and sensitivity to each interaction. Because CHWs tend to come from the same communities they serve, they play a key role in insular settings where communities may experience fear and lack of trust. CHWs have the unique ability to distill the complexities for community members as they attempt to enter the healthcare system (Gebremeskel et al., 2021; Olaniran et al.,2017; Olaniran et al.,2019). However, in spite of the increasing demand, emphasis on, and contribution of the CHWs, the promising program has continued without a significant paradigm shift towards comprehensive primary care, lacking a system strengthening approach. Comprehensive primary care is characterized by multidisciplinary teamwork, a social understanding of health, meaningful community and multi-stakeholder engagement in management, advocacy for policy changes to address the social determinants of health, and services that cover rehabilitation, treatment, prevention and promotion (Labonte et al., 2017). We will use HEWs and CHWs interchangeably in this manuscript.

Over the course of three decades, multiple efforts have been made to enhance the responsiveness of the CHWs program including expansion to pastoralist and urban settings, improving community

participation, and expansion to provide treatment of uncomplicated conditions (Teklehaimanot & Teklehaimanot, 2013). In 2020, Ethiopia's Federal Ministry of Health (MoH) launched an ambitious roadmap for optimizing the health extension program (HEP) through expanding the health service packages, task shifting, and changing the professional mix. The program has grown to encompass 18 essential health service packages with a workforce of 40,000 HEWs working from more than 17,000 Health Posts (HP) (Assefa et al., 2019; Olaniran et al.,2017; Teklehaimanot & Teklehaimanot, 2013).

Ethiopia has achieved remarkable health outcomes in the last three decades and CHWs/ HEWs are one of the major contributors to the success. The achievements include a 5% increase (from 39% in 2016 to 44% in 2019) in the percentage of children aged 12-23 months who received all basic vaccinations; the reduction of neonatal mortality rates from 49 per 1,000 live births in 2000 to 30 per 1,000 live births in 2019; a decline in U5MR from 123 deaths per 1,000 live births in 2005 to 59 deaths per 1,000 live births in 2019. Moreover, receipt of antenatal care (ANC) and institutional delivery has gone up from 27% and 5% in 2005 to 74% and 48% in 2019 respectively. The proportion of women with the recommended four or more ANC visits increased from 12% in 2005 to 43% in 2019 (Doetsch et al., 2022).

Ethiopia's nationwide CHW program continues to experience multiple challenges to enhance better health outcomes notwithstanding the multiple efforts to improve the program (Assefa et al.,2019; MERQ,2020). Evidence for the decline in service provision points to supply-side factors of the CHW program which have overwhelmingly failed to address the quantity and quality of health workers, an under-resourced health system and poor infrastructural development (Liu et al., 2011; Mhlongo et al., 2020; MERQ,2020). Hence, Ethiopian mothers, children and newborns remain at risk because of unreliable access to basic health services (Amref,2020.). Based on the Demographic and Health Survey in 2019, there is a fragmentation in MNCH outcomes. Ethiopia has a large burden of communicable diseases and still has an MMR of 412 per 100,000 live births and U5MR of 67 per 1,000 (USAID,2020). For example, while a higher proportion (74%) of mothers received the first ANC, only 43% received the recommended four or more ANC. Also, Skilled Birth Attendance (SBA) during childbirth is 48%. Postnatal care (PNC) is at 34% of women aged 15-49 (EDHS,2019). The CHWs program is experiencing systemic challenges that

stem from the fragmentation of health finance; medical and equipment supply; working and living infrastructures; CHWs empowerment, monitoring, supervision, and information; coordination and governance; and stakeholder engagement (Gebremeskel et al.,2020). To achieve the SDGs, Ethiopia must reduce neonatal deaths from 29 to 12 per 1,000 live births and maternal deaths from 412 to 70 per 100,000 live births in an environment of increasingly constrained health resources.

The COVID-19 pandemic amplified the problems of an already overwhelmingly fragile health system (Roberton et al 2020; Pallangyo et al., 2020). According to recent reviews on the impact of COVID-19 on MNCH, there is a decline in MNCH service utilization including ANC, institutional deliveries and immunization (Palo et al., 2022) due to the major challenge of the health system and lack of policies in preparation for crises (Alabi et al., 2023). The overarching direct and indirect impact of COVID-19 includes delayed or decreased care, disruption in service provision and utilization and mitigation strategies or recommendations (Adu et al., 2022). Consequently, global projections of the indirect impacts of COVID-19 propose a 38.6% rise in maternal mortality and a 44.7% increase in child mortality per month across 118 LMICs including SSA countries (Alabi et al., 2023.; Sahoo et al., 2021). In Ethiopia due to the pandemic, MNCH service delivery declined significantly: ANC declined by 26.35%, skilled birth attendance declined by 23.46%, PNC declined by 30%, family planning declined by 14%, and abortion care declined by 23.7%(Zewdie et al., 2022).

Emerging evidence shows the need to characterize components of a resilient health system (Danaher et al., 2014; Gebremeskel et al., 2021; UNICEF;2022; Kruk et al., 2015), however, there is limited evidence on what critical success factors (CSFs) are necessary to transform the community health system's resilience to enhance MNCH equity. Hence, we argue that it is time for relevant stakeholders in the health system to emphasise the requisite conditions for building a resilient health system for sustainable and equitable MNCH and other health outcomes. According to Rockart (1982) understanding critical success factors (CSF) is crucial for top management to determine where management attention should be directed (Rockart, 1979); they are the aspects of a program considered most essential to its success or failure (Peffers et al., 2003; Rockart, 1979). CSFs can guide organizations' strategic planning, implementation of a plan and achievement of

high performance. They are success conditions or necessary states of being and are circumstances or prerequisites that must exist for a project's success to occur (Näslund, 2013; Peffers et al., 2003). Although health system emergencies and shocks continue to underscore the need for a more resilient health system for equitable MNCH and other health outcomes, there is limited evidence-based on internal and external success factors at different levels to enhance comprehensive MNCH equity and a resilient community health system during the COVID-19 pandemic and beyond. This manuscript aims to critically examine CSFs in developing a resilient community-based health system in rural Ethiopia using COVID-19 as a policy window.

Theoretical framework

Our study was guided by different theoretical frameworks which informed the research processes and research questions. First, we used the socio-ecological framework (SEF) to inform the description of the multilevel determinants of the CHWs program's effectiveness (CDC, 2020; Gebremeskel et al., 2021). The SEF posits that factors at various levels (individual, interpersonal, community, and health system levels) uniquely and jointly contribute to health interventions. Second, our study was informed by the WHO's health system framework, a leading structure of discourse on health systems building. The framework comprises six operational building blocks—service delivery, health workforce, information, medical products and technologies, financing, and leadership and governance, it however falls short in including macrolevel community context and engagement. Despite this limitation, the framework's relevance is recognised by policymakers, programmers and researchers in national and global health and has become a pillar for planning, implementation, and evaluation (Gebremeskel et al., 2021). Third, we used the synergetic model, which shifts the focus from state-private business co-production to ideas that involve state-society organization cooperation (Evans, 1996). State-society synergy is a framework used in analyzing the relational behavioral pattern between state and non-state market actors. We used a synergistic model based on the works of Peter Evans's State-Society Synergy approach (Evans, 1996), Judith Tendler's (Tendler, n.d.) concept of blurred public-private boundaries, and Elinor Ostrom's (1996) vision of "co-production" (Ostrom, 1996). Furthermore, we draw on Kingdon's multiple streams framework (Kingdon, 1984): Kingdon's approach provides the conceptual framework for the analysis of the three streams – problems, policies, and politics. Kingdon argues that policy change occurs when there is adequate attention to a problem (the problem stream), a policy solution has

been clearly articulated and reached consensus (the policy stream), and there is political will to adopt this policy (the politics stream). When all three streams converge, a policy window opens, representing an opportunity for advocates of proposals to push attention to their special problems (Kingdon, 1984).

Our findings were reported based on the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Appendix13).

Research method and material

This study is a qualitative case study using document review, focus group discussions (FGDs) and key informant interviews (KII). A qualitative case study is a research methodology that helps in the exploration of a phenomenon within some context (Yin, 2017). Desai and Potter (2006) stressed that development studies require the use of a wide range of research methods: the mix of methods enables the different techniques and their results to be compared against each other, allowing judgements to be made as to which method (or combination of methods) is the most appropriate for any particular purpose. In a case study, a real-time phenomenon is explored within its naturally occurring context, with the aim of answering the "how" and "why" questions (Yin, 2017). Yin proposes that a case study inquiry should rely on multiple sources of evidence because data source triangulation allows the researchers to have a trustworthy groundwork for the findings and the contribution of knowledge (Yin, 2017). According to George and Bennett (2012), case studies enable comprehensive, adequate and deep contextual and conceptual understanding; case studies are a useful means to closely examine the hypothesized role of causal mechanisms in the context of individual cases. AG conducted two FGD in two purposively selected districts of West Shewa zone, the move from single-case to paired comparison offers a balanced combination of descriptive depth and analytical challenge that progressively declines as more cases are added (Tarrow, 2010).

Research setting

Ethiopia is one of the most populous countries in Africa with 123 million inhabitants, which is second only to Nigeria. The World Bank (2022) classifies Ethiopia as a low-income country, but

it is also one of the fastest-growing economies in SSA. It still has a largely rural population, above 80% of the population lives in rural areas, and 12–14% of the total population are pastoralists or agro-pastoralists (CSA,2023). Since the adoption of the 1994 ethnic-based constitution, the government of Ethiopia has been structured in the form of a federal system of government. The country is administratively divided into eleven ethnic-based regional states (provinces) and two chartered cities that are administered separately from states (Mendo & Mansukhani, 2022). This study was conducted in the Oromia regional state, which is the largest of the eleven Ethiopian states, both in terms of population and landmass(Mendo & Mansukhani, 2022).

Ethiopia has a top-down decentralized model for the delivery of healthcare along political structures. The health sector is structured into a three-tier system: tertiary care, provided at specialized hospitals; secondary care, provided at general hospitals with inpatient and ambulatory services; and primary healthcare (primary hospitals, health centers and HEWs post) (Merq, 2020). Each primary healthcare unit serves approximately 25,000 people. The CHWs/HEP program is the primary health system component at the community level that reaches the rural majority communities by recruiting and training paid community-based HEWs (Teklehaimanot & Teklehaimanot, 2013).

In this research, the nested nature of the case study encompasses two distinct populations including HEWs/CHWs (16 FGD participants), and subnational and national public health policy actors (12 KII participants). These populations are spread over three geographical areas with respect to the scope of their work: West Shewa Zone CHWs, Oromia Region (sub-national) and Ethiopia (national) public health policy actors.

The FGD data was collected from health extension workers (HEWs) in West Shewa Zone. West Shewa is one of the zones of the Oromia region, the zone has 23 districts and is located to the west of Addis Ababa (Capital city of Ethiopia). The zone has a population of 2,058,676, of which 1,028,501 are males and 1,030,175 are females. In this Zone, in 2019, 84 percent of the population live in rural areas (UNICEF. 2022). Currently, the zone has 8 hospitals, 92 health centers and 528 CHW posts (each post has an average of 2 HEWs). The CHW program and health posts are administered and funded under the public health system. Despite the progress in other parts of the country, the West Shewa zone is underperforming when it comes to MNCH outcomes.

Characteristics of participants:

FGD participant (Inclusion criteria): All participants, CHWs/HEWs, were adults ranging from the ages of 21 and who had been residents of the district (work site). The participants had at least one-year experience working as a CHW in MNCH before COVID-19; three and more years of CHW/MNCH work experience in a rural area; over one year of HEWs national training; and werea full-time salaried employee. The study did not exclude HEWs/CHWs by their gender or sex.

KII participant: Key informants were recruited based on their known involvement in the policy process leading to the planning and the implementation of CHWs/MNCH program. Snowball sampling was used to recruit participants whereby participants were suggested and recruited by other participants (Noy, 2008).

The principal investigator (AG) estimated the saturation of data between 10-12 interviews and 2 focus groups comprising 6-8 individuals based on previous similar approaches (Guest et al., 2020).

Participant recruitment:

FGD recruitment: Using purposive sampling, AG worked with the Oromia Regional Health Bureau (ORHB) and zone health administration to select the two districts. Then AG contacted and worked with the district health office to recruit potential FGD participants to send the recruitment poster to potential participants via the districts' regular means of communication, telegram, email and announcements during review meetings.

KII recruitment: The principal investigator, AG, worked with the MoH, ORHB, zone health administration to select the first potential participant in the KII. AG started by sending an invitation email with information about the study and the KII recruitment poster. The source of the referral (the referee) was confidential. The potential invited participant had the right to accept or decline the invitation, and this response was confidential too.

We used a first-come-first-served basis for enrolment. Prior to participating in this study, participants were asked to provide their free and informed consent by signing a consent form.

Data collection: Research instrument

The data collection was organized in three parts: FGDs, KIIs and document review. AG collected the data using semi-structured FGD guides developed in English and translated to Oromo language and the KII guides developed in English and translated to Amharic and Oromo language guided the KIIs. The two guides were carefully crafted following the theoretical frameworks and relevant literature to include neutral, non-biased, and non-leading questions to avoid influencing participant responses. AG is fluent in the local language. Based on their agreement, AG contacted participants for their convenient time and place to sign the consent form and then conducted the FGD and KII. AG acted as the facilitator to recruit participants, ensure confidentiality, and distribute and collect consent forms.

At the beginning of each FGD and KII, AG briefly described the purpose of the study to the participants. All FGDs and 11 KII were conducted face-to-face, and one KII was conducted using Zoom. After consent was given, each FGD and KII was audio recorded. The focus group sessions lasted between 80 to 90 minutes and the KII lasted between 60 to 90 minutes. A research assistant was assigned to take notes during the FGDs after a brief training about research ethics and process by AG. The research assistant was fluent in local Oromo language and possesses a BSc degree and research-related experience.

As a token of appreciation, all FGD and eight KII participants were compensated with a small honorarium, for their time and effort and to cover their lunch-related expenses. In the context of COVID-19, participants adhered to public health guidelines including wearing masks.

Most of the data collection was conducted face-to-face in Afan Oromo and Amharic, based on participants' language preferences. Two FGDs were conducted with CHWs working in two different districts - Weredas (Adea Berga and Ejere) of the West Shewa Zone. In-depth semi-structured KIIs were conducted with twelve key informants from national and sub-national level health systems.

Data collection took place between September to November 2022 at different locations depending on participants preference. The FGDs were conducted in a rented hotel hall while KII with policymakers were conducted in convenient locations for participants such as their offices.

We conducted a document review to enrich the findings from the FGD and KII, and to understand the context and operation of the HEWs/CHWs program. Policy documents, including national/regional strategies and plans, were considered to represent the major priorities for CHWs-led MNCH. The relevant and available documents were selected and accessed through the recommendation of the key informants working in the National and subnational HEP/MNCH program in Ethiopia.

Data analysis

We followed Braun and Clarke's (Braun & Clarke, 2022) six step thematic analysis. The analysis (Braun & Clarke, 2022) included development of a coding framework informed by questions from the KII/FGD guides and the WHO building block framework and SEM that involved (1) familiarization with the data; (2) generating initial codes; (3) developing a coding tree to guide the coding of transcripts; (4) identifying themes; (5) reviewing, defining, and naming themes; (6) interpreting the narratives and stories; and (7) producing the report —a concise, coherent, logical, and non-repetitive account supported by vivid examples.

FGD and the KII were audio-recorded documents and AG transcribed them verbatim. Verbatim transcription was done by listening to audio-recorded materials. The two FGDs were in English, four KIIs were in the Oromo language, and eight KIIs were in the Amaharic language. These were all transcribed into Word documents and subsequently translated to English language. Data were also cross-checked by listening to the original recording while reading along in English.

The transcript content was coded using an open coding process manually to ensure the quality and accuracy and of coded transcripts and to address any discrepancies. Codes were developed after an initial review of the transcripts. The transcript content was analyzed inductively to get familiar with the data. First, after familiarization with the transcript AG and OU coded one transcript from each FGD and KII, they coded individually and compared their codes. After debriefing and consensus, the transcript was coded accordingly. After debriefing, JE and SY randomly chose and compared to check the alignment or discrepancies of the coding of the transcript. Emerged themes were based on an iterative process of inductive and deductive approaches. Deductive approaches

were drawn from existing literature and the systematic review phase and the study's theoretical frameworks. In inductive approaches, themes emerged from the data and were not forced to fit into preconceived categories (Saldaña, 2013). The analyses used triangulated data from multiple sources and multilevel government and nongovernmental health policy experts and frontline CHWs, and document analysis. The themes and patterns that emerged from each dataset were compared, and similarities and differences analyzed through the within - and cross case analysis. Given the small size of the dataset, we decided to code manually without employing any qualitative data analysis software.

Policy documents

Policy documents were significant to the study, and were used mainly from a realist perspective (Thorogood, 2018), that is, as a means to understanding the CHWs/HEP policy/ program in the context of rural Ethiopia. Hence, policy documents were essential in providing background information to the study and in defining the questions and trajectories that were pursued in the FGD and KII. The analysis was also enriched by useful insights from the policy document. Using thematic analysis, we sought a document that mentions the major themes that emerged from the KII and FGD, based on inductive and deductive approaches. Major health policy documents used in this study include, inter alia, the second Health Sector Transformation Plan (HSTP-II) (Health, 2021), A roadmap for optimizing the Ethiopian HEP (2020-2035) (Merq, 2020). The list of policy documents is included as an appendix (Appendix:15).

Trustworthiness

Trustworthiness, a qualitative validation criterion, was applied in this study in line with established guidelines (Yin, 2017). Therefore, the researcher's inherent bias was controlled partly by being self-aware and allowing the participants to generate data based on their own perceptions. We enhanced the trustworthiness of the study's findings by using different techniques recommended by renowned qualitative researchers including member checks, peer review, and triangulating the data by using multiple sources of data to confirm emerging codes and themes to serve as a data validation strategy and help to establish the credibility of the study findings (Merriam, 2002; Creswell, 2020).

Researcher reflexivity and positionality statement

To enable any audience of qualitative studies to evaluate the validity of conclusions extrapolated from data, researchers should, as part of the study, neutralize or bracket their biases by stating them explicitly to the full extent possible (Merriam, 2002). AG, OU, JE and SY have extensive experience as global health experts and have multiple publications and work on MNCH and related policy and programs in SSA including Ethiopia. AG has more than eight years of experience in community health program management in Ethiopia and has worked in different contexts of health program implementation and evaluation in Ethiopia.

Results

Characteristics of participants

The sociodemographic characteristics of FGD participants are summarized as follows: In the FGDs, there were a total of 16 female health extension workers from two districts (Adea Berga and Ejere) of West Shewa Zone. The FGD participants are female and the majority - 15 (93.75 %) of them are in the age range of 25-40. The highest level of education or training that they have completed were as follows: college diploma 12 (75%) and over one year of HEWs training 4 (25%). Participants' total work experience as a HEW (in years): 6 and above – 14 (87.5%) and four to five years - 2 (12.5%). For all the participants, walking was their most used mode of transportation during fieldwork/outreach activities. The average distance between their work site and fieldwork/outreach site in kilometers: above 5km, 9 (56.25); 3km to 5 km 5(31.25%); and less than 3 km 2 (12.5%). The most used form of communication was face-to-face with clients during home visits for all the participants. In the past 12 months, 9 (56.25%) of the CHW participants had an estimated monthly personal income of 5001 and above Ethiopian Birr (ETB) and the rest earned an income below 5000 ETB.

A total of twelve public health policy/ program experts were recruited to participate in the KIIs. Eight participants (66.6%) were recruited from the three levels of government health structures. These include three participants who were recruited from MoH, they act as national primary health system and HEP experts; two participants who were recruited from ORHB, they act as regional primary health and HEP experts; and three participants who were recruited from the West Shewa

Zone (one Zonal level health MNCH expert) and two district level health office HEP experts. Four (33.3%) participants were recruited from NGOs. These include two national-level experts (one program director and one monitoring and evaluation [M&E] expert) and two from the regional-level program manager/expert. In terms of gender, four (33.3%) women and eight men (66.6%) participated. Most of the participants have post-graduate level (MSc) educational backgrounds in health and related study programs and they have extensive (more than 10 years) public health-related experiences in different levels of responsibilities.

Using multilevel data and thematic approaches, our analysis uncovered underlying critical success factors (CSF) in developing a resilient community-based health system in rural Ethiopia. We identified ten distinct yet interconnected sub-themes (sets) of critical success factors to develop a resilient community-based health system in rural Ethiopia. We identified ten critical factors within the WHO health system and beyond. CSF within the WHO's health system framework include adaptation and optimization of programs, health finance optimization, diversification and sustainability, reliable health system evidence-building and translation, reliable access to essential medical and diagnostic supplies, community health workers' living and working conditions, and transformational governance and leadership. CSF beyond the WHO health system include: alignment of multi-stakeholder engagement towards co-production, reliable security and health infrastructure development, reliable digital transformation of the community health program, and gender transformative approaches in the health system. We present the ten interconnected sub-themes(sets) of CSFs.

CSF within the WHO's health system framework:

1. **CHWs program optimization and comprehensive care**

Our findings underscored the adaptation, optimization and comprehensiveness of the program package and service delivery as a critical success factor (CSF) for Ethiopia's flagship CHW program. Adaptation strategy in the CHW program context refers to an attempt to scale up the innovative CHW program to fit with the changing service demand, demographic change, epidemiological shift sociocultural context, and enhance health outcomes and impact.

The demand for and positive perception of the CHW program among the community is increasing over time. CHWs originally provided 16 essential health service packages but are currently responsible for 18 health service packages comprising prevention, promotional, and basic curative services.

"We provide services like vaccination, home-to-home visits, education, growth monitoring for children under two years, pregnant women follow-up, ANC services, and we treat under five children for diarrhea. … Not only home-to-home visits but we also provide health education at health posts, at schools, and at community organizations like 'Idir'. We do both before and after-delivery services for mothers. After delivery, we monitor the situation of the mother and the new baby; we promote breastfeeding, and we measure the weight of the baby to monitor the growth of the baby. We also offer anti-parasite medicine for newborn babies. We provide vitamin A every six months. We also work on malnourishment and can provide supplementary food; we can also monitor the progress of malnourished children and if they are not recovering well, we will refer them to the nearby health center for further treatment." (FGD participant, From Adea Berga District)

"If we look at vaccination, they [pregnant women and children] used to go to woreda(district) to get service, before the introduction of the CHWs program but now they can easily access them from the nearby health post, which is available in their neighborhood. They have better awareness now; nobody forces them to be vaccinated (no obligation). Hence, there is a dramatic change from year to year." (FGD participant, Ejere District)

Comprehensive primary health care: Our findings underscore the fact that the community has gradually recognized the significance of the program. This is evidenced by the increasing demand for CHW services and the program's comprehensive to provide services beyond health education and promotion. However, the finding shows the unmet needs of community health services in rural neighborhoods.

"Even though our role is mainly prevention, the community is expecting more. The community needs more services from us for their children, beyond education. Otherwise, their interest in our service would go down when their demand and our service do not match. Some people wouldn't like to go far, or they may have no access to or money for transportation, so they need help in their neighborhood." (FGD participant, From Adea Berga District)

"My comment is that rural communities should not travel to towns or cities to seek every basic medical service. So community health workers should be empowered knowledge-wise and logistic-wise. There should be a conducive working situation for health workers. There should be more health workers, beyond health promoting. There should be pharmacists and lab technicians at the health post level." (KII 4, District health office, HEP experts)

Our findings align with the current government commitment to optimizing the program through expansion, task-shifting, and professional mix. Ethiopia launched "A Roadmap for Optimizing the Ethiopian Health Extension Program, 2020 – 2035" in March 2021 to enhance primary health access and realize UHC.

2. **Health finance optimization, diversification, and sustainability**

According to our analysis, in Ethiopia, optimized, diversified, and sustainable health financing is one of the key CSFs for better achievement of the program and health outcomes including MNCH. Although the Ethiopian government has multiple approaches to enhancing the financial capacity of the health system, there is a huge financial gap in practice. See more quotes on S-5.

"To strengthen the health system, improving the health financing system is very crucial. Due to the high population size and increasing service demand, the health sector should be given priority. Health financing should be given more attention in order to increase healthy interventions." (KII 2, National level NGO, Program Director)

"One of the crucial factors in improving the health system should be revenue and adequate budget allocation. However, the budget for primary health is very limited. This should be improved. … It requires improving expenditure on the primary and the community health program. After that, it is the recurring budget that takes the biggest share, and it requires adjustment. Program improvement is required for human resources (HR). Allocation needs to be improved." (KII 1, MoH, Primary health program expert).

Participants highlighted that in Ethiopia the implementation of the community health program optimization roadmap is lagging behind, and the fragmentation of health financing is one of the key factors. The road map for optimization of the HEWs program requires about 12.6 billion USD for 15 years. Improving budget allocation to the government, improving partners' support for the health system, and alternative domestic resource generation and mobilization from the community and private sectors are among the key strategies.

"The implementation HEP roadmap is lagging behind due to budget shortage and limited courage. Realization of the road map is important to improve the HEWs program. An intensive resource is required, then logistic supplies are necessary to provide the service…So, the health sector uses more donors' budgets. So, as you said there should be a way to enhance domestic resource mobilization. I don't think that there is a simple way to move out of aid dependency in a short time." (KII 8, MoH, HEP expert)

"The Ethiopian government can not realize the optimization of the HEWs program alone. The majority of the health sector programs are from the donor's support. The budget allocated by the government is very limited. The health sector relies on the support from donors and partners. If the government of Ethiopia is not able to receive the donor's support, I don't think the government can do it alone." (KII 7, MoH, Primary health system expert)

In addition, participants stressed the importance of alternative domestic resource mobilization to address the financial challenge of the health system. In Ethiopia, there are different health insurance schemes including national-level community-based health insurance (CBHI) schemes. In Ethiopia currently, this is at the initial stage and needs further mobilization and systemic support.

3. **Reliable access to essential medical and diagnostic supplies**

Our finding demonstrates the CSFs for the CHW program are also determined by access to essential medical and diagnostic supplies.

"The health posts are not adequate to address the current service demand, there are inadequate materials and equipment to provide service. There are inadequate quantities of fridges, and the available ones are not functional. HEWs are expected to go to the nearby health center to store or pick up vaccines, which also impacts the potency of the vaccine. The constant move from health posts to health centers and health posts to homes is challenging." ***(****KII 5, Regional health bureau, Primary health expert)*

"*The major issues that I can raise as a problem are: …We have no refrigerators. So, mothers and children have to wait for a week until we go to the health center and bring the vaccine for weekly supply. Some mothers come from long distances and may use public transport, if they are not getting the vaccine on the first day they have to come back, which would incur more expenses. Pregnant women cannot be vaccinated unless they visit the health center. Also, there are times when Iron is in short supply. Pregnant women need a timely supply of tetanus toxoid (TT) and Iron, but the supply is not consistent." (FGD participant, Ejere District).*

4. **Reliable health system evidence-building and translation: Monitoring, evaluation, and information.**

Our analysis indicates that health system evidence-building and translation are among the key CSFs for better health system management and health outcomes monitoring and evaluation. Reliable health system data quantity, coverage, quality, frequency, and capacity to use and manage are preconditions for sustaining the basic health service to ensure health quality and well-being. Actors in the health system need to work with research institutes to co-produce evidence-informed

policy and practice through integrated knowledge generation and practice for better health outcomes and to improve the CHW program's effectiveness and ability to anticipate and cope with *uncertainties.*

> "*Evidence is crucial for the health program's effectiveness. I think it would be good if we could invite professionals who can propose different options to the program; I think it is important to engage them to help with research and implementation research." (KII 7, MoH, Primary health system expert)*
> *To strengthen the health system, health system monitoring mechanisms deserve attention. Currently, I don't think it is a very strong data system. Starting from the planning level it is important to engage the different actors to provide technical assistance and fill the health financing gaps." (KII 2, National level NGO, Program Director)*

Our finding highlights the need for improvement in the data management system and program monitoring and evaluation.

"It is important to improve the health data collection, analysis, and utilization of health workers. I think, at the local level there should be regular planning, monitoring, and reviewing of mechanisms on health data, at least every three months on-site using the reported data. This can give a chance to see the progress and the challenges, and then to address the challenges." (KII 4, District health office, HEP experts)

Ethiopia's health program planners are experiencing challenges in getting recent national-level representative data. Currently, the annual health program targets are planned based on the data projected from the census from over one decade ago; Ethiopia last conducted a census in *2007, this was16 years ago.* This is a challenge to plan for the actual population including mothers and child health. Modernizing and enhancing the country's health system data management in terms of proper budget allocation, infrastructures, technology, and human resources knowledge and skill is crucial to ensure a reliable health data system challenge including MNCH.

Our findings show that Ethiopian CHWs report their performance using the Community Health Information System (CHIS) through the DHIS2 (District Health Information) software platform, but they have a challenge to fully use the system and generate the required data for programming. DHIS2 is a platform for the collection, reporting, analysis and dissemination of aggregate and individual-level data.

"There is one report using an online platform, DHIS2, but the health extension workers do have not enough knowledge and support to enter the data and utilize the data, there is limited

infrastructure like slow internet, limited technical capacity, and electricity, partners collaboration is important here "(KII 3, District health office, HEP experts)

5. Improved community health workers living and working conditions.

In our findings, conducive community health workers' living and working conditions are among the CSFs for the effectiveness of the program and the CHWs as well. We can say CHWs are the drivers of this essential service to save lives and improve the well-being of hard-to-reach rural communities in a hard-to-access service. In Ethiopia, currently, approximately 40,000 trained HEWs act as the nation's frontline health workforce, each serving about 2,500 individuals residing in their local village *(kebeles).* They have been playing a vital role in improving health outcomes including MNCH, especially in rural areas of low-resource settings.

"The benefit and the job burden for the HEWs are not comparable, the distance like from 'the ground to the sky'. Our benefit is very low, we save a large number of communities, and it took us a long time to convince a single mother…. Better education opportunities for HEWs and more training opportunities need to be stressed to improve the performance of HEWs. We are not a cornerstone; we should not be restricted to changing our workplace. HEWs there should be a flexible approach to transfer (changing work site) from village to village, health post to health post, and district to district." (FGD participant, Ejere District)

"The role of health extensions in improving maternal and child health is significant. Therefore, health extensions should have a better education, they must have access to advance their training level. Next, there should be conducive living and working conditions for HEWs…. There are policies being enacted to strengthen the health HEP, to reorganize the HEWs program as merged or comprehensive. But it was not practiced, there is no allocated budget." (KII 9, Zonal level health MNCH expert)

HEWs/CHWs need to be arranged with better education opportunities more training opportunities and freedom to be transferred from one site to another. CHWs empowerment includes better income and remuneration. CHWs need to be granted free healthcare access for themselves and their family. HEWs need to be granted in-kind materials/equipment. CHWs/ HEWs need a better working environment and balanced/equivalent responsibilities.

6.Transformational health program management and leadership

Our analysis underlined transformational health program management and leadership as key accelerators of successful full health program intervention. Transformational health program

management and leadership have a crucial role in terms of developing interest and influence among stakeholders.

"During the beginning of COVID-19, there was a strong commitment from the leadership to coordinate the stakeholders. The pandemic was not only a challenge but also an opportunity for the leadership to engage the community, stakeholders, and the lower government structure." (KII 2, National level NGO, Program Director)

"I think COVID-19 was not only a challenge but also an opportunity. For us as a country, especially during the first wave of COVID-19, as we can talk confidentially, there was the whole government engagement starting from the Prime Minister's Office. This helped a lot in engaging the community and the lower government structure. Especially in terms of establishing these Quarantine Centers and Isolation Centers, the local government has taken responsibility and done other work side by side in terms of mobilizing the necessary resources." (KII 7, MoH, Primary health system expert)

Our findings stress that MNCH outcomes represent a country's level of development, hence health programs and MNCH need more attention from the leaders and politicians.

"I think there is no adequate space for health from leaders or politicians. However, health needs commitment. The level of MNCH is one of the development indicators, it is a representative of a country." (KII 2, National level NGO, Program Director)

"The role of the leadership is important. …where the senior management engagement is high there is better progress and achievement. MNCH programs also need high leadership engagement which can attract partner and community engagement; this can also improve the multisectoral engagement up to the lower level, it gives capacity to the health institution." (KII 10, Regional NGO, Program manager)

CSF beyond WHOs health system framework.

7. Alignment of multi-stakeholder engagement towards coproduction: *"The government cannot do it all alone".*

The inclusion of a full range of stakeholders is essential as a group affected by the problem or to affect the intervention. Our finding highlights how the alignment of multi-stakeholder engagement towards coproduction is among the vital CSFs for the improvement of MNCH outcomes and the community health system. Our analysis emphasizes the deliberate and meaningful engagement of various actors including the community, nongovernmental organizations, donor organizations, and private sectors towards the coproduction of improved health systems and health outcomes as "the government cannot do it alone".

"A lot has been done. It is known that the government cannot do it alone, it requires multisectoral engagement. The government has primary responsibility for the health sector as a professional

institute, it has experience in responding to previous epidemics, material, knowledge, and experience. But it will not address all alone." (KII 7, MoH, Primary health system expert)
"As I said earlier if you consider different actors as development actors, involve them…Therefore, the private actors and the civil society are critical; this needs to be supported in a health policy framework. If so, they can be mutually beneficial to the system. … It is a matter of helping the government's policies and development plans and strategies. However, strategizing together and making directions have not been significantly done. …Private sectors as development actors should also be considered, they should be involved in setting up the health strategy. As a country, I don't think we have a document that shows that mandate." (KII 2, National level NGO, Program Director)

"One of the major factors for the community health program's effectiveness is community engagement." *Our finding shows* the community plays a pivotal role beyond service utilization as stakeholders affected by the problem or who affect the intervention. Ensuring the continuity and sustainability of the existing multiple community engagement platforms has the potential to contribute to health program management including health services and programs promotion, and resource mobilization.

"One of the major factors for the community health program's effectiveness is community engagement. (KII 7, MoH, Primary health system expert)
"The community can do whatever it can as long as there are transparent discussions/ communications on how to improve and contribute to the health system. I can say that there is no problem in the community. Currently, there is no specific project implemented by the government alone, the government is mostly emphasizing Health and human resources, even if it is not enough" (KII 4, District health office, HEP experts)

Community engagement is crucial to mobilizing resources (cash, labor, and in-kind) and addressing resource limitations to build health posts and health centers.

"The communities' role in the HEWs program is not easy, while the government was supplying the nails and copers, the community was providing their labor, wood, and superstructure. In my perspective, there is nothing that the government can implement without the active participation of the community…. Therefore, I think that should be paid attention to and the community should be a partner in the work that others are doing. Of many health posts, I can say about 60% were built by community participation. The community should collaborate and build health posts. This helps the government to focus on the allocation of skilled manpower and more services. … For example, we recently had a good experience in terms of resource mobilization from the community for health in the Oromia region Jima Zone where we mobilized 50 million Ethiopian Birr. This is great support for the government to build infrastructure, assign human resources, and avail necessary services." (KII 8, MoH, HEP expert)

"As related to COVID-19, our community is playing various roles ensuring handwashing every time, maintaining a clean-living environment, and constructing public toilets along the roadside

of their respective village with an intention to prevent the community's exposure to diseases including COVID-19."(FGD participant, From Adea Berga District)

In addition, participants witnessed the fact that most of the previous achievements are due to partner effort and support. Health system partners, including Non-Governmental Organizations (NGOs) and donors, have been playing a pivotal in the health system and health outcomes improvement in Ethiopia.

"Partners have done multiple supports to enhance the health system including MNCH…. because the government cannot do everything and allocate a budget for everything. Most of the health budgets come from partners, partners covered the budget for the capacity-building activities, and partners also had a significant role in terms of supply and logistics. …The government alone will not deliver MNCH services because most of the previous achievements are due to partner effort and support. While multiple stakeholders are needed during this COVID-19 time, there is not much interest or the existing ones are leaving due to security issues." (KII 9, Zonal level health MNCH expert)

"The government is not purchasing any equipment for HEWs., most of the equipment in the health post is donated by UNICEF. This way it is possible to strengthen the health system." KII4:
"There is a good collaboration between the government and nongovernmental sector from the Federal government through organizing different technical working groups to organize resources. The high-level collaboration is very encouraging." (KII 4, District health office, HEP experts)

Donors' and partners' engagement is crucial during the planning, implementation, and evaluation.

"If I tell you specifically about COVID-19, they were engaged when the emergency preparedness and emergency plan was prepared. Major Donors and Partners are engaged. Since they were engaged, they were able to find out what general technical work was required. What is the required technical training? How much financing is needed is being worked out jointly. Hence, I don't think there is much of a gap on this side as MOH was working together with them on the response and the plan." (KII 7, MoH, Primary health system expert)

The majority of the participants emphasized the importance of joint planning, joint implementation, and joint evaluation with partners for improved health outcomes.
"I think joint planning, joint implementation, and joint evaluation with partner organizations is important. When the partners come to our area, we have a good relationship in terms of implementing and monitoring the performance of the project in terms of input, output, and impact." (KII 9, Zonal level health MNCH expert)

"My suggestion, I think as a public health worker, joint planning, joint implementation and joint evaluation with partner organizations is crucial." (KII 7, MoH, Primary health system expert)

8. Reliable digital transformation for community health program

Our finding highlighted digital transformation in healthcare as one of the CSFs for health system improvement. Digital transformation (DT) entails the utilization of a set of technologies to trigger significant changes in the healthcare management system that can enhance the health system's accessibility, efficiency, equity, and quality to improve health outcomes and well-being. DT in health care is key to making better decisions, providing better care, and creating a better patient experience utilizing digital technologies. A digital transformation in the medical device industry impacts how products are developed, accessed, and delivered.

"Technology-assisted supply chain management is important to overcome the challenges we are currently facing. COVID has impacted the health organizations and the system. For example, shortage of supply, such as medicine. Most of the medicines and medical supplies are imported from abroad, so due to COVID the supply chain was interrupted. The challenge was not only due to internal problems… in this case, but the access of technology is also crucial" (KII 9, Zonal level health MNCH expert)

"Technology is crucial to improving the supply chain and the support system…COVID-19 as an opportunity to utilize some of the available technologies…As I told you before…we can take those things as best practices…., there were virtual trainings where the entire resource was integrated into the system. These are some really helpful technologies out there to manage the CHWs program in the context of COVID-19 and beyond…we need partners to engage on community-based health information system component. Such policies are very important" (KII 1, MoH, Primary health program expert).

9. Reliable security and health infrastructure development

Security and health infrastructure development are fundamental CSFs of health and other development interventions. Our analysis underscored that volatile conflict is pushing public health facilities to be closed and health workers to leave their work sites, which has negative consequences on MNCH outcomes and community health in general. Despite the improvement, there are infrastructural development challenges particularly in rural Ethiopia to ensure the availability and accessibility of health services.

"There is a security issue, of course, this is a challenge for the public health facility and workers, who are leaving their site. … To be frank, in the last 3 years in the West Oromia region, it has been difficult to travel from one site to another site. There is a big supply challenge because of this security issue. Even if we are not distributing supplies, mobility is restricted in that area." (KII 10, Regional NGO, Program manager)

About 160 HP and 10 health centers are out of service due to security issues/conflicts, lootings and burned military camps. Fridges are out of service." (KII 9, Zonal level health MNCH expert)

"This is clear, there is a problem. For example, due to the war in the north, health organizations of the Amhara, Afar, and Tigray regions were destroyed. They were looted. There are also experts

who died in the war, for example in Afra area. Such problems also exist in the Oromiya regions too. The government is putting great effort into reinstalling the heath organisations. This also needs strong support from the community and the partners, and in addition to the commitment from the government." (KII 8, MoH, HEP expert)

Infrastructure development can determine the access, coverage, and utilization of basic social services including community health programs. Almost all the participants underscored the availability of basic infrastructures like roads, electricity, clean water supply, and communications technology as critical for the CHWs program to be effective and resilient.

It is important to address the growing service demand.

"They *do not have adequate room for storage, treatment, environmental sanitation, ventilation, electricity, water, and no fridge to store vaccines. Renovation of the health post, equipping the health post with standard equipment, improved infrastructure water, and electricity. Some health extension workers are leaving their jobs which should be addressed." KII5*

"Something that I would like to suggest is, for example majority of the health extension workers have no residential home, first they should have a residence at their work site. How can somebody serve best if he/she does not have rest/sleeping/facility? The second issue is access to education, educational opportunities should be arranged to provide more efficient services to the society they serve. All health extension workers are not on the same level of training, some are still in the third level and others are in the fourth level. (KII 4, District health office, HEP experts)

10. Gender transformative approach in the CHWs program

Despite the multiple efforts of the Ethiopian government to address the challenges, gender inequality is enduring in the community due to social norms and health system level challenges. Since its introduction, the Ethiopian community health program is characterized by a majority of women. The CHWs program is dominated by women at the service delivery level, while their representation is limited at coordination or managerial level. The main justification for the over representation of women in the CHWs program is that female CHWs are more convenient for approaching women and children at the health post and through home visits for related tasks.

At the community level women are the key players in the CHWs program.

"Mostly, women's group structure is the most functional one. Women have a 'One to Five' structure which is a group formed taking into account the neighborhood. They contact each other in such a manner. First, the One to Five group members discuss on specific agenda on what they should do regarding the health and death of mothers and children, how women visit health facilities for vaccination, and the recommended time for pregnant women to attend ANC care. Additionally, they identify those pregnant women. They also address when the woman should visit

the health facility for a checkup before delivery when to start the required care, time-frequency to make follow-ups at the health post or health station, where she must deliver. They guide and provide the woman with relevant information." (FGD participant, From Adea Berga District).

"Female HEWs are executing effectively. Women trust other women when it comes to discussing their personal reproductive issues. We the HEWs can easily approach a woman even while she is in the kitchen. Even the husband is comfortable when HEWs are Female. However, the work could be difficult for the current HEWs while moving from home to home, crossing jungles, in remote areas, and in difficult geographic areas. Also…sometimes male community members are not comfortable approaching and getting support from female HEWs. So, it is important to recruit male HEWs." (FGD participant, Ejere District).

Our analysis stressed the importance of an appropriate gender lens - a gender-transformative (GTA) approach to analyze the root causes and aim for structural changes in power relations, norms and policies in RMNCH/CBHS. GTA critically examines how existing institutions, gendered power relations, and norms can be transformed to address the root cause of MNCH outcome and access inequality. It will be important to enhance the leadership and managerial role and representation of women in CBHS through inclusion and empowerment of CHWs in multilevel program management. In Ethiopia there is gender inequality across the multilevel health workforce structures (CHWs). Ethiopia acknowledges the gender inequality in health/RMNCH/CHWs programs, but more work is needed in terms of understanding the social and structural/ systemic root cause for the persistent gender inequality. For instance, while the community-based health program is dominated by women, CHWs - including the voluntary "Women Development Armey" - their leadership role is still minimum. This is a systemic problem, which needs fundamental policy change to embed and empower women in the community health system and RMNCH, in order for them to play a leadership role on issues affecting them and their fellow women's health and wellbeing. It is important to balance the engagement of women and men in health program management; CHWs outreach activities are dominated by women (community engagement to CHWs) while men dominate the office/management role.

" Well, there is a lot of work done on gender. Although a social change process is needed to bring about gender equality. The country has a women's policy. This women's policy also enforces gender mainstreaming in all sectors. But when we go from the national level to the community level, the representation of women in leadership and decision-making is very low. This also influences the design of policies for… Especially women have no decision-making capacity or lack

of decision-making capacity. In some places, there are those who ask their husbands' permission to visit a health facility. There is gender power difference and there is economic dependency. (KII 2, National level NGO, Program Director).

It is important to create a conducive environment for active participation of women to effectively play their role: a policy needs to be promulgated, social norms challenged, and women's capacity building entrenched.

"A capacity building is needed from our experiences to make them proactively engage and use the space they are given; Secondly, the social norm needs to be improved, the social norm is highly restrictive. They should be given the opportunity to influence and participate, they will influence the agenda. There are social norms that make it difficult to raise their issues; When we think about health, the norms in the social environment must be improved, they must be supportive, and again, it is necessary for women to develop their own capacity. (KII 2, National level NGO, Program Director)

"Health extension is not only a women's issue…. I do not think that only the mother or the wife should be taught when it comes to reproductive health education. Reproductive health is a wife's and husband's issue. At the beginning of the program due to social norms, it was said that it would be better to deploy women HEWs but in the current situation, transformation is needed. Therefore, if they don't engage the men, it will be very difficult to bring transformation. Therefore, there should be a balance of male and female gender in health extension programs to bring comprehensive change. It is necessary to consider health extension programs for both men and women. … Often in our country, reproductive health is considered a woman's role only. Women are the targets for family planning and reproductive health. And it overlooks men. And where does this start? It starts by making health extension workers women. Most of the time, they teach women. But to bring a comprehensive change, the program requires men to engage as role models. We also support having a gender-mixed health extension workforce." (KII 2, National level NGO, Program Director).

Our finding highlights the need for dismantling power asymmetries by enhancing the role of women and men in the RMNCH/CHWs program to ensure the effectiveness of the program. In the context of co-production, a multiprong approach can enhance men's knowledge and promote reproductive autonomy (the power to make and act on decisions about reproduction) while for women in the community, the social norm can be influenced. This also helps to dismantle the relationship between sexuality, reproduction and gender norms, and hence transform the power asymmetries constructed on their basis.

"According to my view, the engagement of male HEWs can improve performance. It is well known that CHW's work is full of ups and downs, and transportation is also a problem. It is a better idea to engage both genders to work together, they can easily succeed in the challenge."(FGD participant, From Adea Berga District)

Better CHW- led MNCH needs an active engagement of men too.

"Yes, they can support the program. We have learned that without active husbands or the whole men in that community not only the health program the whole aspect of their life would not be effective. We have been seeing this gap. The health sector has learned and provided strategies. To improve family health that is incorporated into the new HEWs program as a specific component. Men and women of that community should engage, take responsibility, and take part in improving their family's health." (KII 5, Regional health bureau, Primary health expert)

Discussion

Ethiopia continues to be one of the riskiest regions for maternal and under-five child death occurrences in the world. While community-based health programs have been emphasized as a promising strategy in promoting primary healthcare access and improving health outcomes including MNCH and pandemics like HIV/AIDS and the current COVID-19, the health system is still unreliable. Health system emergencies and shocks like the ongoing COVID-19 continue to underscore the need for a transformative and resilient health system for equitable MNCH and other health outcomes (Gebremeskel et al., 2021; Javanparast et al., 2018). Thus, this paper examines critical success factors in developing a transformative and resilient community-based health system in rural Ethiopia to achieve better MNCH outcomes.

Our analysis highlighted ten CSFs within the WHO's health system framework in developing equitable MNCH and a resilient community-based health system in rural Ethiopia. CSFs within the WHO's health system include: CHWs program optimization and comprehensive care; health finance optimization; diversification and sustainability; reliable health system evidence-building and translation; reliable access to essential medical and diagnostic supplies; community health workers' living and working conditions; and transformational governance and leadership. CSFs beyond WHO's health system framework include alignment of multi-stakeholder engagement towards co-production; reliable security and health infrastructure development; reliable digital transformation of community health programs; and a gender transformative approach in the health

system. There is a clear and pressing need to improve the resilience of health systems across Ethiopia. In this section, we discuss some of the major CSFs.

CSF within the WHO health system framework:

The World Health Organization (WHO)'s health system framework and health system building blocks/pillars are considered critical factors for an effective and efficient health system(WHO, 2007). Since its introduction in 2007, national to global health system plans and evidence organizations have been guided by this framework as the gold standard for a functional health system (Fridell et al., 2019; Paschoalotto et al., 2023). According to the framework effective healthcare systems are dependent on those six core pillars that contribute to ensuring a robust health system, thus it is not surprising that the Ethiopian health programs including the CHWs program are guided by the WHO's health system framework.

Our findings underscored the WHO's health systems' strengthening building blocks as critical factors to building a transformative and resilient health system in Ethiopia and beyond, however, the Ethiopian health system remains fragmented (Gebremeskel et al., 2023). Our findings emphasized the necessity of the progressive CHWs program optimization and comprehensive care to address the persistent MNCH and other health outcome inequities in Ethiopia and beyond. The WHO's recommendations suggest a task-shifting approach as one method to rapidly increase access to health services including MNCH. Specific tasks can be moved, where appropriate, from highly qualified health workers to health workers with shorter training and fewer qualifications for more efficient use of the available human resources for health and to expand access to health services in LMICs (WHO,2008). According to the Lancet, global health findings based on 15 systematic reviews, optimising CHW programs requires evidence-based policies on CHW education, deployment, and management(Cometto et al., 2018).

However, in Ethiopia the recent community health program optimization plan is lagging due to the health financing fragmentation and limited funding and financial allocation. Most of the participants believe that *"The Ethiopian government cannot realize the optimization of the HEWs program alone"* coupled with donors' fragmented support, as the optimization program requires about 12.6 billion USD for 15 years. Despite multiple efforts to increase health spending, Ethiopia

is one of several countries in Africa which falls short, far below the international health expenditure benchmarks; the government's contribution is still far from the Abuja commitment of 15% (MoH,2019). Health financing and investment have been widely recognized as key areas for the health system to achieve national and universal health goals (Kutzin, 2013), however, ensuring optimization, a mix of financing mechanisms/diversification, and sustainability is far from the rhetoric. Ethiopia's health plan has been guided by the 'One plan - One budget - One report' approach. This is an approach intended to underpin the process of harmonization and alignment in the health sector to organize and coordinate resources from different sources to strengthen the health system's response (UN,2011). However, evidence is limited on the effectiveness of this approach.

In Ethiopia, beyond the donor dependency approach, practical alternatives such as domestic resource generation and mobilization approaches should be emphasized to strengthen the systemic and context-based community resource mobilization and the private sector engagement in the form of a corporate social responsibility model to address the financial health gap. Despite the unfavourable conditions, CHWs have been playing a vital role as drivers of the program to reach every rural village. CHWs in rural areas deserve more attention in terms of getting standard knowledge, skills, competence, better income and remuneration, and different financial and in-kind incentives (Miller et al., 2018). Despite the country's promising health policy to ensure health equity by building a resilient health system in the context of the WHO health system framework, the country is experiencing resource challenges and there are still significant gaps in terms of putting the policy into action (Gebremeskel et al.,2023).

CSFs beyond the WHO health system framework:

CSFs beyond the WHO health system framework indicate that a comprehensive and flexible health system framework is crucial to realizing a transformative and resilient community health system. Thus, our findings highlighted additional key potential critical factors of a resilient health system. These include multi-stakeholder engagement, security and health infrastructure development, and digital transformation of CHW programs. Also, the WHO health system framework lacks a "results chain and causal mechanism", which is an illustration of the anticipated causal relationship

between the different health system frameworks towards equitable MNCH outcomes and the transformative resilient health system (UN,2011).

Our finding stressed that “The government cannot do it all alone”. The inclusion of a full range of stakeholders is essential as a group affected by the problem or to influence the intervention. Our analysis emphasizes the deliberate and meaningful engagement (from planning level to, implementation to, evaluation and decision making) of various actors including the community, nongovernmental organizations, donor organizations, and private sectors towards the coproduction of improved health systems and health outcomes (Boydell, 2018; Petkovic et al., 2023).

Our finding highlighted digital transformation in healthcare as one of the CSFs for health system improvement. The digital health divide is already worsening health inequality because of the uneven deployment and uptake of digital solutions. Digital transformation (DT) entails the utilization of a set of technologies to trigger significant changes in the healthcare management system that can enhance the health system's accessibility, efficiency, equity, and quality to improve health outcomes and well-being (Till et al., 2023;Asthana & Prime, 2023; Feroz et al., 2021; Mangieri, 2019; Willcox et al., 2019). Digital tools help health workers quickly and easily collect data and ensure health workers remember proper protocols. Tablet applications that can be run offline allow community health workers (CHWs) to collect patient data in remote areas with limited internet access, and open-source health management information systems can more efficiently aggregate patient data within a district or a region.

There is some evidence showing that mHealth initiatives are playing a role in the CHWs program in Ethiopia. A recently published systematic review in the context of a resource-constrained setting focusing on Ethiopia, identified 52 studies across different areas of digital health, including mHealth, EMR, telemedicine, cloud-based technology, and Artificial Intelligence. The review highlighted the contribution of digital health including MNCH. The review indicated the use of mobile health as cost-effective, with SMS-based education for improving the knowledge and awareness of family planning, maternal and child health services including ANC, PNC and infant feeding (Manyazewal et al.,2021). mHealth has multiple advantages for CHWs, the community and the program by overcoming organizational, temporal, and geographic constraints, and it can help keep healthcare systems effective.

Much of the rural Ethiopian population continues to experience challenges in accessing rural health care. Almost all the participants underscored the fragmentation of basic infrastructure. Security and health infrastructure development *are* fundamental CSFs of health and other development interventions. Infrastructure development can determine the access, coverage, and utilization of basic social services including community health programs (Luxon, 2015). Although the health system and social infrastructures are considered critical UN(2020), evidence is limited on health system infrastructures and security nexus. Some of the existing evidence stressed the cruciality of health system infrastructure and that reliable health infrastructures depend on other infrastructures.

Gender Transformative Approach (GTA) in the CHWs program

In Ethiopia, since its introduction the CHWs program design and implementation seem gendered, as the majority of its services are designed to address MNCH through female CHWs (feminised profession). However, despite improvements over time, Ethiopia remains one of the countries with the highest maternal and child mortality and morbidity in the world.

The GTA is one category on the chain (continuum) of gender integration approaches. It is an approach of analyzing the root causes (existing institutions, gendered power relations, and norms) can be transformed and aims for structural changes in power relations, norms, and policies(IDRC,2019). Ethiopia acknowledges the gender inequality and has been undertaking multiple efforts to address the challenge including in health/RMNCH/CHWs programs. More effort is needed in terms of understanding the social and structural/ systemic root cause for the persistent gender inequality in CBHS.

In Ethiopia there is a gender inequality across the multilevel health workforce structures (CHWs). Gender inequality persists in Ethiopia's health system management and service-seeking in both public and private spaces (Bergen et al., 2020). For instance, while community-based health program is dominated by women CHWs - including the voluntary "Women Development Army" - their leadership role is still minimum in CHWs program. Female CHW being used as an instrument to fix women issue. It is evident that in Ethiopia there is a strong social belief that sees RMNCH including childcare as a 'women only' issue. Hence, in the context of GTA, the problem

must be re-framed by centering the RMNCH issue in broader social norms and structures to address the root cause. The solution should be sought in this broader social context.

Women's leadership and managerial roles and representation must be enhanced through inclusion and empowerment in multilevel CBHS. It is crucial for multi stakeholders to invest in women and their leadership potential, as this has the promise to improve health and wealth at the individual, institutional, and community levels (Harrison et al., 2022). Changing gender norms is also crucial for the acceptance and effectiveness of the program (Feldhaus et al., 2015).

In the context of co-production and a multiprong approach, our analysis emphasized dismantling sexual and gender norms by enhancing the role of women and men in the RMNCH/CHWs program to ensure the effectiveness of the program and ensure reproductive autonomy. CHWs perspective: *"We also support having a gender-mixed health extension worker".* A GTA approach helps service providers, the engagement of male CHWs can offset the burden of work for female colleagues while dismantling sexuality and gender norms and enhancing the effectiveness of the program. The engagement of men CHWs can enhance the engagement of husbands and men in general in CHW programs including in sexual and reproductive health, family planning, maternity and child health (Gupta et al., 2020; UNFPA and MenEngage, 2014) A multi-site randomised controlled trial in four Rwandan districts with fathers and their partners highlighted culturally adapted gender-transformative interventions with men and couples can be effective at changing deeply entrenched gender inequalities and a range of health-related behavioral outcomes (Doyle et al.,2018).

Health policy implications:

This study highlighted important key areas for policy, practice, and research. Ethiopia has more than three decades of lessons learned in implementing the CHWs program to improve MNCH, however the program continues without significant transformation. Despite the positive change in terms of better health outcomes including MNCH, the current community-based health system has not been closing the gap of MNCH health inequity in terms comprehensiveness, equitability, resilience, and sustainability for the hard-to-reach majority of Ethiopians, including women and children living in rural areas. In Ethiopia, although a nationwide community-based health program

is available in every rural village, the health program has been facing unique system challenges and fragmentation. After three decades, Ethiopia needs a paradigm shift to transform its community-based health systems using COVID-19 as a policy window. Building on and vitalizing a multi stakeholder synergetic co-production framework could be one of the potential approaches to ensure a comprehensive, equitable, resilient, and sustainable CBHS.

The paths to transformative and resilient health systems require a comprehensive and multifaceted framework that demonstrates comprehensive community-based health care. Using an inter-disciplinary approach that draws from multiple theoretical frameworks including the socio-ecological framework, the WHO health system framework, the state-society synergy framework/co-production framework and Multiple Streams Framework (MSF), I (ATG) suggest a Community Health Co-production and Transformation framework (CHCT) (Figure 2).

For effective functionality of a CHCT framework it is crucial to consider the following features of the framework:

1. Meaningful multi-stakeholder synergy and coproduction approach: Meaningful multi-stakeholder co-production refers to jointly approaching the problem/need analysis; followed by a co-design/plan, co-advocate and mobilize, co-implement and lead and co-monitoring and evaluate synergy among relevant health system actors. Thise requires enabling a power shift: More intensive efforts are required to open space within the vertical and unidirectional system to enable broader and deeper collective action. This will ensure the effectiveness of a meaningful co-production by changing the power asymmetry, balancing top-down and bottom-up management approaches, creatin a hybrid approach. A strong synergy of coordination, trust, willingness and accountability towards common goals/results are also important.
2. Embedded multipronged coproduction approach: To build a health system (by using the different capacity, niches, specialization to engage). This is important for Comprehensive Primary Health Care (CPHC) with CSFs. A selective and vertical disease prevention approach is not closing the health equity gap in multiple ways. Moving beyond the six building blocks of the WHO's health system to the ten agile and context-based CSFs is

required to co-produce CPHC that focuses on a continuum of equitable and sustainable health services and outcomes.

3. Embedded resilience management system: It is crucial to move from emergency oriented resilient system thinking to transformative resilience health system through embedded resilience management system. Embedded resilience management comprises planning, assurance, and control to ensure effective evidence building, preparedness, threat management, innovation, change readiness, absorption, recovery, adaptation, and sustainability.
4. Health system change and result management. It critical to build on the lesson learned, resilient and transformative health systems are not without success and failures of health access, coverage, quality, equity and sustainability assurance. Result based management ensuring result chain and result based management is a key to measure success and failure.
5. Embedded result-based management (RBM): RBM is necessary to optimize and improve the achievement of health results and ensure transform CBHS.

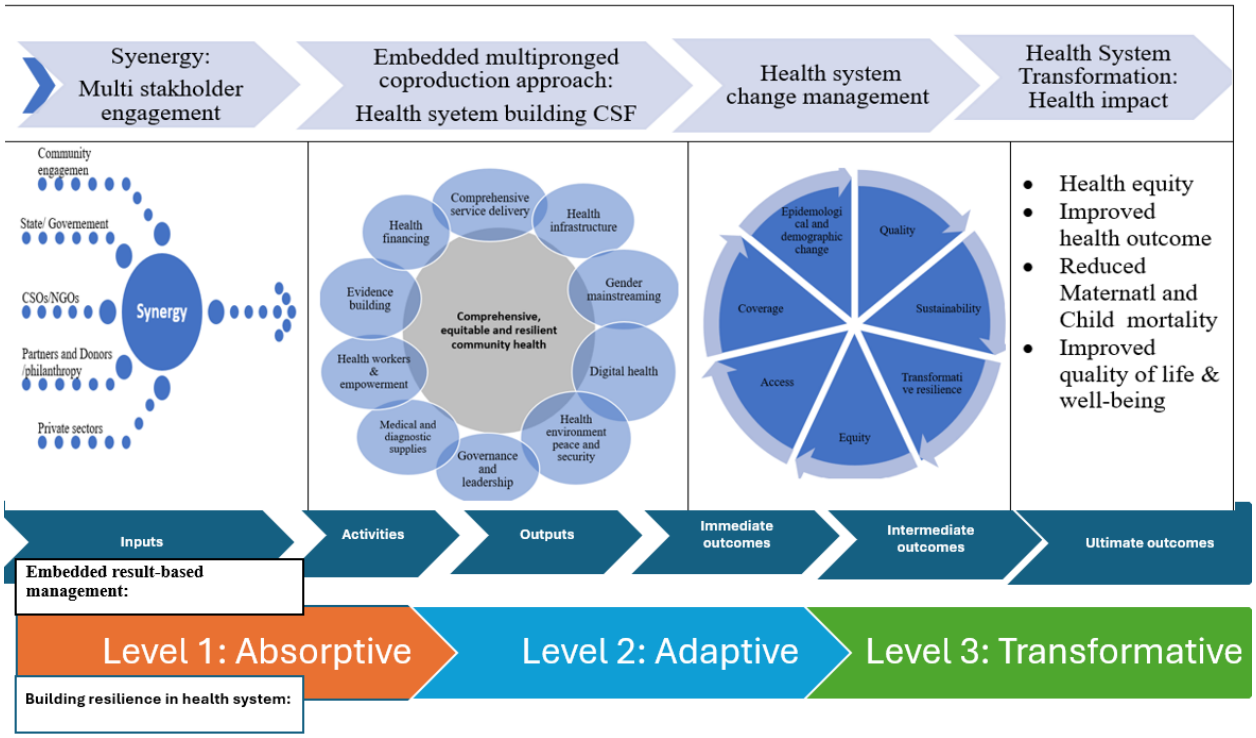

Fig. 2. Community Health Coproduction and Transformation (CHCT) Framework, Developed by ATG, 2024

The following figure depicts a multidimensional and integrated theoretical approach for a community health transformation framework, illustrating the significance of integrated theoretical approaches to inform CHCT, using am inter-disciplinary approach that draws from multiple theoretical frameworks, including the socioecological framework, the WHO health system framework and the state-society synergy framework/co-production framework).

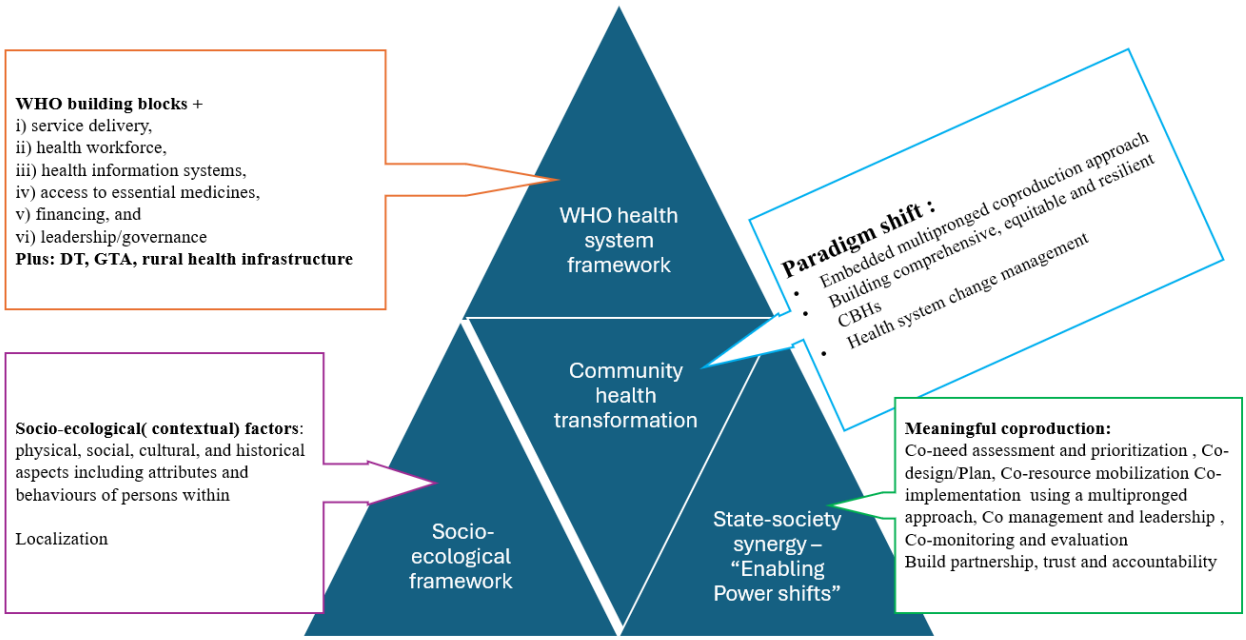

Fig. 3. Multidimensional and integrated theoretical approach for community health transformation framework, by ATG, 2024

Conclusion

Countries like Ethiopia remain the riskiest for maternal and under-five child death occurrences in the world. In Ethiopia, community-based health programs have been emphasized as a major promising strategy in promoting primary healthcare access and improving health outcomes including MNCH. However, the health system remains unreliable. Our finding emphasizes CSFs

to ensure MNCH equity and build a transformative and resilient health system for the disadvantaged rural majority population in Ethiopia and beyond using COVID-19 as a policy window. The analyzed CSFs are success conditions and prerequisites that must exist to realize equitable MNCH and transformative resilience in community-based health systems. The WHO's health systems strengthening framework are necessary core building blocks that contribute to building health systems, but they are not sufficient to build transformative and resistant health systems given the ever-changing health environment. Comprehensive health system success factors including multi-stakeholder engagement; reliable security and health infrastructure development; digital transformation, and gender transformative approaches, which are determinants to realizing an equitable and transformative resilient community health system.

Using COVID-19 as a policy window, health system policymakers and decision-makers need to redefine and redesign the community health system, moving beyond the successes and failures of the last four decades, to address the ever-changing demographic, epidemiological, and technological dynamics. Using this policy window, Ethiopia's CHWs program needs a paradigm shift to comprehensive and transformative community-based health systems in multiple areas. In this way then can accelerate health outcomes and optimum responses to the continued MNCH health inequity gap while addressing current and future generations' health needs within the fast-changing health environment. Areas that need transformational change include moving from standard WHO's and incomplete health system building blocks to agile critical success factors and context-based approaches; shifting from fragmented government control and donor-driven short-term disease-specific support approaches to a systematic and synergized multi-stakeholder coproduction approach; moving from the renovation of vertical and selective basic health prevention approach to logistically and technically embedded comprehensive community healthcare co-production, transformation, and resilient health framework to address complex health system challenges, including MNCH.

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5.5. Transforming the multi-stakeholder engagement towards coproduction of optimized Maternal, Newborn, and Child Health and a resilient community health system in rural Ethiopia

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Abstract

Introduction: In Ethiopia, Maternal, Newborn, and Child Health (MNCH) outcomes have been improving, however, the current level of maternal and under-five children mortality remains the highest in the world. Despite the rhetoric around the significance of multi-stakeholder engagement as a buzzword in development theories and polices to improve health and other development outcomes, there is limited evidence on how multi-stakeholders intersect and mutually reinforce each other toward the co-production of improved MNCH outcomes and a resilient community health system. The aim of this manuscript is to examine barriers to and facilitators of co-production in the context of multi-stakeholder engagement to optimize MNCH outcomes and a resilient community health system in rural Ethiopia.

Methods: We conducted a qualitative case study in West Shewa Zone, rural Ethiopia. A purposive sampling technique was used to recruit participants. Data sources were two focus groups discussions with CHWs, twelve key informant interviews with multilevel public health policy actors, and a policy document review related to the CHW program to triangulate the finding.

Thematic analysis of the qualitative data was conducted. Our study was informed by multiple theoretical frameworks including the World Health Organization's building block framework, state-society synergy model to inform the research processes and analysis. We collected between September 15, 2022, to November 28, 2022.

Results: In the context of a multi-stakeholder approach, our analysis revealed the multilevel barriers to and facilitators of co-production in the community health landscape in rural Ethiopia. The major barriers of co-production include lack of vertical and horizontal alignment, lack of a continuum of and sustainable engagement practices, and lack of systemic coordination platforms. Major facilitators of co-production include an embedded integrated community health system, promising macro-level multi-stakeholder and community-level engagement and co-production aspects.

Conclusions: Our study reveals mixed policy and practice-related results, the current multi-stakeholder engagement is necessary but insufficient and fragmented to co-produce optimized MNCH outcomes and ensure a resilient health system in rural Ethiopia. Moving beyond the current multi-stakeholder engagement as a buzzword in health polices to practice through, embracing meaningful co-production frameworks is fundamental while building on multi-stakeholder engagement efforts to optimize MNCH outcomes and a resilient community health system. A co-production framework leverages the intersection and mutual reinforcement of multi-stakeholder synergy throughout the CHWs' program cycle through shared power and joint assessment, planning, implementing, decision making and evaluating. Fostering effective multi-stakeholder engagement synergy requires balanced shared power, alignment to community priorities, systemic mapping, coordination and monitoring, and continuum and sustainability of engagement strategies.

Keywords: Maternal Newborn and Child Health (MNCH), Health Extension Program, Community Health Program, multi-stakeholder, Engagement, Co-production, State-society synergy, health diplomacy, case study, Ethiopia.

Introduction

In the last three decades, MNCH issues have gained significant global political economic attention, the responsibility for ensuring the right to health for all lies not only with states and their obligations to their own people but also with the international community (UM,2015; Brizuela & Tunçalp, 2017). This could be due in part to changes in global development thinking perspectives around reducing inequality since 1990. As a result, the global Maternal Mortality Ratio (MMR) saw a reduction of 34 percent between 2000 to 2020 and Under-Five Mortality Rate (U5MR) reduction of 59 percent between 1990 and 2021 (WHO et al.,2023). However, despite the progress, sub-Saharan African (SSA) countries continue to have the highest MMR and U5MR occurrences in the world and this has become a key health system challenge in the region and persists as an important agenda of the Sustainable Development Goal (SDG) (WHO et al., 2023; Yaya & Ghose, 2019). SDG # 3 aims to reduce MMR to less than 70 per 100,000 live births, reduce newborn mortality to at least 12 per 1,000 live births or lower in every country, and reduce the U5MR to at least 25 per 1,000 live births or lower in every country through multi-stakeholder engagement (UN,2015). Therefore, to achieve the SDGs, Ethiopia must reduce neonatal deaths from 29 to 12 per 1000 live births and maternal deaths from 412 to 70 per 100,000 live births in an environment of increasingly constrained health resources.

The adoption of the Alma-Ata Declaration in 1978 (WHO,1978) on Primary Health Care has contributed to the acknowledgement of the fact that health determinants lie beyond the domain of the health sector and this has led to repeated calls for multi-stakeholder response (OECD,2020). Since the Alma-Ata Declaration, Ethiopia has made various attempts, including encouraging multi-stakeholders engagement, to improve MNCH outcomes and achieve Universal Health

Coverage (UHC) (MoH, 2020). Ethiopia introduced an ambitious nation-wide community health program in 2003 with plans to improve access to primary health promotion and essential MNCH for disadvantaged rural communities (Teklehaimanot & Teklehaimanot, 2013; MERQ,2020). The current level of better health outcomes including MNCH is attributed to the CHWs program. Since the launch of the program, Ethiopia has reduced maternal and child mortality by half. The CHWs program is run by CHWs who are situated at the lower levels of the hierarchy of the health system. Ethiopia has a top- down, vertical decentralized health system along with a decentralized regional (provincial) political structure. The Federal Ministry of Health (MoH) is mandated to formulate national policies, strategies and standards (Health, 2021). The MoH works with different levels of the health system's administrative hierarchies. The highest to the lowest hierarchies include MoH (Health, 2021), regional health bureaus, zonal health offices and district health offices. District health offices are the bottom or micro level of health administration to facilitate primary healthcare service provision, including the community based Health Extension Program (HEP) (MoH, 2020).

However, due to the fact that the Ethiopian health system is in a fragile state (Azevedo, 2017; MERQ,2020 ; Gebremeskel et al., 2023) the nation-wide CHW programs continued to experience multiple challenges to improving health outcomes (PAHO/WHO,2011; Dureab et al., 2021; Liu et al., 2011; Mhlongo et al., 2020; MERQ, 2020). The supply side health program has overwhelmingly failed to address the quantity and quality of health workers, an under-resourced health system, poor infrastructural development, and social determinates of health (Liu et al., 2011; Mhlongo et al., 2020). Even though health spending is increasing, Ethiopia is one of several countries in Africa which falls short of international health expenditure benchmarks (Kelly et al., 2020; Oleribe et al., 2019). The government of Ethiopia allocates about 7.8% of its national annual budget to health, which is still far from the Abuja commitment of 15% (Kelly et al., 2020). The skilled health work force is constrained and the health sector has been heavily dependent on fragmented external funding (Tadesse et al., 2021; Teklehaimanot & Teklehaimanot, 2013). The ongoing COVID-19 pandemic is amplifying the problems of an already overwhelmingly fragile health system (Roberton et al, 2020).

In Ethiopia, like in many other Low- and Middle-Income Countries (LMICs), on the demand side the rural community health program reveals a complex socio-political economy. There are wide

gaps and inequality in the availability and utilization of MNCH services in rural and urban areas of the country (Gebre et al., 2018). High inequalities of MNCH outcomes continue to exist between rural and urban residents, and among different regions of Ethiopia (Gebre et al., 2018). Inequality in MNCH outcomes is increasing over time, with the demand side factors of MNCH outcomes inequality in Ethiopia including low-economic status, illiteracy, lack of health and other infrastructural developments (Gebre et al., 2018). The most disadvantaged in society include women, rural residents, the uneducated and unemployed (Gebre et al., 2018; Woldemichael et al., 2019).The deprived areas and disadvantaged communities have difficulties in accessing means of prevention and adequate MNCH services due to weak health systems and fragile logistics.

In the last three decades, as MNCH issues have gained significant attention, in Ethiopia and internationally, multiple efforts have been made to address health system challenges and improve MNCH (UN,2015, WHO et al 2023; Brizuela & Tunçalp, 2017). During this time, multi-stakeholder initiatives are ubiquitous in health polices as a key strategy to address national and international SDGs. The 2030 agenda necessitates a whole-of-society strategy, SDG 17 recognizes multi-stakeholder partnerships as important vehicles for mobilizing and sharing knowledge, expertise, technologies, and financial resources to support the achievement of the SDGs in all countries. The SDGs call for the meaningful and active participation of stakeholders at all levels to realize progress and to ensure that 'no one is left behind' (UN DESA, 2020). According to the SDGs, all stakeholders including governments, citizens, Non-Governmental Organizations (NGOs), Civil Society Organizations (CSO), academia and the private sector all have roles to play in contributing to achieving these goals. Multi-stakeholder partnership *is* increasingly highlighted in Ethiopia's health policy reforms (Health, 2021; Merq, 2020) to address the health system challenges and improve health outcomes, including MNCH. In this article, we follow the widely used understanding of 'stakeholders' as individuals, groups, or organizations that affect or are affected by organizational activities like policy making, development, implementation, or management, as described by Freeman (1984).

Better health outcomes are not a product manufactured by the healthcare system alone, but require the coordinated engagement of actors beyond the health professionals (Batalden et al., 2016).

Building on the theory of Evans (1997)'s state-society synergy and Ostrom's co-production (Evans, 1996) (Ostrom, 1996), we argue that it is becoming more common and crucial for more stakeholders to be involved in producing and improving policy outcomes. Co-production is prevalent and becoming the 'emerging paradigm' in development discourse and practice (Dunston et al., 2009). In emerging political economies where governments have limited capacity to provide public service, there is often no alternative to co-production (Linders, 2012). Co-production goes beyond traditional consumer participation models, as the production and delivery of optimum services is difficult without the active engagement of the beneficiaries (Ostrom, 1996). In co-production approaches, citizens are not the passive targets or beneficiaries of government activities, but become vital elements in their success or failure (Sorrentino et al., 2018). Building on Elinor Ostrom's Political Theory and Policy Analysis (Ostrom, 1996),co-production can be defined as the integration of multiple actors in the production of public services.

Multiple efforts have been made to enhance multi-stakeholder engagement in health program development from the local to international community. In many countries, the COVID-19 pandemic underscored the need for multi-stakeholders to prevent and control the virus and reduce its impact in collaboration with government. Multi sectoral collaboration 'Health in All Policies' is a systematic approach which emphasises a broad multi-sectoral method for any national health plans, and to address all the determinants of health (Health, 2021). Community engagement such as the Women Development Army were introduced to promote HEWs programs and services (MERQ,2020; de Leeuw, 2017). This entails collective actions by wide-ranging actors outside the health sector, such as education, women affairs, agriculture, and water, within the framework of health determinants. A large portion of health finance comes from donors and development partners in the form of loans and donations from all over the world (46.8%), the Ethiopian Government is the second largest source (16.5%), followed by out-of-pocket payments (35.8%), and others (0.9%) (Debie et al., 2022; WHO,2017). Ethiopia has a mixed health delivery system composed of a diverse range of actors across the public (73%) and private sectors (27%) (MoH, GFF &WB, 2019).

Despite the rhetoric around multi-stakeholder engagement as a buzzword in development theories and polices (Health, 2021; Merq, 2020), evidence is limited on how the muti-stakeholders interact and mutually reinforce each other towards co-production and improved MNCH and a resilient

community health system. There are bodies of literature addressing the need and practice of multi-sectoral engagement for finance and resource mobilization more broadly (UN DESA,2016). The existing evidence focuses on individual actors (WHO, 2019; Kenny et al., 2015; London School of Hygiene, 2018; Mamo et al., 2019) without considering the comprehensive synergy among multiple stakeholders in the context of CHWs program and MNCH in rural Ethiopia. In addition, the existing evidence on stakeholder engagement largely focuses on patient and stakeholders' involvement in health research and guideline development but does not provide guidance on how multi-stakeholder engagement should be aligned, interact, and be mutually reinforced in health policy, practice and evaluation (Buckley et al., 2023; Fellenor et al., 2021; Petkovic et al., 2020).

The aim of this manuscript is to examine barriers to and facilitators of co-production in the context of multi-stakeholder engagement toward optimized MNCH outcomes and a resilient community health system in rural Ethiopia.

Theoretical framework

Our study was guided by different theoretical frameworks to inform the research processes and analysis. First, we used the socio-ecological framework to inform the description of the multilevel determinants of the CHWs' program effectiveness (Gebremeskel et al 2021; CDC,2020). The socio-ecological framework posits that factors at various levels uniquely and jointly contribute to health interventions, namely individual level, interpersonal level, community level, and system level factors (Gebremeskel et al 2021; CDC,2020). Second, our study was informed by the WHO's Health Systems Framework, a leading structure of discourse on health systems building. The framework comprises six operational building blocks—service delivery, health workforce, information, medical products and technologies, financing, and leadership and governance, it however falls short in including macrolevel community context and engagement (Gebremeskel et al 202). Third, we used the synergetic model, which shifts the focus from state-private business coproduction to ideas that involve state-society organization cooperation (Evans, 1996). State-society synergy is a framework used in analyzing the relational behavioral pattern between the state and non-state and market actors. We used a synergistic model based on the works of Peter Evans's State-Society Synergy approach (Evans, 1996), Judith Tendler's (Tendler, n.d.) concept

of blurred public-private boundaries, and Elinor Ostrom's (1996) vision of "co-production" (Ostrom, 1996).

Synergy is defined by Evans as a win-win relationship, which can be achieved by "complementarity", which is premised on mutually supportive relations between public and private spheres, and "embeddedness" whereby close relations between public and private citizens are forged and maintained (Evans, 1996). State–society synergy asserts that active government and mobilized communities can enhance each other's developmental efforts (Evans, 1996). Ostrom (1996) emphasizes the fact that synergy cannot be achieved if public officials and citizens continue to see a great divide between them (Ostrom, 1996). Furthermore, we draw on Kingdon's multiple streams framework (Kingdon, 1984): Kingdon's approach provides the conceptual framework for the analysis of the three streams – problems, policies, and politics. Kingdon argues that policy change occurs when there is adequate attention to a problem (the problem stream), a policy solution has been clearly articulated and reached consensus (the policy stream), and there is political will to adopt this policy (the politics stream). When all three streams converge, a policy window opens, representing an opportunity for advocates of proposals to push attention to their special problems (Kingdon, 1984).

Our findings were reported based on the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Appendix:14).

Methods

This study is a qualitative case study using document review, Focus group Discussions (FGDs)) and Key Informant Interviews (KII). A qualitative case study is a research methodology that helps in the exploration of a phenomenon within some context. Desai and Potter (2006) stressed that development study requires the use of a wide range of research methods: the mix of methods enables the different techniques and their results to be compared against each other, allowing judgements to be made as to which method (or combination of methods) is the most appropriate for any particular purpose. In a case study, a real time phenomenon is explored within its naturally occurring context, with the aim of answering the "how" and "why" questions (Yin, 2017). Yin

proposes that a case study inquiry should rely on multiple sources of evidence, because data source triangulation allows the researchers to have a trustworthy groundwork for the finding and the contribution of knowledge(Yin, 2017). According to George and Bennett (2015), case studies enable deep contextual understanding and they have potential for achieving high conceptual validity; case studies are a useful means to closely examine the hypothesized role of causal mechanisms in the context of individual cases. The move from single-case to paired comparison offers a balanced combination of descriptive depth and analytical challenge that progressively declines as more cases are added (Tarrow, 2010).

Research setting.

Ethiopia is one of the most populous countries in Africa with 123 million inhabitants, which is second only to Nigeria. The World Bank (*2023*) classifies Ethiopia as a low-income country, but it is also one of the fastest growing economies in SSA. It still has a largely rural population, above 80% of the population lives in rural areas, and 12–14% of the total population are pastoralists or agro-pastoralists (CSA,2020). Since the adoption of the 1994 ethnic based constitution, the government of Ethiopia has been structured in the form of a federal system of government. The country is administratively divided into eleven ethnic based regional states (provinces) and two chartered cities that are administered separately from states(Mendo & Mansukhani, 2022). Ethiopia has a top-down decentralized model for the delivery of healthcare along political structures. The health sector is structured into a three-tier system: tertiary care, provided at specialized hospitals; secondary care, provided at general hospitals with inpatient and ambulatory services; and primary healthcare (primary hospitals, health centers and HEWs posts) (Merq, 2020). Each primary healthcare unit serves approximately 25,000 people. The CHWs/HEP program is the primary health system component at the community level that reaches the rural majority communities by recruiting and training paid community based HEWs (Teklehaimanot & Teklehaimanot, 2013). This study was conducted in Oromia regional state, which is the largest of the eleven Ethiopian states, both in terms of population and landmass (Mendo & Mansukhani, 2022).

Case study setting: The case study is built up on the perspective of the multi-level community health program actors including national, regional, zonal and onsite service provides (CHWs). Following Yin's (2017) embedded multiple case study approach, we collected data from different levels or sources to enhance a balanced combination of descriptive depth and analytical challenge (Tarrow, 2010). Such comparative methods enable generalizations of findings using between cases and within case using multiple units of analysis (George & Bennet,2015). In this embedded multiple case study, the nested nature of the case study encompasses two distinct populations including HEWs/CHWs (16 FGD participants), and subnational (regional, zonal and district) community health program implementers and national public health policy actors (12 KII participants). These populations are spread over three geographical areas with respect to the scope of their work: West Shewa Zone CHWs, Oromia Region (subnational) and Ethiopia (national) public health policy actors.

The FGD data was collected from HEWs in West Shewa Zone. West Shewa is one of the zones of Oromiya region. The zone has 23 districts and is located to the west of Addis Ababa (capital city of Ethiopia). The zone has a human population of 2,058,676, of which 1,028,501 are males and 1,030,175 are females. In this Zone, in 2019, 84 per cent of the population lived in rural areas (UNICEF, 2020). Currently, the zone has 8 hospitals, 92 health centers and 528 CHW posts (each post has an average of 2 HEWs). The CHW program and health posts are administered and funded under the public health system. Despite the progress in other parts of the country, the West Shewa zone is still underperforming when it comes to MCH outcomes.

Participants selection

FGD participants

All participants, CHWs/HEWs, must be adults ranging from the age of 21 who are residents of the district (work site). The participants must have one-year experience working as a CHWs in MNCH before COVID-19; three and more years of CHW/MNCH work experience in rural area; over one year of HEWs national training, must be a full-time salaried employee. The study did not exclude HEWs/CHWs by their gender or sex.

KII participants

Key informants were recruited based on their known involvement in the policy process leading to the planning and the implementation of CHWs/ MNCH program. Snowball sampling was used to recruit participants whereby participants were suggested and recruited by other participants (Noy, 2008). The principal investigator (AG) estimated the saturation of data between 10-12 interviews and 2 focus groups and 6-8 individuals based on previous similar approaches (Guest et al., 2020).

Participant recruitment

FGD recruitment

Using purposive sampling, AG worked with the Oromia Regional Health Bureau (ORHB) and zone health administration in an attempt to select the two districts. Then AG contacted and worked with the district health office to recruit potential FGD participants by sending the recruitment poster to potential participants via the districts' regular means of communication - telegram, email and announcements during review meetings.

KII recruitment

The principal investigator, AG, worked with the MoH, ORHB, zone health administration to select the first potential participant in the KII. AG started by sending an invitation email with information about the study and the KII recruitment poster. The source of the referral (the referee) was confidential. The potential invited participant had the right to accept or decline the invitation, and this response was confidential too.

We used a first-come-first-served basis for enrolment. Prior to participating in this study, participants were asked to provide their free and informed consent by signing a consent form.

Data collection

Research instrument

The data collection was organized in three parts: FGDs, KIIs and document review. AG collected the data using semi-structured FGD guides developed in English and translated to Oromo language and KII guides developed in English and translated to Amharic and Oromo language. The guides were carefully crafted following the theoretical frameworks and relevant literature to include neutral, non-biased, and non-leading questions to avoid influencing participant responses. AG is

fluent in the local language. Based on their agreement, AG contacted participants to agree on a convenient time and place to sign the consent form and then conducted the FGD and KII. AG acted as the facilitator to recruit participant, ensure confidentiality, and distribute and collect consent forms.

At the beginning of each FGD and KII, AG briefly described the purpose of the study to the participants. All FGDs and eleven KIIs were conducted face-to-face, one KII was conducted using Zoom. After consent was given, each FGD and KII was audio recorded. The focus group sessions lasted between 80 to 90 minutes and the KII lasted between 60 to 90 minutes. A research assistant was assigned to take notes during the FGDs after a brief training about the research ethics and process by AG. The research assistant was fluent in local Oromo language, possesses a BSc degree and research-related experience.

As a token of appreciation, all FGD and eight KII participants were compensated with a small honorarium, for their time and effort and to cover their lunch related expenses. In the context of COVID-19, participants adhered to public health guidelines including wearing masks.

Most of the data collection was conducted face-to-face in Afan Oromo and Amharic, based on participants language preference. Two FGDs were conducted with CHWs working in two different districts/Weredas (Adea Berga and Ejere) of West Shewa Zone. In-depth semi-structured KIIs were conducted with twelve key informants from national and subnational level health systems.

Data collection took place at different locations depending on participants. The FGDs were conducted in a rented hotel hall while KII with policy makers were conducted in convenient locations for participants such as their offices.

We conducted a document review to enrich the finding from the FGD and KII, and to understand the context and operation of the HEWs/CHWs program. Policy documents, including national/regional strategies and plans were considered to represent the major priorities for CHWs led MNCH. The relevant and available document were selected and accessed through the

recommendation of the key informants working in National and subnational HEP/MNCH program in Ethiopia.

Data analysis

We followed Braun and Clarke's (Braun & Clarke, 2022) six step thematic analysis. The WHO building block framework and SEM guided the data analysis and interpretation of the qualitative data sets. FGD and the KII were audio-recorded document and AG transcribed verbatim. Verbatim transcription was done by listening to audio-recorded materials. The two FGD and four KII in Oromo language, and eight KII in Amaharic language were transcribed into Word documents. Then, the transcribed document in both languages was translated into the English language. Data were also cross-checked by listening to the original recording while reading along in English.

The transcript content was coded manually to ensure the quality, accuracy and any discrepancies of coding transcript. Codes were developed after an initial review of the transcripts. The transcript content was analyzed inductively to get familiar with the data. First, after familiarization to the transcript AG & OU coded one transcript from each, FGD and KII, they coded individually and compared their codes. After debriefing and consensus, the transcript was coded accordingly. After debriefing, JE and SY randomly chosen and compared to check alignment or discrepancies of the coding of the transcript. Emerging themes were based on an iterative process of inductive and deductive approaches. Deductive approaches were drawn from existing literature and the systematic review phase and the study theoretical frameworks. In inductive approaches, themes emerged from the data and were not be forced to fit into preconceived categories (Saldaña, 2013). The analyses used triangulated data from multiple sources and multilevel government and non-government health policy experts and frontline CHWs, and document analysis. Given the small size of the data, we decided to code manually without employing any qualitative data analysis software.

Policy documents

Policy documents were significant to the study, and were used mainly from a realist perspective (Thorogood, 2018), that is, as a means to understanding the CHWs/HEP policy/ program in the

context of rural Ethiopia. Hence, policy documents were essential in providing background information to the study and in defining the questions and trajectories that were pursued in the FGD and KII. The analysis was also enriched by useful insights from the policy document. Using thematic analysis, we sought a document that mentions the major themes that emerged from the KII and FGD, based on inductive and deductive approaches. Major Health policy documents used in this study include, inter alia, second Health Sector Transformation Plan (HSTP-II) (Health, 2021) and A roadmap for optimizing the Ethiopian HEP (2020-2035) (Merq, 2020). A list of policy documents is included as an appendix (Appendix :15).

Trustworthiness

Trustworthiness, a qualitative validation criteria, was applied in this study in line with established guidelines (Yin, 2017). Therefore, the researcher's inherent bias was controlled partly by being self-aware and giving the participants the opportunity to generate data based on their own perceptions. We enhanced the trustworthiness of the study's finding by using different techniques recommended by renowned qualitative researchers including member checks, peer review, and triangulating the data by using multiple sources of data to confirm emerging codes and themes to serve as a data validation strategy and help to establish the credibility of the study finding (Merriam, 2002; Creswell,2020).

Ethical considerations

The research proposal was carefully evaluated, and the ethics of the study subsequently reviewed and approved by two respective institutions, the University of Ottawa Research Ethics Board, ethics clearance certificate (Appendix - Ethics File Number S-06-22-8072) andnd the Ethiopian Public Health Institute, Institutional Review Board (EPHI-RIB) certificate of approval (protocol number: Appendix- EPHI-IRB-462-2022, minute No:109). In addition, to strengthen the importance of the study, support letters were received from School of International Development and Global Studies, University of Ottawa and from the study area, Ethiopian MoH, ORHB and

West Shewa health office. The data collection period was between September 15, 2022 and November28, 2022.

Participants gave their free and informed consent to be enrolled in the study. Participants provided written informed consent prior to participating in this study. They were also informed that once they chose to participate, they could withdraw at any time or chose not to answer any questions, to which there would be no negative consequences.

Written informed consent were collected by the principal investigator (AG). AG immediately stored the softy copy/electronic files on a password protected computer that is in a locked office at home and on a secure network. Then signed consent forms were torn up and thrown in a secure garbage bin. All our research participants were (women and men) adults over age 21. We did not collect data from minors.

Researcher reflexivity and positionality statement

To enable any audience of qualitative studies to evaluate the validity of conclusions extrapolated from data, researchers should, as part of the study, neutralize or bracket their biases by stating them explicitly to the full extent possible (Merriam, 2002). AG, OU, JE and SY have extensive experience as global health experts and have multiple publications and work on MNCH and related policy and programs in SSA including Ethiopia. AG has more than eight years in community health program management in Ethiopia and worked in different contexts of health programs implementation and evaluation in Ethiopia.

Results

Characteristics of participants

The socio-demographic characteristics of Focus Groups Discussions *(*FGDs) participants is summarized on Table (see S - *5)* In FGDs, a total of 16 female health extension workers (HEWs/CHWs) from two district of West Shewa Zone participated. All the FGD participants, HEWs/CHWs, were female, and the majority 15(93.75 %) of them n the age range of 25-40. The

highest level of education or training that they have completed: college diploma – 12 (75%) and over one year HEWs training – 4 (25%). Participants' total work experience as a HEW (in years), six and above – 14 (87.5%) and four to five years – 2 (12.5%). For all the participants, walking was their most commonly used mode of transportation during field work/outreach activities. The average distance between their work site and field work/outreach site in kilometers: above 5km - 9 (56.25); 3km to 5 km – 5 (31.25%); and less than 3 km – 2 (12.5%).

A total of twelve public health experts were recruited to participate in the Key Informant Interviews (KIIs). Eight participants (66.6%) were recruited from three levels of government health structures (three participants from MoH, two participants from ORHB, and three participants from West Shewa and two district level health offices). Four (33.3%) participants were recruited from NGOs (two from the national level and two from the regional level. In terms of gender, four women (33.3%) and eight men (66.6%) participated. Most of the participants have post graduate level (MSc) educational background in health and related study programs and they have extensive (more than 10 years) public health related experiences in different levels of responsibilities.

Barriers to multistakeholder engagement

In the context of multi-stakeholder engagement, our analysis revealed the multilevel barriers to and facilitators of co-production in the community health landscape. *T*he major manifestations of lack of co-production include lack of vertical and horizontal alignment, lack of continuum of sustainable engagement practice, and lack of systemic coordination platforms. Major facilitators of multi-stakeholder engagement towards co-production include embedded integrated community health systems, promising macro-level multi-stakeholder and community-level engagement and co-production aspects.

Based on the detailed analysis, we summarize and present the major finding below. In this paper multi-stakeholder refers to the organizational activities of multi-stakeholder acting in the Ethiopian health system's landscape, including communities and their institutions, multi-sectoral line ministries, CSO and NGOs, donors and development partners, the private sector, academia and

research institutes. Also, macro level refers to national level context, meso-level refers to regional level context, and micro level refers to zonal and district context.

The subthemes include: The challenge of alignment (vertical structures and horizontal relationships), lack of continuum of sustainable practice, and lack of a systemic coordination mechanism.

The challenge of alignment (vertical structures and horizontal relationships)

In the context of multi-stakeholder engagement, our finding highlights alignment-related challenges at the CSOs/NGOs and community level, characterized by a lack of horizontal and vertical alignment and fragmentation of the multi-stakeholder holistic engagement system. Throughout the multi-level health system structures, health actors are not linked to the needs and expectations of grass root communities.

At the COS/NGOs level, implementing partners submit their intervention proposal and receive approval from respective national or regional level bureaus. Then, implementing partners appear at their area of implementation without prior consultation, prior communication, pre-assessment or joint priority seating and planning with the direct beneficiary community and district level health offices.

"Most implementing partner project agreements are made at the Federal or Oromiya regional level. They come to us for actual practice/implantation, this is a transparency gap, we have no prior information about the project and the duration of the project. There is also, a transparency gap among some partners who are not clear on what they are doing, and for how long they are doing it. I don't mean all." (KII 9, Zonal level health MNCH expert).

"Stakeholders integration is not uniform in some districts, there is strong and functional collaboration. In some distract the collaboration is moderate and unfortunately null in some areas." (KII 8, MoH, National HEWs/CHWs expert).

There is a gap of vertical alignment to the local context or problems and expectations of the community. Government has the ultimate power to initiate health policy and practice, top-down community engagement is problematic in ensuring community trust and meaningful community engagement (CE). A top-down professional-led CE approach without a balanced grass root voice/perspective to the top alignment and integration into the community-based institution, culture, and norms is a challenge to ensure ownership and sustainability.

"From *the beginning, I don't think the community participation approach was context-specific and volunteer-based. If this was the case, we wouldn't have such an interruption. Community participation is still high on other issues…however, their participation in health, education, and other government program is not functional. The approach is not on volunteer bases, there is some political or administrative force behind it. The community has its own organization like 'idir'or 'iqub' they are very committed to those."(FGD participant, From Adea Berga District)*

"The community engagement approach has been a top-down prescription. It is only the implementer who knows the success and the challenge. End-users have limited participation. So now we are trying to kind of reverse that. When we do the community engagement, how is it functioning first? What is their challenge? What should they hold? What do you contribute? It was functioning in that manner by understanding what they were saying." (KII 7, MoH, Primary health system expert).

Using a predetermined issue, government and the implementing partners both focus on the donors' interest, not on the local interest and problem. The current interventions are partner-driven and top-down, with partners not initiating their project from the zone or community.

"From my practical experience…CSOs/NGOs focus on the donors' interest, not on the local interest. NGOs / partners are not initiating their project from the region or the zone or community, they approach the government with the predetermined proposal… In one of my previous implementing partner organizations, we directly started working the project with CHWs but when the implementing organization phased-out the project, the activities initiated by the project were stopped. This is because despite working with CHWs/HEWs, there was no integration with the

existing local government structure in starting and co designing the project. There was no co-planning with the district health office and health facilities did not own the project because of lack of co creation, this is a co-creation gap." (KII 12 Regional NGO, Public health Expert)

" Some NGOS prepare proposal on "air or remotely" without understanding and assessment of the project area. The proposal should be aligned with the actual problem otherwise we don't consider as practical." (KII 5, Regional health bureau, Primary health expert)

Beyond the top-down prescribed interventions, often there is a culture and language barrier between the community and the implementing partner (NGOs/CSOs).

"The NGOs have the intention to work for the community and in the community. But they have limited capacity, they don't have enough knowledge of the culture of the project area, and they don't speak the language of that community. This is a big challenge, often there was no communication with the community, there was no community integration to understand and address the problem and to support and own the project. NGOs should have appropriate human power with the knowledge of the values and the language of that community to be more effective. (KII 5, Regional health bureau, Primary health expert)

Lack of holistic system aligned support**:** Arguably, holisticness of the program could make the Ethiopian community health system unique, however, there is a lack of a holistic community health program strengthening support system to optimize CHWs accessibility and MNCH outcomes.

"There are CSOs actors and programs inconsistency. For example, the HEWs program requires holistic intervention. However, CSO/NGO actors come with a specific program. They could come just for immunization they have the challenges to support the whole program. The government does not want it, and that is one of the challenges. When a partner comes without system-supporting capacity, it doesn't strengthen the program." (KII-1, MoH, National level primary health program expert)

Lack of inclusiveness in multilevel structures and multiple aspects of the program, instead of incorporating the implementing partners as a stakeholder in every aspect of the CHWs cycle, often there is externalization of stakeholders.

"They cannot have real unity and so they cannot bring change. The health sector shouldn't see the NGOs as external bodies, now there is a progress, there is a progress of seeing each as a part of the same system in terms of building trust among each other to improve the benefit of the community. The health sector should accept them, as they came to work on the health sector task. (KII 5, Regional health bureau, Primary health expert)

Lack of continuum of and sustainable practice

Our analysis shows a lack of a continuum and sustainability is a challenge in the current multi-stakeholders practice and community-based health intervention. The term "continuum" refers to the continuity of meaningful engagement or synergy or partnership in the community health program cycle: joint planning, implementation, and evaluation to enhance coproduction.

"I have over then years of experience in government health sector and partners, I know many NGOs and projects, there is a big gap in health interventions project ownership and sustainability. Some of the initiatives are always backsliding. There is lack of co-creation, joint project planning, implementation, monitoring, reviewing and the like. If there is cocreation, the stakeholders feel ownership and take care for it as they have co-designed and implemented. Then the project will sustain whether the partner exist or not." (KII 12 Regional NGO, Public health Expert)

The existing state-multi-stakeholder synergy lacks continuum of engagement in the community health program cycle.

"The community engagement strategy is not well organized. There is some community participation, for times when the higher-level leaders give attention or direction it would be hot. It is just like a campaign, sometimes strong and sometimes very low. The overall approach of community engagement is not planned and regular. The community is suspicious and generally lacks trust [in the health system]. When you invite the community for different health issues, they

assume that there is an attached political issue, so they are not willing to participate. When sometimes the community is engaged on health issues, there are also political issues, so the community doesn't what this, the community do not engage." (KII 10, Regional NGO, Program manger)

"…, but the main challenge is there is no regular meeting and monitoring mechanism. I think they should have regular planning, monitoring, and review mechanisms, at least every three months. This can give a chance to see the progress and the challenge, then to address them in collaboration." (KII 4, District health office, HEP experts)

Often the community engagement platforms are donor-driven, project-based, and short-term result oriented, which pose a challenge to the sustainability of projects. The strategy is not functioning in a sustainable way, there are always interruptions. Short term result-oriented projects are problematic.

"Nowadays, the community structure is not functioning well as it was intended. It is characterized by considerable dropouts or interruptions. Now, it is interrupted and there are dropouts as the people developed negative attitudes toward such a structure. Sometimes the way of organization and participation is attached to political activities and orientation." (FGD participant, From Adea Berga District).

Despite multi-stakeholder engagement in the health program, fragmented resource allocation for health intervention is also a big challenge to ensure health intervention sustainability.
"Some organizations come with limited budget, so it is important to use that limited resource on specific activates instead of multidirectional activities." (KII 9, Zonal level health MNCH expert).

"Okay, compared to other sectors, there is a large number of NGOs working on maternal health and family health, reproductive health. But this is not comparable to the level of problem and demand, they are few in number, and the problem of the society is large and severe. Even though the NGO's budget amount is not comparable, there is a gap between the level of the problem and

the budget, we need more support internally and internationally." (KII 5, Regional health bureau, Primary health expert)

Lack of self-esteem, donor dependency syndrome is also a challenge to ensure sustainable community health system. The "dependency syndrome" is an attitude and belief that the Ethiopian government cannot address the health system challenge without the initiatives of donors' and development partners' support.

"I don't think that there is a simple way to move out of aid dependency in a short time. Yes, various donors help the health sector program. The health sector is one of the beneficiaries of SDG resources pooled from different donors. So, the health sector uses more of donors' budget. So, as you said there should be a way to enhance domestic resource mobilization. Increasing the export item to improve the economy of the country." (KII 8, MoH, National HEWs/CHWs expert).

"Most of the health budgets come from partners, partners were covering the budget for capacity-building activities, and partners also had a significant role in terms of supply and logistics." (KII 9, Zonal level health MNCH expert).

"*If the government of Ethiopia is not able to receive the donors support, I don't think the government can do it alone. Majority of the health sector programs are from the donors support. The budget allocated by the government is very limited. Health sector relays on the support from donors and partners." (KII 12 Regional NGO, Public health Expert)*

"I don't think the government alone can resolve the health system challenge. Even the government officials say this. Even, after some projects are completed and handed over to the government, there is a time when they area not able to sustain the project." (KII 11, National NGO, HEWs program M&E)

Inadequate health diplomacy: Despite the efforts of the government to create a conducive environment, the CSO amendment in 2019, and the ambitious HEWs/CHWs optimization launch (MERQ, 2020), the efforts to advocate for and attract multiple national and international public

health actors is limited. Majority of the public health workers have limited knowledge about the CSO proclamation amendment.

"In my perspective, the CSO proclamation amendment alone would not improve the CSOs engagement, but the reverse is happening. CSO proclamation alone can not bring significant change, [long laugh], I am not good in politics, So, I think the international diplomacy is wakened, maybe this is due to the current political instability or lack of capacity. I was among those who were so hopeful on the improvement. The interest of USA is not clear during this political crisis. Donors have no interest due to the political instability." (KII 12 Regional NGO, Public health Expert)

"Since the amendment of the CSO proclamation in 2019, I didn't see any significant changes." (KII 10, Regional NGO, Program manger)

"There was one plane, one budget, and one report, to coordinate the partner's budget under one plane, budget, and governance system. I said earlier, the partners are leaving and so it is not working as planned. When there is an available budget, using under one doesn't have any problem, rather it enhances budget effectiveness. However, in practice, it is not progressing currently." (KII 9, Zonal level health MNCH expert)

In the current context, initiatives are coming from partners, not from the government.

"I think the government should create a conducive environment. The government should engage partners as a sector. The government should recognize the sector and invite them. But the current practice is that partners with interest go to the government. It means that the initiative is from the CSOs. But should come from the government too so that different sectors can participate as one of the development actors." (KII 12 Regional NGO, Public health Expert)

"When the project is phased out some NGOs are properly transferring the project to the government to ensure sustainability. In some cases, there is a cooperation gap. If the Health sector is not participating in the processes, there is no proper handover during the project phase-out time. This is not good." (KII 5, Regional health bureau, Primary health expert)

The volatile security and political issues are exacerbating the challenge of continuum and sustainability of engagement challenge.

"For example, the conflict that started two years ago has set back a lot of things. It has had a big effect…. there are certain gaps that need to be addressed." (KII 7, MoH, Primary health system expert).
"The health sector is particularly affected by the political crisis. Funds have declined significantly. The health extension program is particularly affected. That's where most of the problems come from. Related to that, not only the public sector but also other sectors have been affected." (KII 7, MoH, Primary health system expert).

Inadequate systemic coordination and implementation capacity

Our findings illustrate that the existing CSOs/NGOs-state synergy is not effectively functioning due to a lack of adequate coordination platforms and implementation capacity. Lack of system coordination refers to the inadequate systemic management tools and capacity for optimum functioning of the process of community health program intervention. The multi-level macro-level (national), meso-level (regional) and micro-level (district and zonal) barriers include inadequate coordination capacity, inadequate capacity to monitor the program, manage the limited resource, inadequate health diplomacy, volatile security and political issues.

There is a challenge of inadequate coordination from macro-level, to meso- and micro-level and on both CSO/NGOs and the government's side.

"*There is a leadership role challenge from the Ministry of health to the CHWs, grass root level. There is a leadership, management and commitment problem to transform the policy on paper to action." (KII 12 Regional NGO, Public health Expert)*

"There is a problem on the side of civil society. There is a lack of coordination in the civil society organization, it would be good if things here and there are coordinated together." (KII 2, National level NGO, Program Director)

The existing coordination situation is not strong.

" No, it is not strong. There are collaborations with civil society on capacity building. There are expansions through EPHI (Ethiopian Public Health Institute). But I wouldn't say it's strong. It is very weak. If there is a strong collaboration among them, they can strengthen the program. They can advocate for the government. Many things can be fixed." (KII-1, MoH, National level primary health program expert)

"There is annual joint planning, the" Woreda Base plan". But there is a challenge with the follow-up. There is no system of follow-up on how the resources were utilized. Theoretically, the plan is expected to be one. The allocated budget should be known or announced. But there is no monitoring system or officer. Report and idea exchange stop here. It is the partner's responsibility to submit a report, there is no prior notice or request from the government side." KII 10, Regional NGO, Program manger)

CHWs are overburdened to facilitate and coordinate the multi-stakeholder engagement. Two HEWs serve about five thousand people with 16/18 HEP packages with limited knowledge, skill and motivation.

"*There is a human resource challenge. Two HEWs serve about five thousand people this is because of the financial challenge. They could have done if you have more health workers. It is very challenging for 2 HEWs to provide services for 3000-5000 people. The have limited knowledge, skill and motivation. They do all this by walking multiple kilometers to provide home to home service. If reducing the package is not possible, then increase the number of health workers. They don't have sufficient working and living situation. More training opportunities should be facilitated for them. 'KII-12 regional NGO expert." (KII 12 Regional NGO, Public health Expert)*

CHWs are also working on other government tasks, outside health sector activities.

"Yes, the HEP packages are 18 and are many given their number, sometimes one sometimes two, About 7 out of the 18 packages focus on maternal and child health. Of course, overpacking will

slow down the performance quality and quantity. In addition to those packages, they are also working on other government task, out of health sector activities. For example, health extensions are part of local cabinet. It also brings problems; it creates additional workload. I think the solution could be increasing the number of the HEWs and separating MNCH as a specific program. Given the number of activities in MNCH, separation of the program is very important." (KII 9, Zonal level health MNCH expert)

"The implementation is at lower level, so there is to some extent a review meeting and monitoring approach. But their feedback is based on the individual relationship, it is not the amount of your performance." (KII 10, Regional NGO, Program manger)

The current coordination platform is not uniform and functional up to the district level. There is a problem with organizing and planning the available resources, and there is a resource shortage at the service site.

"I can't say out loud that the coordination platform is uniform and functional up to the district level. It is not possible to say that 100 percent will be implemented as agreed here, because the lower structure may be influenced by partners' interests. Partners may lobby by providing incentives for lower-level officials, incentive can twist. As you said, people who are incentivized in connection with poverty and incentives can twist some things, so I can't say that it has been fully implemented." (KII 7, MoH, Primary health system expert).

The resource allocation, support is insufficient for coordination.

"…most partners do not have an office at the woreda level, except for some local NGOs. The most common problem raised by the district is on resource allocation, support is insufficient. They say that the demand is high, and our gap is high, but the support is less. In some districts, they can work very friendly and considerate. Multisectoral integration is not uniform in some districts there is strong and functional collaboration, in some distract the collaboration is moderate and unfortunately null. There is a strong Woreda-based planning engagement and ISS facility-level integrated supportive supervision every year." (KII 8, MoH, National HEWs/CHWs expert).

'We have a good collaborative approach with the MoH, but there is a problem as you go down to the lower structure, like at the zonal and district levels. Particularly, there is limited capacity to implement the policy. …At the lower, there is a problem with organizing and planning around the available resources because there is a resource shortage at the service site. If they think that there is a partner in the area, they assume the partner would provide all the required supplies. There is the problem of reliance on the partner at the service site. I think this is resource mismanagement."(10 National NGO expert)

Inefficient capacity to manage the limited resource, including duplication, is also another manifestation of a multi-stakeholder coordination barrier in Ethiopia.

"I think that this is very clear, I don't believe that the government will work independently. Despite the multiple work done so far with the support of NGOs, there is still a gap. I don't think it can be done by govt alone. I think for the future, there should be proper resource management approach, there is a moment the resources are wasted unnecessarily. I think that if the government and partner organizations focus on working together so that those resources are not wasted, the wastage of resources will be reduced because some times there is duplication of efforts. This can save resources. Every time mapping of partners and programs is required to overcome such wastage. …The number of CSO in different zones is not uniform; you could see more in one region, and you don't even see one in another zone or district. I think there is a prioritization issue. Sometimes some partners select their implementation site. In some areas there are large, concentrated partners in others no partners, there is allocation, Partner's preference is based on infrastructure or personal/social relationships." (KII 10, Regional NGO, Program manger)

"*Despite the effort towards changing the situation, NGOs have been free to select their project implementation site and project activities. There have been duplication issues, some districts have no NGO support, lack of budget, project phaseout time/ contract period being over, and maybe the country's current situation.* ***(****KII 5, Regional health bureau, Primary health expert)*

Enablers of multi-stakeholder engagement

The subthemes include i) embedded integrated community health system; ii) promising macro-level multi-stakeholder engagement and co-production aspects; and iii) promising community-level engagement and coproduction aspects.

Embedded integrated community health system

The Ethiopian community health program is nation wide and embedded into the community and the health system. The CHWs/ HEP program is the extension of national primary health system with a holistic multi-package of services (18 packages including MNCH components).

As indicated in the macro-level policy documents, such as HSTP-II (Health, 2021), a roadmap for optimizing the Ethiopian HEP(2020-2035) (Merq, 2020) is designed to address health access needs and the rights of the disadvantaged rural majority population, using the community as a consumer of services and key stakeholder.

In contrast to other countries, the Ethiopian CHWs program, which is designed based on specific disease or pre-programs, is an integrated mix of multiple-packages. The CHWs program is designed to provide an integrated multi-package of services under a single program coordination, with the majority of the HEP components related to MNCH and tailored to the needs of mothers and children in disadvantaged contexts.

"The health extension program is an effective option, and this is not only to our country, but the world has witnessed and learned from it. What makes ours special is the fact that the one in other countries more of barter driven and non-institutionalized with the health system, but ours is aligned with the government health system with paid staff to maintain the system well. In addition, what makes it different from other countries is that other countries mostly work on a single initiative through their community health program; Or it could be a family planning area or RMNCH (Reproductive, Maternal, Newborn, Child Health) area or disease prevention or other programs." (KII 7, MoH, Primary health system expert).

"Female HEWs were preferred, because, majority of the components of health extension program are related to MNCH…. they play significant (over 50%) role in providing family planning

services, ANC, child immunization and nutrition programs (screening and supplementation). Existing evidence including DHS associate the current improvement with the HEWs program.…. The community itself has testified this and demanding for more the program packages. Stakeholders and the communities have witnessed on the effectiveness." (KII 7, MoH, Primary health system expert).

The CHWs/HEP program is a conducive landscape for multi-stakeholder engagement to address the various challenges of the health access and determinates.

"*Health extension programs are not sector specific in nature. Another part of the government sector is seeking the engagement of the private sector. We think we have engaged the government sector very well. Other sectors also need to engage and collaborate." (KII 7, MoH, Primary health system expert).*

Promising macro-level multi-stakeholder engagement platform and co-production aspects

Our finding reveals that efforts have been made to engage multi-stakeholders through policies and strategies in community health program landscapes. Perspectives on the macro-level multi-stakeholder engagement platform indicates the need for better accountability programs and community participation.

There are macro-level multi-stakeholder related policies and strategies to enhance engagement and stakeholders' partnership in the community health program. These include the revised Civil Societies Proclamation No. 1113/2019, One Plan, One Budget, and One Report strategy. The revised Civil Societies Proclamation No. 1113/2019 (called CSP/2019), opens the space for CSOs to carry out a vital role and make meaningful contributions by lifting the disabling rules of the previous law. The CSP/2019 abolished the 10% rule on funding, enabling CSOs to raise funds from any lawful source without requesting approval from the national CSO Agency. The law also gives flexibility of administration and program activities and allows for the transferring of project equipment to another project after phase-out.

" The Proclamation before 2019 had many restrictions, and those restrictions were lifted to bring in and use donor and foreign aid better. Moreover, domestic civil society organizations were in a situation where they were missing out on budgeting, so I think that by adjusting them, they will develop their capacity and improve the health sector and other sectors as well." (KII 7, MoH, Primary health system expert).

The MoH One Plan, One Budget, and One Report approach was introduced to guide the harmonization and alignment of stakeholders' funding to health sector plans and health outcomes.

"The One plane, one budget and one report is important. It enhances cooperation during planning and performance and monitoring. There is such approach in the health sector level, but in practice there is a gap. There is a great expert turn over, after a short time the expert who have planned would not there during planning, they may leave the position or the sector. New staff may have limited experience. One budget will help to save the resource or avoid resource wastage, with one budget it is possible to address multiple tasks." ***(****KII 5, Regional health bureau, Primary health expert)*

There is a macro-level promising initiatives of joint planning, implementation and evaluation; a joint technical working group and a steering committee in every level.

"As a ministry of health, we involve all levels from woreda to the ministry of health on one plan, one budget, and one report. This is one part of the efforts of the MoH to engage the grass root, going down to the district and coordinate." (KII 8, MoH, National HEWs/CHWs expert).

"There are some initiatives, Joint project inception, planning, implementation. NGOS/partners are working with government. Some partners are employing/ assigning secondments, these are like ambassadors. In Oromia health bureau there are about 10-12 staff assigned as a seconded to provides technical support and share their organization's experience excellence, play a liaising role, ensure their brand. Like a bridge between the government and parties. Seconded is not enough, there is a gap in joint problem identification, project selection and project cocreation." (KII 12 Regional NGO, Public health Expert)

Our finding shows the existing and emerging multi-level stakeholders have a great interest to work on reproductive health, including MNCH. Participants acknowledged the support from donors such as the UNICEF but contended that joint planning, joint implementation and joint evaluation between the government and partner organizations is crucial.

"Okay, compared to other sectors, there is a large number of NGOs working on maternal health and family health, reproductive health. But this is not comparable to the level of problem and demand, they are few in number, and the problem of the society is large and severe. Though the NGO's budget amount is not comparable, there is a gap between the level of the problem and the budget, we need more support internally and internationally…The government alone could not deliver the MNCH. Because most of the previous achievements are due to partners' effort and support." ***(****KII 5, Regional health bureau, Primary health expert).*

Promising community-level engagement and co-production aspects

All participants stressed that community engagement (CE) is crucial for the success of CHW program in rural Ethiopia. There are different platforms of CE in Ethiopia. These include engaging indigenous institutions like 'Idir' 'Ikub', Traditional Birth Attendants and CHWs program-based groups, such as women's development groups. In Ethiopia, health policies and strategies like HSTP-II (Health, 2021) and a roadmap for optimizing the Ethiopian HEP community engagement (2020-2035) (Merq, 2020) is one of the strategic approaches to ensure the CHWs program for rural and remote populations.

"The role of the community is big. Every aspect of our work needs community engagement whether vaccination, maternity health, or communicable disease. Mainly, we were using the Women Development Army, we also use key community leaders and religious leaders then they inform the community in their respective…. The government must give more attention to the program, but the community can do what ever they can as long as there is transparent discussion/ communication on how to improve and contribute in the health system. I can say that there is no problem from the

community. Currently, there is no specific project implemented government alone." (KII 4, District health office, HEP experts)

Women's groups are the most active and functional platforms of MNCH service promotion and demand creation, "as clients and change agents."

"*Mostly, the women's group structure is the most functional one. Women have 'One to Five' structure which is a group formed taking into to account neighborhood. They are selected and organized form the community to promote MNCH services like when pregnant women should visit the health facility for ANC and their children vaccination." (FGD participant, From Adea Berga District)*

"More of the Health Extension Program is related to women and children; efforts have been made to organize women to work as clients and change agents. At that time, I was also engaged, so I tried to make them aware. When the document was prepared, an effort was made to understand from them their challenge and how to solve it." (KII 7, MoH, Primary health system expert).

Aspects of community engagement are potential sources of resource mobilization and include cash and in-kind resource mobilization. The community has been showing a great potential to support the health system; there is nothing that government can implement without the active participation of the community.

"In my perspective, there is nothing that government can implement without the active participation of the community. The communities' role in HEWs program is not easy, while the government was supplying the nails, and copers, the community was engaging in providing their labor, wood, and superstructure. Many health posts (60%) were built by community participation. ... For example, we recently have good experience in terms of resource mobilization from the community for health, in Oromiya region, Jima Zone recently we mobilized 50 million, Ethiopian Birr. This is great support for the government to build the infrastructure, assign the HR and avail necessary services. Implementing for themselves and collaborating with the government during the implementation." (KII 8, MoH, National HEWs/CHWs expert).

The community is significantly engaging through contributing cash to buy an ambulance, building a maternity waiting home near the health centers and contributing crops to feed pregnant women while at health facility for delivery.

"*In addition to the ambulance supplied by the government, the community also made a demand, so they donated a lot of cash to buy an ambulance and make it available, and in terms of building a maternity waiting home near the health centers, the community contributed a lot. But when I say this, I do not mean that there are no challenges." (KII 7, MoH, Primary health system expert).*

"*Our communities are actively participating. They contribute 100 ETB for Ambulance purchase/ maintenance, they are contributing crops for pregnant women, they are renovating the health post, and building the fence of the health post through their own material and labor. They are even contributing their resources in cash or /in kind to support to construct the health center." (KII 4, District health office, HEP experts)*

"What does the community contribute? We help by providing labor and wood and stone from the area, but the government provided the outputs of the factory. It was supposed to be that the government would cover the fees paid to the people who make and build nails, cement, and tin. In the area of RMNCH, there were also mobilizations to improve the existing low performance. If you have seen, the community has engaged well when working to improve the family planning. Immunization reduces the drop-outs, with the moto of no mother should give birth at home, no mother should die while giving birth." (KII 7, MoH, Primary health system expert)

Community Based Health Insurance (CBI), pooling funds to offset the cost of healthcare, is becoming the emphasis of the Ethiopian health policy and practice (Health, 2021; Merq, 2020). There is a growing interest on strengthening CBI to ensure sustainable health services. Participants anticipate that CBI will improve the health-seeking behavior and strengthen the health financing challenge of the informal sector, including rural communities who base their livelihood on agriculture. However, there were concerns that the CBI may be ineffective.

"We are promoting CBHI at scale rather than making them pay from their own pockets while going through the health check and the health extension program. CBHI is now compulsory; already been ratified. As of this year, all regions are implemented that way. For this, except for those that are done by free will, those who can are benefiting by paying. A client goes to a health post, then a health center, then a hospital." (KII 7, MoH, Primary health system expert)

"CBHI has acceptance among the community, and it is increasing health-seeking behavior. Because they contribute once a year and would access the health for the year. The community is using it a lot. It is making a big contribution. It is also widely accepted by society." (KII 9, Zonal level health MNCH expert)

Participants explained that co-production, which they identified as knowledge sharing, enhanced ownership and sustainability, which enhances the community health system and MNCH:

"Co production is important, because knowledge is every where, I have it you have it, and it also exists every where. If we bring it together to produce it would enhance ownership, or you could not blame some one. If the project by NGOs/ governments starts from the community through co-creation all respective stakeholders to identify the problem and to design the solution together we will not fail as pervious or should not be give us a blinking result (the result sometimes seen and disappear sooner). It would give us a community owned and sustainable result to improve our country's health system, this is the way I think." (KII 12 Regional NGO, Public health Expert)

Effective community engagement should start from the bottom/grass root level. A crucial aspect of meaningful community engagement in the rural Ethiopia community health system is the community's ownership of health programs.

"*Community participation is crucial, approaching the community and asking the community on what they need to improve is important. The community should feel this is my work, co-planning co-evaluation with the community are important to enhance the CHWs program. We work with the community for the community, community has the resource. Any community effort without*

community engagement has no continuation and will fail." (FGD participant, From Adea Berga District)

"Last year I worked on one project as a consultant in "Borena area." I can not tell you how much I was pleased to see such co creation approach. We called all the respective stakeholders from the HEWs, from the community rep, religion institution, community leaders, from health sector, from health, women, social affairs. We came up with very genuine gap/ problem identification with the stakeholders, this is our problem and we need this to be solved for us. Now the project is started in a very good way." (KII 12 Regional NGO, Public health Expert)

Building on the existing indigenous social structures in the community and 'the whole community engagement approach' is crucial to ensure inclusiveness of community participation and to enhance synergy.

"*In order to address the challenges, we follow the whole community engagement approach. Therefore, it is being done to engage not only the women, but also the men, the youth and the social structure. At the end of community engagement, there comes empowerment, isn't it? We have not reached that stage of community empowerment. We haven't reached there, yet. But we are moving towards that. There are some improvements compared to what we had before. But for the empowerment to happen, there are push and pull factors." (KII 7, MoH, Primary health system expert).*

"To improve the engagement of the community we should organize the community into different groups based on their situation. Then, we have to create favorable conditions for participation. Inviting the community during planning and incorporating their suggestion in the planning, instead of top to down planning. I think, this has a better output. Working with the community can help to prevent child vaccination dropout. Community engagement should be maintained." (FGD participant, From Adea Berga District)

Discussion

Over the last two decades, the health outcomes in Ethiopia, including MNCH outcomes, have been improving, however the current high level of negative MNCH outcomes is unacceptable. To achieve the SDGs, Ethiopia must reduce neonatal deaths from 29 to 12 per 1000 live births and maternal deaths from 412 to 70 per 100,000 live births in an environment of increasingly constrained health resources. Despite the multi-stakeholder engagement in the country wide CHWs program, there is limited evidence on how they interact and mutually reinforce each other towards the co-production of optimized health outcomes. We conducted a qualitative case study to examine barriers to and facilitators of multi-stakeholder engagement toward the co-production of optimized MNCH outcomes and a resilient community health system in rural Ethiopia. In the context of multi-stakeholder engagement, our analysis reveals the multilevel barriers to and facilitators of co-production in the community health landscape. *T*he major manifestations of lack of co-production include lack of vertical and horizontal alignment, lack of continuum of sustainable engagement practices, and lack of systemic coordination platforms. Major facilitators of multi-stakeholder engagement towards co-production include an embedded integrated community health system, promising macro-level multi-stakeholder and community-level engagement and co-production aspects.

In the context of multi-stakeholder engagement, our discussion focusses on the barriers to co-produce improved health outcomes in community health system in Ethiopian. First, according to our finding the current Ethiopian multi-stakeholder approach lacks adequate vertical and horizontal alignment to the needs of the community, there is a limited effort to incorporate communities voice through prior needs assessment to define the problem and plan the solution jointly. The existing engagement often meant inviting the beneficiary community and local/ district implemented to be informed on new plans, or to solicit their support for decisions that had already been made; which is a long way from putting the community and local stakeholders in the driver's seat. This could be due to the power imbalance, the macro-level government has the ultimate power to initiate health policy to be practiced in a top-down fashion (MoH, 2020; Gebremeskel et al.,2023; MERQ, 2020).

The top-down engagement approach is problematic in ensuring meaningful synergy of co-production. The CHWs programme needs to be multidimensional rather than vertical and should

rely on all stakeholders (Tulenko et al., 2013). The collaboration should influence public service outcomes and should go beyond collecting input from users (Vennik et al., 2016). In Malawi, multi-stakeholders felt that due to lack of top-down and bottom-up balanced stakeholder engagement, the prevailing engagement approach is dominated by tokenistic consultation. Multi-stakeholders have no power to influence health policy-making to better meet their health needs (Masefield et al., 2021). There may be challenges such as lack of commitment by policy-makers and decision-makers to engage the multi-stakeholders (Bahraminejad et al., 2015; Tadesse et al., 2021). Since experts from the public and NGOs have more resource available, they often control and initiate these processes, define the scope of activities, and consequently serve their own interests, which leads to further power inequality (Centre & Jeffery, n.d.).

Genuine power-sharing, partnerships, bi-directional learning, incorporating the voice and agency of beneficiary communities, determines the effectiveness of community engagement (Cyril et al., 2015). In Ethiopia the community engagement framework and strategies should be guided by a framework that describes how empowered public institutions and polices disregard power to citizens, and how levels of citizen agency, control, and power can be increased (Davidson,1998; Arnstein,1969). When designing and implementing community health development programmes, community ownership, leadership. adequate resources, continual monitoring tools and motivation are essential considerations through the continuum of working with people to help them identify and address key problems affecting their community (Gilmore & McAuliffe, 2013).

Second, our finding shows that the existing multi-stakeholder approach in Ethiopia's community health program is fragmented and not well aligned to the holistic community health program system strengthening. While multi-stakeholders are engaging in different levels of health program intervention, they use selective approaches, disease-specific interventions, and their effects may undermine progress towards long-term impact like building resilient health system. Fragmented communi ty health programming is a challenge for community health program effectiveness in SSA(Gebremeskel et al,2021). As a result, in LMICs like Ethiopia, the increased spending has not achieved fundamental shifts in the health system (Gilmore,2013). An inclusive framework is

important to synergize the multi-stakeholder efforts to coproduce a resilient community health system, beyond short term outcome approach (Druetz, 2018; Gebremeskel et al,2021).

Third, according to our analysis the existing state-multi-stakeholder synergy lacks a continuum of sustainable engagement in the community health program cycle; it is characterized by considerable dropouts or interruptions and some of the initiatives are always backsliding. According to our analysis, there is lack of continuum of co-creation, joint project planning, implementation, monitoring, reviewing and the like. Despite more engagement of stakeholders during COVID-19, it was only for short time and was an ad hoc strategy. It seems the focus of the current engagement is achieving short-term project results through periodic demand creation and health promotion activities. It is very crucial to engage stakeholder throughout the health policy cycle (Helbig et al., 2015; Masefield et al., 2021). In Malawi, the perceived barriers to stakeholders' meaningful engagement in the health policy process includes tokenistic involvement, stakeholder hierarchy; mutual distrust; preferred stakeholders and no culture of engagement (Gilson et al., 2012). Co-production gives opportunity for multiple actors and perspectives to address complex continuum and sustainable challenges through joint effort.

Fourth, our analysis illustrates that in the context of multi-stakeholder engagement, there is a challenge of fragmented coordination from macro-level, to meso- and micro-level. There is no adequate and uniform monitoring system up to the district level to organize the program and the available resources. Lack of systemic coordination is becoming a key health system challenge, driven by increasing fragmentation (Gebremeskel et al., 2022; Misra et al., 2020). Also, our finding shows there is inefficient capacity to manage the limited resources; CHWs are overburdened to facilitate and coordinate the multi-stakeholder engagement. This could be associated to the insufficient manpower at lower level, two HEWs serve over three thousand people with 18 HEP packages with limited facilities. "Mottos like 'universal health coverage' and 'no one left behind' cannot be achieved without training and deploying more community health workers" (p#2) (Gebremeskel et al., 2021). It is crucial to consider various stakeholders engagement needs *because i*t is difficult to achieve better health outcomes without coordinated engagement of actors beyond the health professionals and health sector (Batalden et al., 2016; Leviton & Melichar, 2016).

Furthermore, our finding highlights that the Ethiopian health polices/funding are under the influence of multi-stakeholder/donors. Despite the increased efforts of actors in the Ethiopian health system over time, the existing engagements are project based and short-term result oriented, posing a challenge to building a sustainable health system. A donor-driven approach is becoming problematic and falling to ensure a resilient health system for various reasons, such as problems of global leadership; divergent interests; problems of accountability; and power asymmetries (Gebremeskel et al., 2021; Spicer et al., 2020). Also, incompatible interests arise, with individual actors focusing on their own set of goals and priorities (Rajabi et al., 2021). According to the 2005 Paris Declaration on Aid Effectiveness, aid works best when recipient governments develop 'ownership' of policies and programs, and donors provide long-term financial and technical assistance (OECD,2011).

In a changing global context, health diplomacy is crucial soft power to address public health issues through coordinated collaboration. It is an important forum for negotiations on national /global health policy issues that shape and influence health outcomes. It brings together a wide range of actors in areas that affect public health. Beyond the response in the context of health emergency aid or donor-driven approaches, health diplomacy should be the focus of health policy planners and decision makers to proactively demonstrate the level of the MNCH/ community health system challenge and advocate for available policy options to address health system challenges. Aid based or donor-driven approaches are not bringing a sustainable change; they are fragmented, crises /emergency or pandemic oriented (Ebola, COVID; HIV) and they are not focusing on system building. Multiple achievements have been gained through donor and emergency responses, but there remains a limited proactive health diplomacy policy and practice to mobilize international and local actors to address major health system challenges. Proactive health diplomacy strategy emphasizes the need for preventive, anticipatory and preparedness capacity of the health system, building systems that are equitable and resilient. Health diplomacy requires a delicate combination of technical expertise, legal knowledge, and diplomatic skills that have not been systematically cultivated among either foreign service or global health professionals (Katz et al., 2011).

Policy implications

Our study demonstrated the need to move beyond the current multi-stakeholder engagement as a buzzword in health polices to practice through building on multi-stakeholder engagement and embedding a meaningful co-production framework as one of the building blocks to transform the Ethiopian community health system.

Building on the multi-stakeholder engagement

Increasing attention is being paid to multi-stakeholder engagement to drive the development practice and has become a hot button for policy makers and healthcare leaders. Multi-stakeholder engagement is emphasized as an important vehicle for mobilizing and sharing knowledge, technologies, and resources to support the achievement of the SDGs through promoting effective public, and non-government actors partnerships and building on the experience and resourcing strategies of partnerships (UN DESD,2016). This is due to the fact that individuals or groups involved in or affected by health- and healthcare-related polices should have a meaningful role in the planning, practice, and evaluation thereof (Petkovic et al., 2020; Zuckerman et al., 1995). Mitigating the multi-stakeholders challenge requires multi-sector alignment (relational coupling), operational perception alignment (cognitive coupling) and goal and strategic alignment (material coupling) (Nonet et al., 2022). The promising efforts of Ethiopia in this aspect, such as embedded integrated community health systems, promising macro-level multi-stakeholder and community-level engagement and co-production aspects needs to be guided by a multi-stakeholder engagement strategy to coordinate the process, monitor, and evaluate the impact in a co-production framework. Vertical and horizontal alignment, continuum of sustainable engagement practice, and systemic coordination platforms should be basic components of effective multi-stakeholder engagement.

Embedding a meaningful co-production framework

Embedding a meaningful co-production framework is crucial to address the multi-stakeholder challenge in order to optimize MNCH outcomes and create a resilient community health system in rural Ethiopia. A co-production framework places citizens at the centre of public service design and production (Ostrom, 1996) and provides a space for relationship building, knowledge sharing and capacity building of all partners involved. Co-production asserts proactive consented

stakeholder engagement in all levels of project cycle defining the problem, designing, and delivering the solution, and evaluating the outcome, either with professionals or independently (Alford, 2002; Porter, 2020). Co-production with potential stakeholders, including end users, has been achieving promising results in developing and adapting global health interventions. (Dunston et al., 2009). Our study highlights the importance of co-production, stresses the power of co-creation to address critical gaps, including poor coordination of government and non-governmental actors to enhance the community level health system (Johnson & Johnson, 2022*)*. Realizing an effective co-production framework can be achieved by "complementarity" and "embeddedness" (Evans, 1996), but inclusive and meaningful multi-stakeholder joint prioritization, planning, mobilization, implementation, decision-making and evaluation platform is fundamental. Co-production demands a shift in the balance of power, building a shared understanding between stakeholders including service users, researchers, policy makers, practitioners, and managers (Turk et al., 2021).

Conclusion

Our study reveals mixed policy and practice-related results - the current multi-stakeholder engagement is necessary but insufficient and fragmented to co-produce optimized MNCH outcomes and UHC. In the context of a multi-stakeholder approach, our analysis revealed the multi-level barriers to and facilitators of co-production in the community health landscape in rural Ethiopia. Given the recurring socio-economic challenges including a fragile health system and low level of health outcomes, the Ethiopian government and fragmented donor support alone cannot address all the challenges in a short time span. Beyond the existing fragmented multi-stakeholder

engagement, a new way of thinking is required to effectively optimize existing and emerging multi-stakeholder engagement towards the co-production of optimized MNCH and a resilient community health system in Ethiopia. A co-production framework leverages the alignment, intersection, and mutual reinforcement of multi-stakeholder synergy throughout the CHWs program cycle through shared power and joint assessment, planning, implementation decision making and evaluating. Fostering effective multi-stakeholder engagement synergy requires balanced shared power, alignment to community priorities, systemic mapping, coordination and monitoring, and a continuum of sustainability of engagement strategy.

Beyond fragmented donor initiative approaches, proactive health diplomacy strategy is also important to sustain the existing and attract new actors to realize sustainable positive health outcomes and a resilient community health policy and strategy. Our analysis shows that there is limited engagement of academia/research institutes and the private sector in Ethiopian community health systems. Hence, more evidence is required on how the multi-stakeholder synergy should be geared towards co-production of sustainable development, including resilient health outcome in Ethiopia and beyond.

Declarations

Competing interests

The authors have declared that no competing interests exist.

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Author contributions

AG and SY conceptualized the study. AG coded and analyzed the data and prepared the first draft of the manuscript. OO, JE and SY helped with data analysis, provided technical support in interpretation of results and critically reviewed the manuscript for its intellectual content. SY had final responsibility to submit. All authors read and revised drafts of the paper and approved the final version.

Availability of data and materials

The interview data cannot be shared publicly as they hold potentially attributable sensitive information regarding the participants and their roles. It would therefore be unethical to make them public and would undermine the ethical committee agreement and consent process. Data can be requested from the Research Ethics Boards (REB) at the University of Ottawa at ethics@uottawa.ca by researchers who meet the criteria for access to confidential data. All other relevant data are presented within the article.

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Chapter Six: Integrated Discussion, Implications and Conclusion

6.1. Thesis summary and discussion

Over the last three decades in Ethiopia the community-based health system has been emphasized as an effective and efficient strategy in promoting primary healthcare equity and improving health outcomes, including MNCH. Despite the contribution of the program to improving MNCH outcomes, Ethiopia continues to have the highest child and maternal mortality occurrences in the world and the program is not fully transformed to comprehensively address the continued health outcome inequalities and inequities, including MNCH, existing within the country. I argue that

Ethiopia's MNCH outcomes improvement is based on relative comparisons over time, using within country analysis without cross country comparisons. The CHW-based health program continues to operate without the transformational capacity to comprehensively respond to persistent preventable and treatable MNCH challenges. To achieve the SDGs Ethiopia must reduce neonatal deaths from 29 to 12 per 1000 live births and maternal deaths from 412 to 70 per 100,000 live births in unreliable health system environments and with increasingly constrained health resources. There is little evidence that exists on paths to transform the Community Health Workers program is necessary to enhance MNCH equity and CBHS resilience in Ethiopia.

The main goal of this study is to gather and analyze evidence on paths to comprehensive, equitable and transformative community-based health systems (CBHS) to enhance MNCH equity and outcomes in Ethiopia and beyond. The four sets of research questions and objectives were addressed as the main goal of this thesis project. I conducted a multi-phase study comprising of a systematic review and an embedded multiple case study in West Shewa Zone, rural Ethiopia. My study is informed by multiple theoretical frameworks including the SEF, the World Health Organization's health system framework, the state–society synergy framework, and the MSF. My data sources are two focus group discussions with CHWs from two districts with similar context, twelve key informant interviews with multilevel public health policy actors, and a policy document review related to the CHW program. In the FGDs, a total of 16 female health extension workers (HEWs/CHWs) participated from two district of West Shewa Zone. All the FGD participants, HEWs/CHWs, are female, and the majority (93.75 %) of them are in the age range of 25-40. A total of twelve public health experts were recruited to participate in the KIIs. Eight participants (66.6%) were recruited from three levels of government health structures (three participants from MoH, two participants from ORHB, and three participants from West Shewa's two district level health offices). Four (33.3%) participants were recruited from NGOs (two from the national level and two from the regional level). In terms of gender, four (33.3%) women and eight men (66.6%) participated. I conducted a thematic analysis of the systematic review and qualitative case study data.

Using an embedded multiple case study, by carefully analyzing selected multiple cases and multiple units of analysis, I observed similarities and differences within and between cases. The

themes and patterns that emerged from each case were compared, and I found similarities. Comparative methods enable generalizations of findings using between case analysis (Beach & Pedersen, 2019*).* Comparisons can be drawn when the cases are carefully selected, so that the researcher can predict similar results across cases, or predict contrasting results based on a theory (Yin, 2003).

The results section is organized in five standalone articles in keeping with the requirement of the proposed manuscript-based PhD thesis. Articles #5.1, #5.2 and #5.3 are already published in peer reviewed journals, while articles #5.4 and #5.5 have been submitted to peer reviewed journals for publication and are under review.

In the next section I present the summary of the thesis result in brief. My study reveals mixed policy and practice-related results. Article #5.1 and #5.2, the systematic review protocol and the review results, examine the perceived barriers to and facilitators of CHW effectiveness to ensure MNCH equity and a resilient community health system in SSA. The review critically examined the crucial intermediary position of CHWs in promoting public health as an effective strategy to address MNCH and basic health services for rural majority populations of SSA countries. The program's operation in multilevel determinants at different levels affects the course of CHWs' and program effectiveness. Using a SEF, the study identified the multi-level determinants of CHWs' effectiveness at 4 levels: individual/CHWs, interpersonal, community and health system logistics. Under each level, the study identified themes of perceived barriers such as competency gaps, lack of collaboration, and fragmentation of empowerment programs. In terms of facilitators, the identified themes were CHW empowerment, interpersonal effectiveness, community trust, integration of CHWs into health systems and technology. Synthesizing the perspectives of CHWs' lived experience is crucial to inform decision makers, policy makers, and practitioners to address barriers to and scale up facilitators of CHW programs to ensure maternal and child health equity and a resilient community health system. The socio-ecological framework can provide a lens of understanding for diverse contexts that impede or enhance CHWs' engagement and effectiveness at different levels. Adopting a multilevel framework-based CHW/MCH program ensures context-based CHW programs, addressing the multilevel barriers and scaling up the enabling factors.

Article #5.3, the first qualitative paper from the case study, examines the multilevel challenges of Ethiopia's CHW program to deliver optimum MNCH and build a resilient community health system. The CHW program has been an extended arm of Ethiopia's primary health system and has contributed to improved health outcomes. This paper highlights the fact that, despite the promising contribution of the program, including MNCH, CHWs in rural Ethiopia continue to operate in challenging conditions. This paper unpacks the challenges of fragmentation in community-based MNCH and health systems in rural Ethiopia. The program has been facing unique systemic challenges that stem from the fragmentation of health finance; medical and equipment supply; working and living infrastructure; CHWs empowerment and motivation, monitoring, supervision, and information; coordination and governance; and community and stakeholder engagement.

Article #5.4, the second from the case study, examines the critical success factors (CSFs) in developing a transformative resilient community-based health system in rural Ethiopia using COVID-19 as a policy window. This paper reveals ten CSFs within the WHO's health system framework – as well as factors beyond this framework - considered necessary to develop equitable MNCH and a resilient community-based health system in rural Ethiopia. CSFs within the WHO's framework include optimization of programs; optimization, diversification and sustainability of health finance; reliable health system evidence-building and translation; reliable access to essential medical and diagnostic supplies*;* community health workers' living and working conditions; and transformational governance and leadership. CSFs beyond WHO's health system include alignment of multi-stakeholder engagement towards co-production; reliable security and health infrastructure development; reliable digital transformation in community health programs; and a gender transformative approach in the health system. Beyond the standard approach, the identification of CSFs for a transformative resilient community-based health system could be one of the major strategies for community health program transformation, using COVID-19 as a policy window. The transformation of the community health program is a priority to address MNCH outcome inequity and ensure UHC in Ethiopia while addressing current and future primary health needs and risks, demographic, and epidemiological changes.

Finally, article #5.5, the third from the case study, examines how multi-stakeholder engagement contributes to the co-production of optimized MNCH outcomes and a resilient community health system in rural Ethiopia. Despite the rhetoric around the significance of multi-stakeholder engagement as a buzzword in Ethiopian health polices/programs, including to improve health and other development outcomes, there is limited evidence as to how multi-stakeholders intersect and mutually reinforce each other toward the co-production of improved MNCH outcomes and a resilient community health system. In the context of a multi-stakeholder approach, this paper reveals the multilevel barriers to and facilitators of multi-stakeholder engagement in co-production of improved MNCH in the community health landscape in rural Ethiopia. The major barriers of multi-stakeholder engagement in co-production include lack of vertical and horizontal alignment, lack of continuity of sustainable engagement practices, and lack of systemic coordination platforms and implementation capacity. Major facilitators of multi-stakeholder engagement in co-production include an embedded integrated community health system, promising macro-level multi-stakeholder engagement as well as community-level engagement, including co-production aspects.

In the next section I will discuss the over all finding. Despite the emphasis given to the CHW-based program as an emerging broad based efficient, effective, and equitable strategy to address the broad ambition for primary health for rural majority populations living in hard-to-reach areas, the program continues to experience multiple challenges, in an environment of increasingly constrained health resources. In Ethiopia, although the nationwide community-based health program is available in every rural village, the health program has been facing unique systemic challenges and fragmentation. Despite the positive change in terms of better health outcomes, including MNCH, given more than three decades of experience, the current CBHS has not been closing the gap of MNCH health inequity in terms of access, comprehensiveness, resilience, and sustainability for the hard-to-reach large majority of Ethiopians, including women and children, living in rural areas. As a result, the country continues to have the highest MMR and U5MR occurrences in the world.

As highlighted in this study, health system pillar fragmentation is a blind spot for the community-based health system in rural Ethiopia, exacerbating the fragility of the system and fragmentation of MNCH health outcomes. Therefore, despite multiple efforts, rural Ethiopian mothers, children and newborns remain at great risk because of lack of access to basic, life-saving *health* care including MNCH (Amref, 2020). According to the Ethiopian Demographic and Health Survey of 2019, there is fragmentation in MNCH outcomes. Despite the progress that has been made, Ethiopia has a large burden of communicable diseases and still has a MMR of 412 per 100,000 live births and U5MR of 67 per 1,000 (MoH,2020). For example, while 74% of mothers received the first ANC, only 43% received the recommended four or more ANCs. Also, Skilled Birth Attendance (SBA) during childbirth is 48%, while PNC is at 34% of women aged 15-49 (MoH 2016.; MoH, 2021). In 2019, U5MR across regions varied widely, ranging from 14.8% (12.4–17.8) in Addis Ababa to 62.9% (53.6–74.9) in Benishangul-Gumuz (Tesema et al.,2023). Ethiopia is still one of the top ten countries with the highest mortality of children under-5 years, with 178, 000 deaths in 2019 alone (WHO, 2020). I argue that the fragmentation of the health system could be the main trigger of MNCH outcomes.

My thesis finding also emphasizes that there is a need for a context specific approach, developing a comprehensive, flexible and transformative path for the program to ultimately leverage the success of the CHW program in Ethiopia - in order to reach beyond. In last four decades the health system of many countries, including Ethiopia, has been guided by the standard WHO health system framework. I argue that such a 'One-Size-Fits-All' approach cannot capture the complex context of CHW programs in Ethiopia. This is a problem as there is a lack of a context specific health system framework that pinpoints the specific barriers to and facilitators of a resilient health system (Kok et al.,2017; Kok et al.,2015; Perry et al.,2021; Sacks et al.,2019). The WHO's health system framework focuses on macro level health systems without contributing very much to understanding the micro institutional foundations on which CHWs depend. As revealed by this this finding, community health programs are conceptually and operationally related to specific community settings, and the framework neglects context-based community health system building.

Also, this framework is not comprehensive enough to characterize and inform health system resilience every time and everywhere. The WHO's health system neglects multi-stakeholder

engagement towards co-production, reliable security and health infrastructure development, reliable digital transformation of the community health program, and a gender transformative approach in the health system. COVID-19 highlighted the fragmentation of health systems globally, including Ethiopia, which is in part associated with an incomprehensive top-down approach, short term results-focused disease specific interventions and limited resources, without focusing on health system thinking. Multilevel health ecology contexts and comprehensive integrated health approaches are critical (Shortell et al., 2010; WHO, 2020). Beyond direct disease prevention and treatment outcome-oriented approaches, health programs need to be conceptualized, planned and analyzed through the critical understanding of the complex socio-ecological context for better health outcomes.

My thesis finding also emphasised that in Ethiopia fragmentation of the health system pillars, resource constraints and donor support limits the ability to address the devastating MNCH situation. In Ethiopia, there is an ongoing effort to scale up and optimize the CHW program in terms of service quantity and quality through task shifting by moving some curative/treatment activities to be given at the CHW level, but the community health program optimization plan is lagging due to the health financing fragmentation, limited funding and financial allocation. This may require a more professional mix including pharmacists, laboratory technicians and other interdisciplinary professionals beyond health. Most of the participants believe that *"The Ethiopian government cannot realize the optimization of the HEWs program alone"*, as the optimization program requires about 12.6 billion USD for 15 years. The situation is exacerbated by the fragmentation of donor support. This thesis finding shows that there is a high risk that if the situation continues in a business-as-usual approach, this fragmentation will continue to impede community based MNCH outcomes and health system resilience efforts.

In Ethiopia, despite considerable macro level rhetoric surrounding the multi-stakeholder approach in MNCH and a resilient community health system, there is a challenge of coordination and alignment towards co-production of improved health outcomes, and sustainable and resilient community health systems in rural areas. The major barriers to multi-stakeholder engagement include lack of vertical and horizontal alignment, lack of continuity and sustainable engagement

practices, and lack of systemic coordination platforms. Vitalization of a multi-stakeholder approach is crucial in the Ethiopian health system (Tefera and Ayele, 2021). Through the co-production framework, systemic and aligned multi-stakeholder synergy is fundamental to transform the fragmented health system and improve health outcomes in Ethiopia. A co-production framework leverages the intersection and mutual reinforcement of multi-stakeholder synergy throughout the CHW' program cycle, through shared power and a joint approach to the entire process of planning, implementation, resource mobilization and coordination, decision making and evaluation. Co-production is a meaningful partnership, with balanced responsibility and accountability for co-planning, co-implementation, and co-results-based management among multi-stakeholders (Evans,1997; Ostrom, 1996).

The discourse and practice of co-production is increasingly being promoted as the 'emerging paradigm' (Bovaird, 2007; Cepiku et al., 2013; Batalden et al.,2016; Filipe et al., 2017; Sorrentino et al., 2018; Abubakar et al., 2021; Beresford et al., 2012; Fox et al., 2023; Stevenson et al., 2023). Under the paradigms of state-society synergy (Evans,1997) and co-production (Ostrom, 1996), it is becoming more common and crucial for more stakeholders to be involved in producing and improving policy outcomes.

There is mixed evidence about the CHW program and MNCH outcomes: Promising and Disappointing. There are substantial inequities in MNCH services access and health outcomes within and among regions, there is no alternative to multi-stakeholder engagement to improve health outcomes in the context of meaningful coproduction. The production and delivery of services is difficult without the active engagement of the recipients (Ostrom, 1996). The SDGs call for the meaningful and active participation of stakeholders at all levels to realize progress and to ensure that no one is left behind (UN, 2020). According to the SDGs, all stakeholders, including governments, citizens, NGOs, CSOs, academia and the private sector, have roles to play in contributing to their attainment. State–society synergy asserts that an active government and mobilized communities can enhance each other's developmental efforts (Evans, 1996). In emerging economies, including Ethiopia, where governments have limited capacity to provide public services, including health, there is often no alternative to co-production (Linders, 2012). In

a co-production approach, citizens are not the passive targets or beneficiaries of government activities but become vital elements in their success or failure (Sorrentino et al.,2018).

My thesis result underscored the need for a more resilient health system for equitable MNCH and other health outcomes, using COVID-19 as a policy window. In recent decades, health system emergencies and shocks such as the 2014–16 Ebola epidemic, the Zika outbreak, and, last but not least, the COVID-19 pandemic, continue to underscore the need for a more resilient health system for equitable MNCH and other health outcomes (Kruk et al., 2015; Alabi et al., 2023; Doetsch et al., 2022). In Ethiopia and beyond, the COVID-19 pandemic has amplified the fragility of global health systems. It has also highlighted the need for health system transformation to meet current and future health needs (Claro, 2023). Therefore, the issue of building a resilient community health system is attracting more attention than before as these fragile systems have previously struggled to respond to the effects of health emergencies and pandemics (Gebremeskel et al., 2021).

According to my findings, most of the existing literature on health system resilience focuses on the characterization of a health system that demonstrates preparedness and absorptive capacity, without due emphasis on how to build adaptive and transformative capacity and enabling factors that are necessary to build a resilient health system (Binagwaho et al., 2022; Danaher et al., 2014; Gebremeskel et al., 2021; Kruk et al., 2015). Building on the WHO health system framework (WHO, 2007; Blachet et al., 2020), a comprehensive, equitable and resilient CBHS should be framed and organized beyond an emergency response to transformative resilience. This can be achieved through a multipronged co-production approach, embedding health system resilience management systems comprising planning, assurance and controlling mechanisms. Transformative health resilience refers to the capacity of a health system to shift to a new phase characterized by a more innovative, efficient, effective, equitable and sustainable system beyond current health needs and situations.

My thesis results highlighted ten critical success factors (CSFs) within the WHOs health system framework and beyond in developing equitable MNCH and a resilient community-based health system in rural Ethiopia. The WHO's health systems strengthening framework contains necessary

core building blocks that contribute to building health systems, but they are not sufficient to build transformative and resistant health systems given the ever-changing health environment. Beyond the WHO health system building blocks, comprehensive health system success factors include multi-stakeholder engagement; reliable security and health infrastructure development; digital transformation, and gender transformative approaches as determinants to realizing an equitable and transformative resilient community health system. CSFs are success conditions and prerequisites that must exist to realize equitable MNCH. According to Rockart (1982) understanding CSFs is crucial for top management to determine where management attention should be directed; they are the aspects of a program considered most essential to its success or failure. Hence, its is imperative to transform the fragmented health promotion and disease prevention approach to a sustainable and comprehensive community health care system. Ethiopia needs to ensure health system resilience through logistically and technically well-organized comprehensive and multi-dimensional community healthcare co-production and transformation, co-creating a resilient health framework. Using COVID-19 as a policy window, leveraging multi-stakeholder synergy and a co-production framework, it is crucial to chart innovative paths to move from campaign/emergency-oriented resilience system thinking to embedded comprehensive and transformative resilient health systemto ensure MNCH equity in rural Ethiopia and beyond. Building on an inter-disciplinary approach that draws from multiple theoretical frameworks including the SEF, the WHO health system framework, the state-society synergy framework/coproduction framework and MSF, I suggest a CHCT framework (Fig.2).

Ethiopia must integrate a GTA to enhance women's leadership and promote managerial roles and representation through inclusion and empowerment in multilevel CBHS, which is crucial for better MNCH outcomes and health system transformation. It is crucial for multi-stakeholders to invest in women and their leadership potential, as this has the promise to improve health and wealth at the individual, institutional, and community levels (Harrison et al., 2022). Changing gender norms is also crucial for the acceptance and effectiveness of the program (Feldhaus et al., 2015). In the context of co-production and a multiprong approach, our analysis emphasized dismantling the sexual and gender norms by enhancing the role of women and men in the RMNCH/CHWs program to ensure the effectiveness of the program and ensure reproductive autonomy. The Ethiopia community health program must be redefined beyond the current narrow conceptualization,

particularly MNCH service access and delivery aligned for mothers and children, to the broader social context (including women, girls, men and boys) by changing gender norms and health system challenges for better and more comprehensive outcomes. Gender mix is also important to achieve better MNCH outcomes. The current CHW approach needs to reinforce the skill-mix and task shifting approaches on a large scale to ensure CPHC (Lawless et 2014). Skill-mix and task shifting approaches are innovative approaches to address some of these health care needs. Task shifting refers to task exchanges from qualified to less qualified personnel, since the WHO developed a consolidated guideline on using task shifting to tackle health worker shortages in 2007. Particularly, the approach improves access, efficiency, and quality of care in many countries, including in LMICs (Leong et al., 2021). However, more evidence is needed in terms of task shifting in low health system resource settings, including the current status of Ethiopia.

It is also important to organize evidence on corporate social responsibility models (Nwobu, 2021) for the private sector to take on responsibility in community health, reducing reliance on external resources and moving to whole health system strengthening. Fragmentation of health financing is the existence of a large number of separate funding mechanisms (e.g. many small insurance schemes) and a wide range of health-care providers paid from different funding pools (Mladovsky, 2020). There is limited evidence on how the private sector can contribute to an equitable community-based health system without creating financial barriers to access basic health services.

6.2. Strengths and limitations of the thesis

My thesis is a comprehensive study employing multi-phase research design using multiple theoretical frameworks to address evidence gaps in paths to community health transformation through building comprehensive and resilient community health systems. The thesis is based on a multi-phase qualitative research method comprising of a systematic review and an embedded multiple case study in which different levels or sources of data are collected (Yin, 2003). Comparative methods enable generalization of findings between cases (Beach & *Pedersen,*2019); and predict similar results across cases, or predict contrasting results based on a theory (Yin, 2003). The case study is built on the perspectives of multilevel national health policy makers (public and NGOs) and onsite service provides (CHWs) to ensure MNCH equity and a resilient health system

in Ethiopia. The study stresses a paradigm shift approach to enhance the effectiveness of CHWs and transform the program to address the persisting inequities in MNCH and the unmet need of health service provision among the hard-to-reach rural majority of Ethiopia, especially mothers and children.

This study will be beneficial not only to the communities in which it was conducted but can be applied in other places having comparable health systems or in other low-income countries. This research project will make multiple contributions to community-based health system policy and practice. This approach has enabled me to develop a broad knowledge base of multilevel determinants, CSFs and an understanding of the potential of co-production of CBHS in Ethiopia and beyond to ensure comprehensive, health equity resilient CBHS. The approach guided me to contribute to the local and global debate on conceptualization and framing of comprehensive, equitable and resilient community health systems through co-production and transformation. This approach helped me to inform policy, practice and research interventions. This approach also enhanced my capacity to accomplish a research method based on multi-level and multi-sectoral perspectives using integrated theoretical approaches. In my chosen format, I have maintained a commitment to quality and provide a significant contribution to the area of global health systems, MNCH and community health systems.

This study has three potential limitations. First, the community health program in Ethiopia is predominately run by female salaried public health employees; thus, this case study will not be generalizable for CHW programs in other parts of the world where there is a gender mix and CHWs are not public health employees. Second, due to prevailing security issues and political mistrust within the community, KII participants from zonal and district levels and some CHWs appeared to show some level of frustration and caution in fully expressing their opinions; therefore, key perspectives might have been omitted from their responses. The health program policies, strategies, reports and other related documents were not organized and stored at a specific site to facilitate access to most of the relevant documents for my study. I used the documents which I accessed from the experts I was referred to and was able to access online; therefore, key documents might have been omitted.

6.3. Policy practice and research implications

Moving beyond the program's successes and failures over the last three decades, my thesis finding emphasized the gap between the macro (national) level CHWs program and the challenge during implementation at the micro (district) level. This study highlighted important key areas for CBHS policy, practice, and research. Building on the approach of the last three decades, Ethiopia needs a paradigm shift to transform its CBHS using COVID-19 as a policy window. This calls for the need to sustain opportunities and address the gaps in CHWs program and for paradigm shift in multiple areas for comprehensive equitable and transformative CBHS.

Paradigm shift in community-based health systems (CBHS): Ethiopian health policymakers and actors need to initiate a paradigm shift in the CHW program, leveraging the COVID-19 pandemic as an opportunity for comprehensive equitable and transformative reforms. This shift should prioritize addressing persisting MNCH and other primary health outcomes challenges by employing an integrated theoretical approach to address the multidimensional issues influencing community health transformation. Ethiopia needs a paradigm shift guided by the CHCT framework to a comprehensive and transformative CBHS in multiple areas to accelerate health outcomes and optimize responses to the continued MNCH health inequity gap, while addressing current and future generations' health needs within the fast-changing health environment.

Comprehensive critical success factors (CSF): Building on the existing enabling CSFs by focusing on fragmentation of the health system**:** Ten CSFs - six within the WHO's health system framework – as well as four factors beyond this framework – are considered necessary to develop equitable MNCH and a resilient CBHS in Ethiopia and beyond. Moving away from the WHO's incomplete health system building blocks, policymakers should adopt agile critical success factors and a multidimensional framework tailored to the Ethiopian context. This approach will enable a more adaptable and responsive CBHS capable of addressing evolving health challenges, with key contextual considerations.

Meaningful multi-stakeholder synergy and co-production approach: Meaningful multi-stakeholder co-production refers to collaboration across the full spectrum, from problem/needs

analysis; to co-design/plan, co-advocate and mobilize, co-implement and lead and co-monitor and evaluate; to create synergy among relevant health system actors. Thise requires an enabling power shift: More intensive efforts are required to open spaces framed in a vertical system to enable broader and deeper collective action. This will enable a powershift to enhance an embedded multipronged co-production approach, ensuring comprehensive, equitable and resilient community health. A strong synergy of coordination, trust, willingness and accountability towards common goals/results is also important. Meaningful co-production also depends on changing the power asymmetry, balancing top-down and bottom-up management approaches and creating a hybrid approach.

Therefore, policymakers should transition from fragmented government control and donor-driven support to a systematic and synergized multi-stakeholder co-production approach, working with people instead of working for people. This collaborative effort will enhance the sustainability and effectiveness of MNCH and other health outcome interventions by leveraging diverse expertise and resources. Instead of relying on fragmented and selective approaches, policymakers should prioritize the development of comprehensive and multi-dimensional community healthcare systems. This involves transforming primary healthcare services to ensure they are well-organized, technically sound, and responsiveness using the multi sectoral and the whole of society.

Embedded multipronged co-production approach: Build the health system by creating an enabling environment and alignment based on health system needs and stakeholders' ability and capacity. This is essential to ensure the effectiveness and efficiency of CSF for comprehensive, equitable, transformative sustainable health services and outcomes. The selective and vertical disease prevention approach is not closing the health equity gap, so an embedded multipronged co-production approach is essential to transform the Ethiopian CBHS.

Enhancing the functionality of "One Plan, One Budget, One Report" model of alignment of all stakeholder resources is critical in this aspect.

Embedded resilience management system: Health system resilience is about health system capacity in different contexts/situations, including absorptive capacity, adaptive capacity and

transformative capacity/resilience. Public health actors need to move from emergency oriented resilient systems thinking to transformative resilience health systems, through embedded resilience management systems. Resilience management comprises planning, assurance, and control to ensure effective evidence building, preparedness, threat management, innovation, change readiness, absorption, recovery, adaptation, and sustainability.

Integrate health system change management and RBM: Health policy and program actors need to give emphasis to build on lessons learned from every challenge and success for better policy and program intervention towards transformative CBHS. Result-based management (RBM) is critical to measure successes and failures and promote change management. Embedded RBM is necessary to optimize and improve the achievement of health results and ensure transform CBHS.

Strengthen health diplomacy (soft power) and domestic resource mobilization alternatives: Emphasizing an approach beyond donor dependency, with practical alternatives such as partnership-oriented collaboration, allows for better national and global health outcomes, domestic resource generation and mobilization with an appropriate management system.

Integrate a gender transformative approach (GTA) in CBHS: Multi-sectoral policy actors need to prioritize the leadership and managerial role and representation of women in CBHS through inclusion and empowerment of CHWs. In Ethiopia there is gender inequality across the multilevel health workforce structures (CHWs). This is a systemic problem, which needs fundamental policy change to embed and empower women in community health system / MNCH to play a leadership role on the issues affecting them and their health and wellbeing.

Dismantling gender norms and stereotypes surrounding RMNCH is also critical at the community level to address social norms for better MNCH outcomes. The current conceptualization of the CHWs program is problematic, as it narrowly frames the RMNCH issues as ‘women only’ issues to be addressed by women. In the context of a co-production approach, men’s engagement can enhance knowledge of reproductive autonomy (the power to make and act on decisions about

reproduction) for women in the community. This also help to dismantle the relationship between sexuality, reproduction and gender norms, and hence transform the power asymmetries constructed on their basis. The two CHWs per health posts are already overburdened with 18 health packages which are continuously being updated and expanded. Thus, the multisectoral engagement needs to be implemented without creating a further burden on CHWs.

Context-based health goal setting and prioritization: Health policymakers need to align health goals and indicators based on each nation and sub-nations context. National goal setting is becoming common, however often these policy goals are derived from global goals, including the 2030 agenda for SDGs. As these goals are not based on the specific country context, they will create a pressure on some countries if they are not ready and it is not their priority while they don't have enough resources in their control to implement and achieve them. With the same lens, in countries like Ethiopia, governed in a federal structure, goals and targets also need to be aligned with the specific sub-national/state context.

More research evidence is required: This includes rural CBHS building and infrastructure; Participatory Action Research (PAR) with CHWs and community; private sector engagement in CBHS; task shifting in low infrastructure settings; multidisciplinary community health approach in CBHS; the effect of federal structures/states/provinces socio-economic levels on CBHS implementation and health outcomes.

Conclusion:

Closing the health equity gap in LMICS, including Ethiopia, is critical to ensure comprehensive, equitable and transformative resilient CBHS. There are multiple factors undermining the effectiveness of CHW-based MNCH in Ethiopia. Moving beyond the program's successes and failures over the last three decades, Ethiopia's CHW program needs a paradigm shift to ensure equitable MNCH and achieve national and global health goals.

Hence, given the ever-changing demographics, epidemiology and technological advancement dynamics, community health programs need to be redefined and redesigned. Beyond the current context of the highest rates of MMR and U5MR globally, the Ethiopian government must: Build

comprehensive, equitable and resilient CBHs; Meaningfully engage multiple stakeholders at multiple levels in the co-production of knowledge and structures necessary for health system transformation; Enhance a synergetic approach by enabling the powershift essential for effective co-production; Utilize an integrated theoretical approach to address the multidimensional issues influencing community health transformation; Integrate a gender transformative approach in the primary health system (social and health system level); Strengthen digital technology for community health programming; and Invest in rural health infrastructure, including the working and living condition of rural CHWs, which are crucial to transform community health program in Ethiopia and beyond.

The current situation emphasizes the inability of a fragmented approach of government and donors to transform the CHW program. A vitalized multi-stakeholder co-production framework could be one of the approaches to ensure a comprehensive and transformative community-based health system. In the context of the co-production framework, multi-stakeholders need to engage in redefining the critical paths to develop a transformative resilient community-based health system in rural Ethiopia. Better health outcomes are not a product manufactured by the healthcare system alone but require the coordinated engagement of actors beyond the health profession. There is a need for a context specific approach, developing a comprehensive, flexible and transformative path for the program to ultimately leverage the success of the CHW program in Ethiopia - in order to reach beyond.

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Tables

Table 1: Study selection: Inclusion and exclusion criteria

PICOS strategy	Inclusion criteria	Exclusion criteria
P—Population	• Community Health Workers (CHWs) based in community setting and under public health systems • CHWs in countries of sub-Saharan Africa, which includes countries in Eastern, Central, Western and Southern regions of African continents	• CHWs in clinical health setting • Studies reporting on other health workers perspective like nurses, midwiferies etc.; and • CHWs based research conducted outside of SSA countries
I—Intervention	• No specific intervention • Eligible studies involved different engagement of CHWs to enhance MCH programs through health promotion and education, information dissemination, immunization, home visit, follow up, linkage/referral and delivery services and the like • CHWs program of MCH include family planning, antenatal care, delivery, post-natal care, breastfeeding, immunization/ vaccination, and newborn services for **mothers and under five children** in public health system in SSA.	• Other CHWs activities or non MCH program like studies on environmental health, malaria, sanitation and the like • CHWs research based not in a community setting, studies in clinical setting
C—Comparison	• There was no comparison group for this study	• No comparison

PICOS strategy	Inclusion criteria	Exclusion criteria
O—Outcome	• CHWs' perceived barriers to and facilitators of effectiveness on CHWs/MCH • Multilevel determinants of CHWs engagement to ensure MCH equity and a resilient community health system.	• Perceived barriers to and facilitators of effectiveness of CHWs on their non MCH activities
S—Study design	• Qualitative and mixed-method studies based on lived experience of CHWs • The publication types include peer-reviewed primary research studies, and grey literature documents such as institutional reports, working papers and theses and dissertations • Published in English and published between January 2000 and September 2021in SSA were considered	• Quantitative studies • Articles summaries, commentaries, conference abstract only and/ or lack retrievable full text • Studies conducted before January 2000 and published in languages other than English language

Table 2: Characteristics of included articles

Author(s) and year	Objective of the study	Methods of data collection	Data analysis methods	Study country	Study setting (Rural/Urban)	Number of CHWs by gender
Musabyimana et al 2018 [48]	To examine perceptions of CHWs and others regarding RapidSMS Rwanda, an mHealth system	FGD (10) and IDI (28)	Thematic content analysis	Rwanda	Rural	36(33 Females and 3 Males)

Okuga et al 2015[49]	To explore CHWs understanding of promoting MCH practices and factors that influence their performance.	FGD (4) & IDI (34)	Thematic content analysis	Uganda	Rural and Urban	32(both genders, not disaggregated)
Naidoo et al 2019[50]	To examine the training needs of CHWs working in the field of childhood disorders and disabilities to improve the future training of CHWs and service delivery.	5 FGD (5) & 4 IDI (4)	Thematic content analysis	South Africa	Urban	28 (Females)
Dillip et al 2017[51]	To explore barriers and enablers to increasing timely access to care by linking the three levels of health care provision.	FGD (5) &IDI (96)	Thematic content analysis	Tanzania	Rural and Urban	45 (Females)
Jackson & Hailemariam 2016[52]	To examine the barriers and facilitators for CHWs as they refer women to mid-level health facilities for birth.	IDIs (59)	Thematic content analysis		Rural	59 (Females)

Giugliani et al 2014[53]	To assess implementation process of CHWs programme in Angola.	Mixed method, FGD (6) & 9 IDI (9)	Thematic content analysis	Angola	Urban/municipal	48 (both genders, not disaggregated)
Kok et al 2015[54]	To examine the relationships between CHWs, the community and health sector in order to inform policy in providing maternal health services.	FGD (14) &IDI(44)	Theme content analysis	Ethiopia	Rural	69 (Females)
Mwendwa 2016 [55]	To explore potential for mobile health (mHealth) technologies to support CHWs in delivering basic maternal and new-born services; examines the challenges and opportunities faced by CHWs who use a mHealth tool, RapidSMS in Rwanda.	FGD (14)	Thematic network analysis	Rwanda	Rural	98 (Females)

Ludwick et al 2018[56]	To examine a qualitative evaluative framework and tool to assess CHW team performance in a district program in rural Uganda.	FGD (8)	Thematic content analysis	Uganda	Rural	64 (both genders, not disaggregated)

Table 3: CASP appraisal score

CASP checklist questions	Musa byimana et al 2018 [48]	Okuga et al 2015 [49]	Naidoo et al 2019 [50]	Dillip et al 2017 [51]	Jackson & Hailemariam 2016[52]	Giugliani et al 2014[53]	Kok et al 2015 [54]	Mwendwa 2016 [55]	Ludwick et al 2018[56]
Was there a clear statement of the aims of the research? Record a "Yes" or "Can't tell' or "No"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is a qualitative methodology appropriate? Record a "Yes" or "Can't tell' or "No"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the research design appropriate to address the aims of the	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

research? Record a "Yes" or "Can't tell' or "No"									
Was the recruitment strategy appropriate to the aims of the research? Record a "Yes" or "Can't tell' or "No"	Yes	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes
Was the data collected in a way that addressed the research issue? Record a "Yes" or "Can't tell' or "No"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Has the relationship between researcher and participants been adequately considered? Record a "Yes" or "Can't tell' or "No"	Can't tell'	Can' t tell'	Can' t tell'	Yes	Can't tell	Yes	Yes	Yes	Yes
Have ethical issues been taken into consideration? Record a "Yes" or "Can't tell' or "No"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the data analysis sufficiently rigorous? Record a "Yes" or "Can't tell' or "No"	Yes	Can' t tell	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes
Is there a clear statement of findings? Record a "Yes" or "Can't tell' or "No"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
How valuable is the research? Record a "Yes" or "Can't tell' or "No"	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Overall score & comment	9.5(Highly valuable)	9(Moderately valuable)	9.5(Highly valuable)	10(Highly valuable)	8.5(Moderately valuable)	10(Highly valuable)	10(Highly valuable)	10(Highly valuable)	10(Highly valuable)

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Table 4: Framework analysis key finding: Multilevel perceived barriers to and facilitators of CHWs' effectiveness

Levels of determinate of CHWs engagement		**Key theme**	**Sub-themes**
Individual	Perceived Barriers to CHWs effectiveness	**Lack of competence**	**Knowledge and skill gap:** CHWs have low satisfaction on the limited trainings content and quality. Due to the lack of appropriate knowledge and skills, CHWs are not adequately providing delivery services, using and analyzing the data from RapidSMS and supporting children with disability.[48,49,50,51,54,55] *"What needs to be improved is the use of the data we are collecting. Health facility staff and everyone who has access to RapidSMS should be trained on data analysis so that they can benefit from the system and know what type of information is provided by the system." (Musabyimana et al., 2018, p7)*[48]

			*"I am feeling bad because I don't know how to help the child." (Naidoo et al., 2019, p6)*50 **Lack of motivation:** CHWs are demotivated because of their inadequate training and perceived incompetence. The lack of motivation may increase turnover rate among CHWs and their performance. Some of the reasons for low motivations include lack of training for upgrading and refresher, lack of regular supportive supervision, and insufficiency and delay of incentive.[48,49,50,54] *"Even if we get education opportunity and make improvements in our level, there is no difference to me. Because the HEW who upgrades her status will again be assigned in the [same] kebele, no transfer is given to her, just as if she had not joined the school." (Kok et al.,2015, p7)*[54]
	Perceived Facilitators of CHWs effectiveness	**CHWs empowerment**	**Continuous training and professional development strategy:** *Continuous training and* professional development empowers CHWs by raising their competency, job satisfaction and work outcomes. It also helps to communicate updated MCH information, map, link and monitor pregnant women and child health.[50,51,53] **Mobile technology access and use:** CHWs are very pleased to use technology to communicate with pregnant women and mothers, peers, supervisors and health systems to monitor and communicate with pregnant women, share new data and information timely and efficiently from distance.[48,55] *"…Through the collaboration between the health facility and CHWs and the information shared with RapidSMS, once the mother is reminded and attends the needed service on time, providers are motivated to do their best to keep the newborn and the mother alive" (Mwendwa,2016, p8)*[55]

			Positive attitude: CHWs like their jobs and responsibilities and are willing to provide the MCH services for their community. Positive attitude among CHWs towards their work is important for the service provider and receivers of care.[48,48,50,54]
Interpersonal	Perceived Barriers to CHWs effectiveness	**Lack of collaboration**	**Weak teambuilding:** There is a weak supportive team approach, poor interprofessional collaboration skills between CHWs, health service providers and other health system actors toward common goals.[49,50,51,56] *"What makes us not work hard is, when the woreda health office comes for supervision, they leave our strong parts and take very minor things and discourage us due to those things." (Kok et al.,2015, p7)*[54] **Weak communication strategies:** Absence of effective interpersonal communication strategies in both personal and professional settings. Absence of effective interpersonal communication may increase stress, decreases wellness, and therefore, impacts overall quality of life and work outcome.[50,51,56] The technology is not well suited to local language and culture yet. *"The response sometimes comes in English; I have to look for a translator" (Mwendwa, 2016)* [55]
	Perceived Facilitators of CHWs effectiveness	**Interpersonal effectiveness**	**Interpersonal Trust:** There is a mutual trust between CHWs and the community, therefor they serve as a bridge to link the community and health system. CHWs are enthusiastic about providing related services, pregnant women and their families are willing to listen to the CHWs and to respond to referral. [49,51,54],[52] **Supportive supervision:** CHWs have positive attitudes towards supportive supervision, as it is an opportunity for constructive feedback, mentoring and motivation.[54,56]

			"Our supervisor has been there since we started this program. Like sometime back when we had challenges, she would be the one calling CHWs directly... For everything we are to do, she is always leading us and steering everything. To me she has supported us and done almost everything for us" (Ludwick et al.,2018, p6)[56]
Community	Perceived Barriers to CHWs effectiveness	**The Socio-cultural influence**	**Cultural beliefs and practices:** Pregnancy and newborn are surrounded by many cultural beliefs and traditional practices. The influence of culture affects the perceptions of human reproductive health, and how pregnancy, delivery and childbearing are experienced; and where they seek help for service. *"She was fearful and thought the doctors would do an operation forcefully. She started labour at home and had antepartum haemorrhage. Luckily, she was taken to Adwa Hospital where she had a normal delivery " Jackson et al.,2016, p 475)* [52] In some cases, the women prefer to give birth at home assisted by TBAs, and never called CHWs during labour or birth.[49,50,52] *"People say 'the known devil is better than the unknown God', and the people believe in them [TBAs]. We also communicate with the TBA, because the TBA is more popular than me in the kebeles, so I use her to contact women." (Kok et al.,2015, p7)*[54] **Gender prejudice**: *Gender* refers to the sociocultural constructed characteristics of women and men, such as norms, roles and so on. Gender may sometimes restrict access to MCH services. The community has low interest and trust on health center service due to low interest to be seen by male health workers and fear of Caesarean Section. Community members reported that CHWs being female (gender aspect) was important to them, as they prefer to discuss maternal health issues amongst women.[54,52]

	Perceived Facilitators of CHWs effectiveness	**Institutionalization of community engagement**	**Community participation:** Community ownership can be developed through engaging the various social structures that exist in the community, like the existing community institution, associations, and TBAs while planning, implementing and monitoring community health/MCH intervention to enhance ownership and access culturally competent MCH services.[49,52,54] *"We have the pregnant women's forum with tea and coffee to discuss maternal health with them. This is not considered by other health offices, but we have taken the time in the forums to increase their participation and to discuss maternal health so that we help them and support them financially…" (Kok et al.,2015, p4)*[54] *"They(community) help us very well during the vaccination mobilization period." (Kok et al.,2015, p8)*[54] **Culturally relevant health access:** CHWs capitalized on social networks to identify pregnant women who would become new clients, learn about births and child health. Local community associations/ health development army can make health services more culturally acceptable and influence women's decisions to trust health centers for delivery and other MCH services. Once trust is established, pregnant women and their families would be willing to listen to the CHWs and to respond to referral[49,52,54]. "*At the health post, they can tell us their secrets like a sister—they can't talk about these things to people they don't know." (Jackson et al.,2016,p 475)* [52] *"As I told you, at first the community members used not to value the CHWs; these days it is the community that explains to those who are hesitant to get the service from us, our importance as CHWs has improved*

			and people who have sick children also come to seek advice from us, which was not the case before."(Okuga et al., 2015,p4)[49]
Health system and Logistic	Perceived Barriers to CHWs effectiveness	**Fragile health and logistics system**	**Fragmentation of empowerment of CHWs program:** Fragmentation of empowerment of CHWs program is the insufficient and lack of continuity of coordination, training and professional development strategy, motivation strategies, referral policy/system and supportive supervision that can directly or indirectly affect the MCH service accessibility and health outcome. Some of the descriptions are as follow: **Fragmented coordination of CHWs:** There is lack of coordination on planning and monitoring between different level health actors.[51,54] *"… When we plan to teach mothers or want to have community conversations, the woreda health office may tell us to do other activities like vaccination campaigns." (Kok et al., 2015, p7)*[54] **Fragmented training and professional development strategy:** There is no standard on the content and the quality of the basic and refresher training, the service they provide and the community they serve in different countries of CHWs/MCH programs.[48,49,54,55,56] *"What needs to be improved is the use of the data we are collecting. Health facility staff and everyone who has access to RapidSMS should be trained on data analysis so that they can benefit from the system and know what type of information is provided by the system." (Musabyimana et al 2018, p.7)*[48] **Inconsistent motivation strategies**: The motivation approach is not regular and sufficient. Financial and non-financial incentives and intrinsic motivation are key to job performance and satisfaction.[48,49,50,53,54]

			Fragmented /poor referral policy/system: CHWs experience poor referral system between CHWs and local health facility, lack of referral forms, feedback, and documentation/ lack of registers. Despite the poor referral system, there is a disparity in service provision among rural and urban community once they reach the health facility and delay for service.[50,51,52,54] *"I sent there a mother for delivery, but reaching [the health unit] it was around 5 pm; she couldn't receive the services ... She had to go to another health facility and she later came up to [the district hospital]."(Okuga et al., 2015, p6)*[49] *"The basic thing we have to consider is a woman should not die giving birth. Sometimes even death can happen in a health center. I knew a woman died …, because the health center didn't refer her to the hospital as early as possible." (Kok et al., 2015, p. 7)*[54] **Fragmentation of supportive supervision:** There is no regular supportive supervision, evaluation and feedback mechanism.[48,54,55] **Logistics and basic supply/resource challenge:** CHWs experience challenges of transportation and distribution of essential medical devices to undertake their work, limited access to ambulance service; lack of materials for the job, absence of health facility in the neighborhood and the like. [49,51,52,53,54,55] *"One woman started her labour at home and called me. I called the ambulance and we waited on the road, but the ambulance had gone somewhere else. The woman delivered on the roadside…"(Jackson et al., 2016,p 475)* [52] *"Equipment are not yet available. . . We need the right equipment to take measures from pregnant women and children. For example, we need*

			instruments to measure the height and weight of pregnant women because those measures were not taken at the health facility. . .. We also need thermometers to measure temperature." (Musabyimana et al., 2018, p.6)[48]
	Perceived Facilitators of CHWs effectiveness	**Integration and Technology**	**Integration of CHWs into health systems:** This describes interconnecting different levels of health system service, supply chain, data sources for better health access and outcomes. This includes strengthening links among CHWs, health facility and drug dispensing outlet collaboration to improve supply chain, service quality/ continuum of care system.[49,51,52] "Now the community recognizes us because in the past we were only providing service to specific program, but now we are dealing with almost every health system" (Dillip et al., 2017, p6)[51] **Digital initiatives:** It is an initiative of integrating technology into CHWs programs to enhance MCH service outcome and information access. Mobile health/ mHealth like RapidSMS supported CHW programs have been demonstrating increased CHW performance and improved MCH outcomes. RapidSMS is helping in resolving location, information, context and time challenges.[48,55] *"RapidSMS has helped a lot to prevent maternal, child and neonatal death. … the information shared with RapidSMS, once the mother is reminded and attends the needed service on time,…" (Musabyimana et al., 2018, p.5)*[48]

Table 5: CERQual summary of findings

Outcome	CERQual Assessment of	Explanation of CEQUAL assessment	Number of studies contributing

	Confidence in the Evidence		to the review finding
Perceived barriers to and facilitators of	Moderate confidence	In terms of coherence, adequacy, and relevance: Majority of the studies were consistent in reporting barriers to and facilitators of CHWs effectiveness based on the lived experience of CHWs. Methodological:Minor concerns were attributed to small sample size influences generalizability to SSA. This may be due to our review limitation.	9
Different levels' determinates of CHWs	Low confidence	Methodological: Significant concerns were raised regarding the generalizability of study findings due to methodological limitations, such as limited/ absence of multilevel analysis of determinant of CHWs effectiveness based on the lived experience of CHWs. In terms of adequacy and relevance: Other concerns were about the research design (lack of multilevel analysis).	9

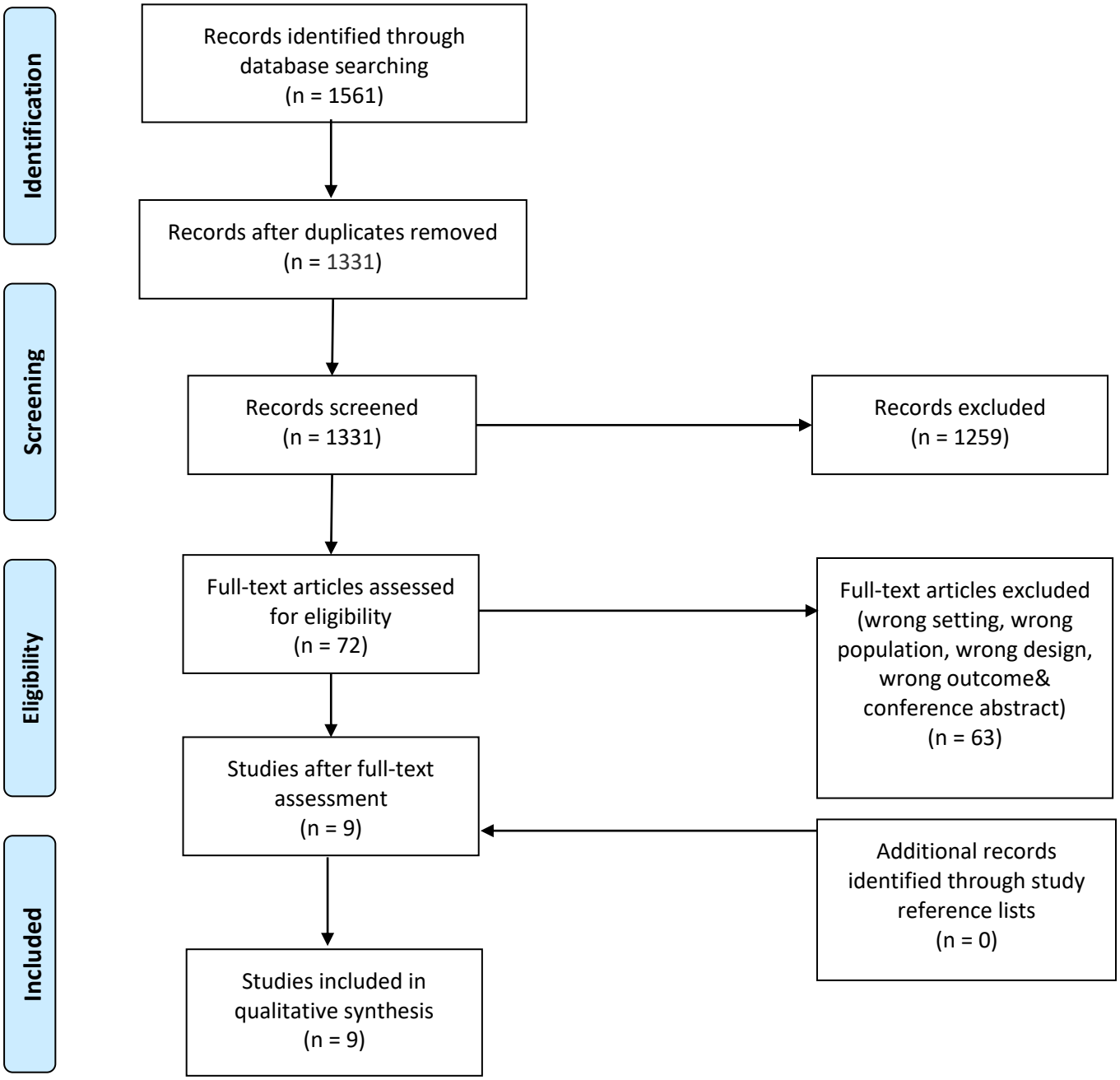
Table 6: The sociodemographic characteristics of FGDs participants, HEWs/CHWs

Sociodemographic characteristics of FGD participant, HEWs/CHWs

	Adea Bega	%	Ejere	%	Total (Adea Berga and Ejere),%
1.What is the average distance between your work site and field work/outreach site in kilometers?					
A. Less than 3 km	2	25	0	0	2(12.5)
B. 3km to 5 km	0	0	5	62.5	5(31.25)
C. Above 5km	6	75	3	37.5	9(56.25)
2. What is the most commonly used kind/ mode of transportation during field work/ outreach activities?					
Walking / on foot	8	100	8	100	16(100)
3. What are the most commonly used forms/ means of communication with your client (phone, home visits…)?					
Home to home visit	8	100	8	100	16(100)
4.What is the approximate house hold in your catchment?					

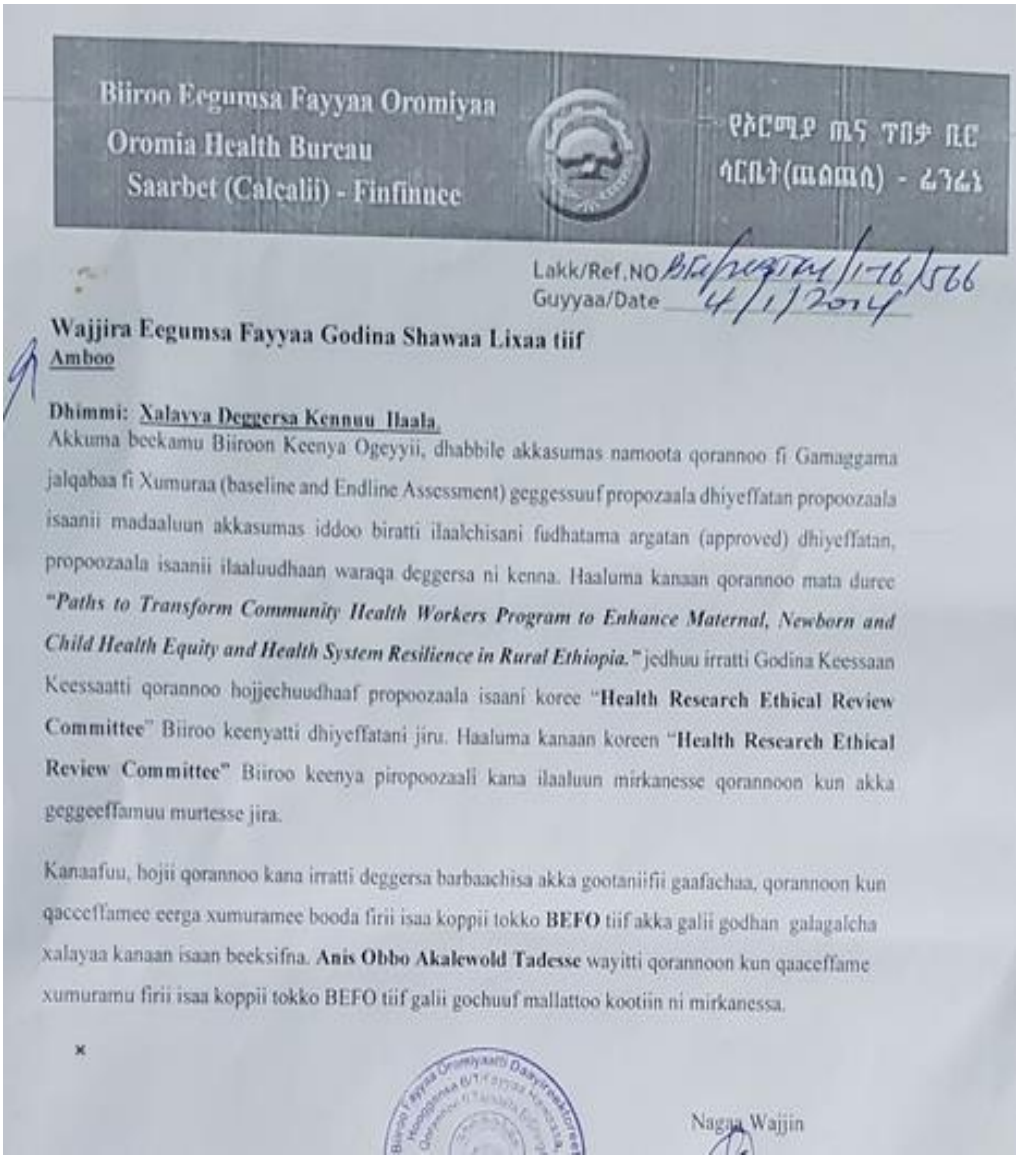
300-500	1	12.5	0		1(6.25)
501 and above	7	87.5	8	100	15(93.75)
5.What is your total work experience as a HEW (in years)?					
A. less than 4 years	0		0		
B. 4-5 years	0		2	25	2(12.5)
C. 6 and above 8	8	100	6	75	14(87.5)
6.What do you currently identify yourself as Gender?					
A. Man	0	0	0	0	
B. Woman	8	100	8	100	16(100)
C. Other (specify):	0	0	0	0	
7.What is your CURRENT relationship or marital status?					
A. Single	2	25	0	0	2(12.5)
B. Married	6	75	6	75	12(75)
D. Widowed / Separated/Divorced	0	0	2	25	2(12.25)
8. What is the highest level of education or training that you have completed?					
A. Completed high school and over 1 year HEWs training	0	0	4	50	4(25)
B. Completed collage diploma and over 1 year HEWs training	8	100	4	50	12(75)
C. Other (specify):	0	0	0	0	
9.During the past 12 months, what was your estimated monthly personal income from all sources in Ethiopian Birr?					
A. 3000 and below ETB per month	0	0	1	12.5	1(6.25)
B. 3,001- 5000 ETB per month	4	50	2	25	6(37.5)
C. 5001 and above ETB per month	4	50	5	62.5	9(56.25)
D. Prefer not to answer	0	0	0	0	
10. How old are you now?					
A.20-24 years old	0	0	1	12.5	1(6.25)
B. 25-40 years old	8	100	7	87.5	15(93.75)
C. 41 years and older	0	0	0	0	

Figure 1: PRISMA FlowchartFigure 1: PRISMA Flowchart



Appendices

Appendix 1: Support letter – Oromia Regional Health Bureau to West Shewa health administration



Biiroo Eegumsa Fayyaa Oromiyaa
Oromia Health Bureau
Saarbet (Calcalii) - Finfinnee

የኦርሚያ ጤና ጥበቃ ቢሮ
ሳርቤት(ጠልጠለ) - ፊንፊኔ

Lakk/Ref.NO BEFO/Program/1-76/5566
Guyyaa/Date 4/1/2014

Wajjira Eegumsa Fayyaa Godina Shawaa Lixaa tiif
Amboo

Dhimmi: Xalayya Deggersa Kennuu Ilaala

Akkuma beekamu Biiroon Keenya Ogeyyii, dhabbile akkasumas namoota qorannoo fi Gamaggama jalqabaa fi Xumuraa (baseline and Endline Assessment) geggessuuf propozaala dhiyeffatan propoozaala isaanii madaaluun akkasumas iddoo biratti ilaalchisani fudhatama argatan (approved) dhiyeffatan, propoozaala isaanii ilaaluudhaan waraqa deggersa ni kenna. Haaluma kanaan qorannoo mata duree ***"Paths to Transform Community Health Workers Program to Enhance Maternal, Newborn and Child Health Equity and Health System Resilience in Rural Ethiopia."*** jedhuu irratti Godina Keessaan Keessaatti qorannoo hojjechuudhaaf propoozaala isaani koree **"Health Research Ethical Review Committee"** Biiroo keenyatti dhiyeffatani jiru. Haaluma kanaan koreen **"Health Research Ethical Review Committee"** Biiroo keenya piropoozaali kana ilaaluun mirkanesse qorannoon kun akka geggeeffamuu murtesse jira.

Kanaafuu, hojii qorannoo kana irratti deggersa barbaachisa akka gootaniifii gaafachaa, qorannoon kun qacceffamee eerga xumuramee booda firii isaa koppii tokko **BEFO** tiif akka galii godhan galagalcha xalayaa kanaan isaan beeksifna. **Anis Obbo Akalewold Tadesse** wayitti qorannoon kun qaaceffame xumuramu firii isaa koppii tokko BEFO tiif galii gochuuf mallattoo kootiin ni mirkanessa.

Nagaa Wajjin

Appendix 2: Support letter –West Shewa health adminstration to Adea Berga and Ejere Districts

BIIROO FAYYAA OROMIYAA TTI

WAJIIRA FAYYAA GODINA SHAWAA LIXAA

WEST SHEWA ZONE HEALTH OFFICE

Lakk. /Ref.No ___

Guyyaa /Date ___

Waajjira Fayyaa Aanaa A/Bargaa tiif

Waajjira Fayyaa Aanaa Ejeree tiif

B/J

Dhimmi:- **Deeggarsa gaafachuu ta'a.**

Akkuma olitti ibsuuf yaalame BFO xalayaa lakk BF/UBTM/176/566 gaafa guyyaa 4/1/2014 barreeseen Akaalewoldi Taaddasaa kan jedhamu Aanaa/Dhaabbata Fayyaa keessan irratti qoranoo mata duree **"Paths to Transform Community Health Workers to Enhance Maternal, Newborn, and Child Health Equity and Health System Resillience in Rural Ethiopia"** jedhu irratti hojachuuf ulaagaa barbaachisaa guutee eeyyama argachuu fi kanaafis deegarsa barbaachisaa akka goonuuf nu gaafateera.

Haaluma kanaan Aanaan/Dhaabbatni Fayyaa keessan hojii qorannoo kanaaf deegarsa barbaacisaa akka gootaniif ni gaafanna.

Nagaa Wajiin

G/G

- Garee I/To'annoo Dhukkubaa waajjira keenyaatiif
  Ambo
- Akaalewoldi Taaddasaa tiif
  B/J

Teesoon/Address … Bil./Tel.+251-112-364758/9 or-2105-3426/39/4506;
- *Fax +251-112-363950; P. O. Box 31; Email- wszCDC@gmail.com*
- *West Shoa Zonal health Office, Ambo, Oromia, Ethiopia*

Appendix 3: FGDs - Recruitment poster

TAKE PART IN THE HEALTH EXTENSION/ COMMUNITY HEALTH PROGRAM STUDY!

The goal of this research project is to analyze evidence on paths to transform HEWs/ CHWs program to enhance MNCH equity and a resilient community health system in rural Ethiopia.

YOU SHOULD PARTICIPATE IN THIS THIS STUDY IF:

- You are trained and salaried public Health Extension Worker (HEW)
- You have been working in a West Shewa zone health office program area in the last three and more years
- You have been providing Maternal Newborn and Child Health (MNCH) related services to rural communities

WHAT THE STUDY INVOLVES:

- You will be asked to participate in one focus group discussion, which will take approximately 90 minutes of your time
- The focus group discussion will focus on: Your experiences in providing MNCH services in the context and beyond COVID-19; Multilevel barriers to and facilitators for HEWs/CHWs to provide improved MNCH, and to improve working conditions for HEWs/CHWs working in rural areas; The role of community engagement in coproduction of improved MNCH and a resilient health system;
- The study is voluntary and confidential. Prior to participating in this study, you will be asked to sign and provide 'Participant Informed Consent Form'
- As a token of appreciation, you will be compensated a small honorarium, for your time and effort
- Participants will be selected on a first-come, first-served basis.

FOR MORE INFORMATION:

Contact the Principal Investigator: Akalewold Tadesse (MSc, PhD-c)
Call: ---

The methodological and ethical components of this study have been approved. The ethical components of the study have been reviewed and approved by Ethiopian Ministry of Health / EPHI, and by the University of Ottawa Research Ethics Board.

Appendix 4: English - FGD - Participant Informed Consent Form

Title of the study:

Paths to transform community health workers program to enhance maternal, newborn and child health equity and health system resilience in rural Ethiopia

Principal Investigator: Akalewold Tadesse Gebremeskel, PhD Candidate in International Development and Global Studies, School of International Development and Global Studies, Faculty of Social Science, University of Ottawa, 120 University Private, Ottawa, Ontario, Canada, K1N 6N5

Supervisor: Dr. Sanni Yaya, Vice-President, International and Francophonie, University of Ottawa; Professor, School of International Development & Global Studies, Faculty of Social Sciences, University of Ottawa, Social Science Building, 120 University, Ottawa, Ontario, Canada, K1N 6N5

Invitation to Participate: I am invited to participate in the above-mentioned research study conducted by Akalewold Tadesse Gebremskel and Dr. Sanni Yaya, in fulfillment of a PhD's thesis project. This is an independent study.

I have been invited to participate in this study because I am salaried public Health Extension worker who has been working in a West Shewa zone health office area for three and more years. In the last three and more years I have been providing Maternal

Newborn and Child Health(MNCH) related services to rural communities of my work site, in a West Shewa zone health office area.

Purpose of Study: The purpose of this study is to critically examine the alignment of community engagement towards the coproduction of improved CHWs-led MNCH and a resilient community health system in West Shwa Zone, Ethiopia.

Funding: No funding for this project

Participation: My participation will include taking part in a focus group discussion lasting approximately 90 minutes. The focus group discussion will take place at a convenient location within West Shewa zone health office area. It will take place in the afternoon or outside of normal business hours depending upon my schedule and that of the principal investigator. The focus group will be audio-recorded in order to accurately capture what is said. I may request that the recording be paused at any time, and I may choose how much or how little I want to speak during the discussion. All information I share through any of the foregoing activities will be kept confidential and strictly used for research purposes only.

Risks: During my participation in this study, I will discuss my experience as a health extension/ community health worker in providing maternal newborn and child health in the context and beyond COVID-19 in my work site, West Shewa health office area and any observations I have on multilevel barriers to and facilitators for HEWs/CHWs to provide improved MNCH, and to improve working conditions for HEWs/CHWs working in rural areas, and the role of community engagement in coproduction of improved MNCH and a resilient health system. If sharing negative experiences, this could possibly cause emotional discomfort, stress, anxiety, or even later regret over disclosing personal information. I have received assurance from the researcher that every effort will be made to minimize these risks by attempting to establish a respectful and comfortable environment for all during the research activities.

Benefits: My participation in this study will help to inform researchers and stakeholders on the multilevel factors affect the course of community health workers' engagement and the community engagement to ensure maternal and child health and community health system resilience in West Shewa zone health office area and beyond. Discussing multilevel factors affect the course of community health workers' and community engagement topics with the researcher and my peers

may provide me insight into how I can improve my engagement in maternal newborn and child health service provision, to address the challenges and to enhance the facilitators in the context and beyond COVID-19 to improve MNCH and a resilient community health system in my work site, West Shewa zone health office area.

Compensation: I will receive compensation in the amount of xxx.00 Ethiopian birr in reflection of the time and effort I am providing and travel related expenses in participating in the research. I will receive this compensation even if I withdraw from the study. I understand that I will be required to sign a form acknowledging receipt of payment, which only the researcher will have access to.

Confidentiality and Anonymity: I have received assurance from the researcher that the information I will share is confidential in nature. However, information shared in focus groups is exposed to other participants and may have limits to confidentiality due to the inability to completely control the actions of others. The researchers will maintain anonymity of all research participants and invite all participants to keep everything shared in focus groups confidential. I have been invited to use a pseudonym during the discussion and have been informed that my identity in focus group transcripts will be concealed by use of pseudonyms or numbers and any identifiable information used in this study will be concealed to prevent others from being able to directly identify me.

I understand that contents of the focus groups will be only used to achieve the goal of the study, to analyze evidence on paths to transform HEWs/ CHWs program to enhance MNCH equity and a resilient community health system in rural Ethiopia. I have been informed that my identity in group discussion transcripts will be concealed by use of pseudonyms or numbers and any identifiable information used in this study will be concealed to prevent others from being able to directly identify me; all of my data will be collected for this purpose, then analyzed and published as a part of a PhD's thesis

Conservation of Data: The data collected such as tape-recorded discussions, transcripts, thumb drives, notes, etc. will be kept in a secure manner. Data will be stored electronically with secured access on a server behind the institutional firewalls at the University of Ottawa. A backup copy of

the data will be encrypted and stored on two password protected external hard drives accessible only by the principal investigator and the supervisors. After 20 years from the thesis defense, all data (electronic, digital, written, etc.) will be destroyed by means of shredding all paper documents, deleting computer files and properly disposed of by the principal investigator and supervisors who have such data in their possession.

Voluntary Participation: I am under no obligation to participate and if I choose to participate, I can withdraw from the study at any time and/or refuse to answer any questions, without suffering any negative consequences. If I choose to withdraw at any stage of this project, I am still entitled to receive the full compensation amount. I understand that individual contributions made during the focus group cannot be withdrawn due to the interdependent nature of focus data.

Acceptance: I, _____ , agree to participate in the above research study conducted by Akalewold Tadesse Gebremeskel, PhD Candidate in International Development and Global Studies, School of International Development and Global Studies, Faculty of Social Science, University of Ottawa, under the supervision of Dr. Sanni Yaya. If I have any questions about the study, I may contact the researcher or her supervisor.

If I have any questions regarding the ethical conduct of this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa.

There are two copies of the consent from, one of which is mine to keep.

Participant's Signature: _____ Date: _____

Researcher's Signature: _____ Date: _____

Appendix 5: English FGDs - Guide for Community Health Workers in West Shewa Zone

Focus Group Discussion Guide for Community Health Workers in West Shewa zone, Rural Ethiopia

Introduction

Hello, thank you for taking the time to meet with me today and sharing your experiences. My name is Akalewold Tadesse Gebremeskel. My colleague,…(RA to be assigned) and I would like to talk to you about CHWs experience in MNCH and community engagement in community health in the context of and beyond COVID-19 pandemic. We are working to critically examine the alignment of community engagement to multilevel determinants of HEWs/CHWs effectiveness to improve Maternal, Newborn and Child health (MNCH) in West Shwa Zone, Ethiopia. Before we begin, I would like to ask you if you have any questions about the consent form you have signed.

Time started ----------

FGD: Socio-demographic characteristics of participant

- Can you please tell me a little bit about yourself? please write your information on a separate form for each participant we are circulating now.

Role and experiences of HEWs/CHWs(general)

- Let us now talk about your experiences in providing MNCH services.
  Probe:
  What kinds of services do you offer the community? Probe on types of outreaches, e.g., home visits, community education, vaccination; probe on kinds of info and services in areas of antenatal care, vaccination, and family planning
- In your opinion was the MNCH service implemented optimally? What worked well in terms of implementation process? Why do you say so?

How COVID-19 impacted HEWs/CHWs working on MNCH

- How has COVID-19 impacted your practices/job on MNCH service delivery?
- How do you describe the changes observed in the use of MNCH services since the onset of the COVID-19?

In the context of COVID-19 and beyond: Multilevel barriers for HEWs/CHWs to provide improved MNCH

- Compared to before COVID-19, what are the multilevel barriers (individual, interpersonal, community and system level) for HEWs to provide MNCH service? Probes:
- In your opinion, what are the challenges currently confronting the successes of community health services in your area?
- What are the challenges of HEWs related to knowledge, skills and motivation to provide optimal MNCH service? If you say so, how it impacted your job?
- What are the challenges of HEWs in terms of horizontal and vertical communication, collaboration, referral system, social network and the like to provide optimal MNCH service? If you say so, how it impacted your job?
- How do you see the support from the health office/ supervisor / health center?
- What are the challenges of HEWs related to sociocultural factors like trust, acceptance, transparence and the like to provide optimal MNCH service? If you say, so how it impacted your job?
- What are the logistics and health system related factors influencing the performance of CHWs? If you say so, how it impacted your job?
- Were you satisfied with the job and amount you were paid and the other benefits you received? Why do you say so?

In the context of COVID-19 and beyond: Multilevel enabling factors for HEWs/CHWs effectiveness and to improve working conditions for CHWs working in rural areas

- Compared to before COVID-19, what are the multilevel enabling factors for HEWs/CHWs to deliver MNCH service effectively?
  Probes: What do you think is the most significant change/ facilitator that has taken place in your facility/CHWs program since COVID-19 started?
- Did you feel like you had adequate empowerment and motivation? Why do you say so?
- From your perspective, what should be done to improve working conditions for CHWs working in rural areas of your region? What worked well and what did not? Why you said so?

The role of community engagement to address the multilevel determinates of HEWs/CHWs effectiveness and coproduce a resilient community health system

- In your perspectives, how COVID-19 impacted the role of community engagement in community health? Probs: Why community engagement is important for improving community health/ MNCH? Do you think that there was *optimal* engagement in terms of HEWs/CHWs program planning, implementation, monitoring, evaluation result measurement? *Why do you say so?* Why or why not?
- In your perspectives, how does the community engagement enhance CHWs program effectiveness to MNCH in your area or address the multilevel determinates of HEWs/ MCH program effectiveness beyond COVID-19?
- Probs: Do you think that community engagement can address the challenges in HEWs program, for example the gaps like the knowledge, communication and teamwork, socio-cultural? Why do you say so? and how?

Beyond COVID-19: Characteristics of effective community engagement in coproduction of a resilient health system

- From your experience how do you evaluate the existing community engagement approach? Probs: How do you differentiate community engagement from community participation? Do you think that the community have enough engagement role to support your work and build their community health? Why you said so? Are processes in place to ensure meaningful engagement of communities in the planning, implementation, monitoring/evaluation of community health activities?
- In your perspective what are the possible factors that influence the participation of community in co-production of community based MNCH? Do you think that community need, voice, and resources are properly integrated? Why you said so? Do you think that they are well empowered/ powerful and are contributing effectively? What worked well and what did not?
- From your perspective, what are the strategy gaps to enhance community engagement in community health program process and management? Probs: what kind of significant change do you expect to improve community engagement to address the multilevel determinants of HEWs and community health? What kind of community engagement do you expect to improve MNCH service? what motivates community engagement in community health program? What should be done to balance the top-down government initiatives and bottom-up community approach to enhance the community in health syetem? Why do you say so?
- From your perspective, how do you evaluate the existing civil-society/non-governmental stakeholders engagement approach? Do you think that they are well situated and are contributing effectively to your work and CHWs program? What worked well and what did not? Why you said so?

Closing

In conclusion, is there anything else you'd like to tell me, suggestions you would like to make, or anything at all you would like me to know about -- regarding your role, barriers and facilitators or paths to transform CHWs/MNCH program.

Do you have any questions for me?
Thank you very much for taking the time to share your perspectives with me.

Time ended _____

Appendix 6: English - KIIs- Recruitment poster

TAKE PART IN THE HEALTH EXTENSION/ COMMUNITY HEALTH PROGRAM STUDY!

The goal of this research project is to analyze evidence on paths to transform HEWs/ CHWs program to enhance MNCH equity and a resilient community health system in rural Ethiopia.

YOU SHOULD PARTICIPATE IN THIS THIS STUDY IF:

- You have been working in Ethiopia’s community health policy and system starting at least one year before the COVID-19

- You have been working as a public policy expert or program management in Maternal Newborn and Child Health (MNCH) related services in Ethiopia

WHAT THE STUDY INVOLVES:

- You will be asked to participate in one interview, which will take approximately 60 minutes of your time
- The interview will focus on: program/policy and practice related to HEW's/ CHW's and multilevel determinates of CHWs effectiveness in the context of and beyond the COVID-19; Maternal Newborn and Child Health (MNCH)/Health system challenges and COVID-19; State-civil society synergy in coproduction of improved MNCH; The success and the failures of the state-civil society partnership; The challenging or the enabling environment in coproduction of improved MNCH and a resilient health system
- The study is voluntary and confidential. Prior to participating in this study, you will be asked to sign and provide 'Participant Informed Consent Form'
- As a token of appreciation, you will be compensated a small honorarium, for your time and effort
- Participants will be selected on a first-come, first-served basis.

FOR MORE INFORMATION:

Contact the Principal Investigator: Akalewold Tadesse (MSc, PhD-c)

Call: …

The methodological and ethical components of this study have been approved. The ethical components of the study have been reviewed and approved by Ethiopian Ministry of Health / EPHI, and by the University of Ottawa Research Ethics Board.

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MINISTRY OF HEALTH, ETHIOPIA

Ethiopian Public Health Institute

ÉDIM École de développement international et mondialisation
SIDGS School of International Development and Global Studies

uOttawa

Appendix 7: English -KII - Participant Informed Consent Form

Title of the study: Paths to transform community health workers program to enhance maternal, newborn and child health equity and health system resilience in rural Ethiopia

Principal Investigator (PI): Akalewold Tadesse Gebremeskel, PhD Candidate in

International Development and Global Studies, School of International Development and Global Studies, Faculty of Social Science, University of Ottawa,
120 University Private, Ottawa, Ontario, Canada

Supervisor: Dr. Sanni Yaya, Vice-President, International and Francophonie, University of Ottawa; Professor, School of International Development & Global Studies, Faculty of Social Sciences, University of Ottawa,
Ottawa, Ontario, Canada,

Invitation to Participate: I am invited to participate in the above-mentioned research study conducted by Akalewold Gebremskel and Dr. Sanni Yaya, in fulfillment of a PhD's thesis project. This is an independent study. I have been invited to participate in this study because I am a public health policy expert for three and more years. In the last three and more years I have been providing health policy related services to enhance Maternal Newborn and Child Health (MNCH) in Ethiopia and Oromiya regional state.

Purpose of Study: The purpose of this study is to examine the perspective of public policy actors on how the COVID-19 present a 'window of opportunity' to transform the landscape of state-society synergy to coproduce improved CHWs/ MNCH program and a resilient community health system Ethiopia, in the context and beyond the COVID-19.

Funding: No funding for this project

Participation: My participation will include taking part in a semi-structured interview lasting approximately 60 minutes. The interview will take place at a convenient location and time. It will take place in the afternoon or outside of normal business hours depending upon my schedule and in consultation with the PI. The interview will be audio-recorded in order to accurately capture what is said. I may request that the recording be paused at any time, and I may choose how much or how little I want to speak during the interview. All information I share through any of the foregoing activities will be kept confidential and strictly used for research purposes only.

Risks: During my participation in this study, I will discuss my experience as a public health policy expert related to state-civil society synergy, community health worker led MNCH program related policy and practice in rural Ethiopia including oromiya regional state and any observations I have on HEWs/ CHW's scope of practice and multilevel determinates of CHWs effectiveness in the context of COVID-19, MNCH /Health system challenges, state-civil society synergy in coproduction of improved MNCH, the success and the failures of the state-civil society partnership, and the challenging or the enabling environment in coproduction of improved MNCH and a resilient health system in coproduction of improved MNCH community health system in the context of COVID-19 and beyond. My participation will include taking part in a semi-structured interview. I have received assurance from the researcher that every effort will be made to avoid any risk by attempting to establish a respectful and comfortable environment for all during the research activities.

Benefits: My participation in this study will help to inform researchers and stakeholders on the multilevel factors affect the course of community health workers' engagement and the state-civil society synergy performing to co produce improved MNCH and community health syetem in the context of COVID-19 and beyond. Discussing on policy process on community health /MNCH program Oromiya regional state, the multilevel factors affect the course of community health workers' engagement and the state-civil society synergy performing to co produce improved MNCH and community health syetem in the context of COVID-19 and beyond with the researcher may provide me insight into how I can improve my engagement in maternal and child health policy and practice, to address the challenges and to enhance the facilitators in the context and beyond COVID-19 to ensure maternal and child health equity and a resilient community health system in rural Ethiopia.

Compensation: I will receive compensation in the amount of xxx.00 Ethiopian birr in reflection of the time and effort I am providing and travel related expenses in participating in the research. I will receive this compensation even if I withdraw from the study. I understand that I will be required to sign a form acknowledging receipt of payment, which only the researcher will have access to.

Confidentiality and Anonymity: I have received assurance from the researchers that the information I will share will remain strictly confidential. I understand that contents of the interview

will be used only for multilevel factors affect the course of community health workers' engagement, health policy process on maternal and child health equity and resilient community health system and the state-civic society synergy performing to ensure maternal and child health equity and resilient community health system in rural Ethiopia.

I understand that contents of the interview will be only used to achieve the goal of the study, to analyze evidence on paths to transform HEWs/ CHWs program to enhance MNCH equity and a resilient community health system in rural Ethiopia. I have been informed that my identity in interview transcripts will be concealed by use of pseudonyms or numbers and any identifiable information used in this study will be concealed to prevent others from being able to directly identify me; all of my data will be collected for this purpose, then analyzed and published as a part of a PhD's thesis.

Conservation of Data: The data collected such as tape-recorded discussions, transcripts, thumb drives, notes, etc. will be kept in a secure manner. Data will be stored electronically with secured access on a server behind the institutional firewalls at the University of Ottawa. A backup copy of the data will be encrypted and stored on two password protected external hard drives accessible only by the principal investigator and the supervisors. After 20 years from the thesis defense, all data (electronic, digital, etc.) will be destroyed by means of shredding all paper documents, deleting computer files and properly disposed of by the principal investigator and supervisors who have such data in their possession.

Voluntary Participation: I am under no obligation to participate and if I choose to participate, I can withdraw from the study at any time and/or refuse to answer any questions, without suffering any negative consequences. If I choose to withdraw at any stage of this project, I am still entitled to receive the full compensation amount. If I choose to withdraw, all data gathered until the time of withdrawal will be removed from the dataset and not used in the study

Acceptance: I, _____ , agree to participate in the above research study conducted by Akalewold Tadesse Gebremeskel, PhD Candidate in International Development and Global Studies, School of International Development and Global Studies,

Faculty of Social Science, University of Ottawa, under the supervision of Dr. Sanni Yaya. If I have any questions about the study, I may contact the researcher or her supervisor.

If I have any questions regarding the ethical conduct of this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa.

There are two copies of the consent from, one of which is mine to keep.

Participant's Signature: _____ Date: _____

Researcher's Signature: _____ Date: _____

Appendix 8: English - KII- Key Informant In-depth Interview guide

Introduction

Hello, thank you for taking the time to meet with me today and sharing your experiences. My name is Akalewold Tadesse Gebremeskel. My colleague,…(RA to be assigned) and I would like to talk to you about CHWs experience in MCH in the context of COVID-19 pandemic. We are working examine the perspective of public policy actors on how the COVID-19 present a 'window of opportunity' to transform **the landscape of** state-society synergy to coproduce improved CHWs/ MNCH program and a resilient community health system Ethiopia, in the context and beyond the COVID-19 response.

Before we begin, I would like to ask you if you have any questions about the consent form you have signed.

Time started ----------

1. **Socio-demographic characteristics of participant**
   Probes:
   - ✓ Can you please tell me a little bit about yourself? (Probes or probing questions about major role of your organization in public health policy, your age, your education, your work experience in public health policy environment)
2. **Problem stream: CHW's scope of practice in the context of COVID-19**
   Do you think that there was *optimal* pandemic response and preventive measures targeted towards rural CHWs? *Why do you say so?* Did the solutions work? Why or why not?
   - How do you see the MNCH problem in your region/ Ethiopia?

- What are some of the challenges for addressing maternal and child mortality in your region/ Ethiopia? Do you think that the CHWs program is an appropriate strategy?
- Do you think that the program was designed and guided by the multiple contexts, multilevel determinates of CHWs effectiveness (individual, interpersonal, community and systemic factors)?
- Do you think that the COVID-19 pandemic is setting back progress in MCH outcomes or exacerbating existing inequalities?

3. **Problem stream: Health system challenges and COVID-19 pandemic**
   - What are the major challenges facing the health system in general and the community health program in particular to ensure MNCH equity and a resilient community health system in the context and beyond COVID-19?
   - In your opinion how does the COVID-19 pandemic has exposed long-standing health system problems of the country? how does the COVID-19 created an extraordinary situation in which governments struggle to mitigate the harmful consequences of the pandemic and sustain MNCH service?
   - From your perspective, to what extent did the pandemic highlight and/or exacerbate a number of multilevel challenges related to HEWs/CHWs (training, skill, motivation, collaboration, safety, trust, acceptance, logistic and protection of the CHWs)

   - From your perspective, to what extent does the COVID-19 present a 'window of opportunity' to transform ways by which civil society interacts with the state in order to improve MNCH and community health system in Ethiopia? Probs:
   - Do you think the government had the capacity to effectively respond to COVID 19 and sustain MNCH in rural Ethiopia?
   - In your opinion, how does the pandemic highlight and necessitated the state-community and civil-society synergy?
   - How does COVID-19 has underscored the importance of enhancing state-civil society synergy and effective partnerships not only in facing the immense challenges posed by the pandemic but also in building a resilient community health system?
   - In your opinion, do you think that COVID-19 had an impact to bridge the gap between stake and stakeholders/CSOs to ensure public health and sustain MNCH? if you say so, how?

4. **Policy stream:** The promising efforts of state-civil society synergy to address multilevel determinates of CHWs/ MCH program effectiveness and co-produce a resilient health system beyond COVID-19?

   - From your experience, how does the state-civil society synergy, policy and program responses impacted the effort to sustain MNCH and community health system? Probs: what are the major policy and program responses? what are the major roles of CSOs to sustain MNCH? what worked well and what did not work well? What are the facilitators and challenges to address the multilevel determinates of CHWs/ MNCH program through state civil-society engagement?

- In your perspective, do you think that there was *optimal* solidarity and engagement to co-plan, co-implement, co-resource mobilization and co-evaluation to sustain MNCH and community health system? what worked well and what did not work well? *why do you say so?*

- In your opinion, how the state-civil society should be coordinated to build better health system? Probs: Why and how state-civil society synergy need to be emphasized?
- From your perspective, what should be done to improve working conditions for CHWs working in rural areas? What worked well and what did not? Why you said so?

5. Evaluating the existing state-civil society synergy to improve HEWs/ CHWs program and co-produce a resilient community health system beyond COVID-19

- In your perspectives, do you think that the existing state-civil society partnership is an appropriate strategy? what are the success and the failures of the state- civil-society partnership to ensure MNCH equity and a resilient community health system? why do you say so? Probs: In your opinion, how the state-civil society initiative is contributing to multilevel determinates of CHWs/MNCH program? Do you think state-society synergy is important during the planning, implementing, monitoring, and evaluation? why do you say so?

- In your perspectives, compared to before 2019, how does the adoption of Ethiopia's new civil society law has enhanced the enabling environment for CSOs engagement to improve MNCH and community health? Probe: What worked well in terms of co-production and ensuring sustainability? What are the strengths? limitations? solutions?
- In your perspectives, how does the 'One Plan, One Budget and One Report' approach is contributing to MNCH and community health program*?* Probe: Did the solutions work? Why or why not? What worked well in terms of coproduction and ensuring sustainability? Why do you say so?
- In your opinion, how state-civic society synergy should be framed to further transform CHWs/MCH program? Why do you say so?
- Beyond community engagement and state-civic society partnership, do you promote privatization of CHWs to further transform CHWs/MCH program? *Why do you say so?*
- What kind of policies should be required to enhance the coordination of state-civil society to ensure CHWs effectiveness and co-production of a resilient community health system?

- In your perspective, do you think that there is an optional community engagement (community level) in CHWs' program management? Do you think that the approach is working well*? What are the opportunities and challenges of the current community engagement approach?*
- How to enhance community empowerment in CHWs' program? What are the existing strengths? limitations? solutions? *how to balance the top down and bottom-up approach for better MNCH outcome?*

6. Political stream: Enabling political environment

- What are the challenging or the enabling political environment for public health policy maker to enhance the state society synergy in the context of co-production of CHS? Probes:
- In your perspective, compared to before COVID-19, do you think that the political environment (legislation, parliament, executive body, political parties, activists, community, business organizations, local and international actors, interest group and the like) is willing to enhance CHWs program and health system? Why do you say so? What are the perceived enablers or challenges from political/ administrative/executive/ donors to implement the state society synergy for better CHWs/ MCH program community health outcomes, beyond COVID-19?
- Does the government or partners promote the state-civil society synergy? Why or why not?
- Is there any strategy in place to advocate for a greater state- civil *society synergy* in government decision making at local or national level? Why do you say so?
- Are processes in place for collaboration, governance, shared power and accountability throughout the engagement process?
- Have relevant government agencies and political players been engaged in approving and designing the state- civil synergy initiative to ensure MCH equity and a resilient community health system beyond COVID-19? Is the state-society synergy initiative aligned with government and political parties policies and strategies to enhance and address the multilevel determinates of CHWs effectiveness?
- In your perspectives, what political leaders can do to address the multilevel determinates of CHWs/ MCH program effectiveness beyond COVID-19?

7. Closing

- In conclusion, is there anything else you'd like to tell me, suggestions you would like to make, or anything at all you would like me to know about -- regarding your public health policy or approach to transform CHWs/MCH program.
- Do you have any questions for me?
  Thank you very much for taking the time to share your perspectives with me.

Time ended _____

Appendix 9: University of Ottawa Research Ethics Board, ethics clearance certificate /REB approval letter

12/07/2022

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

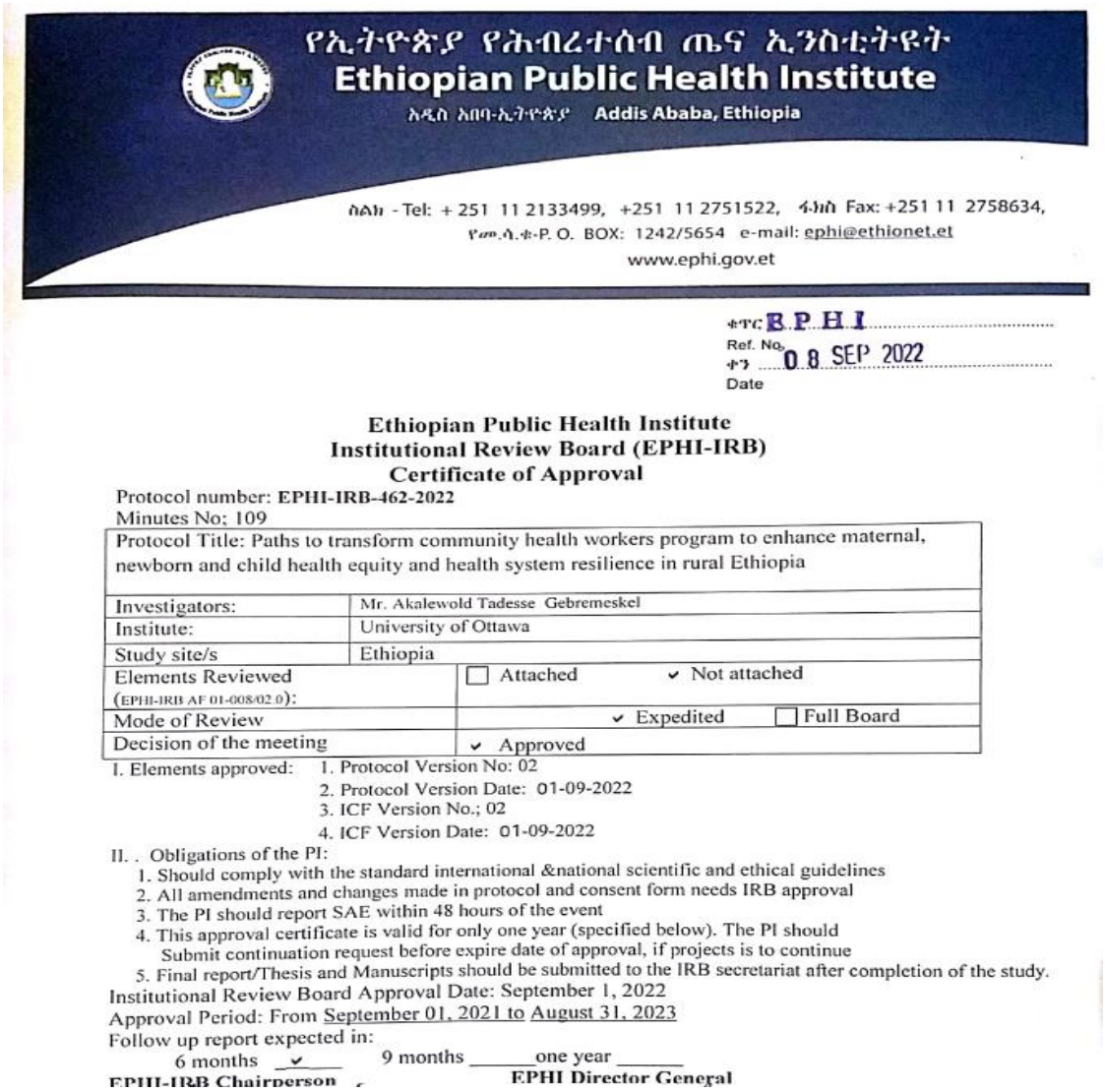
CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	S-06-22-8072
Titre du projet / Project Title	Paths to transform community health workers program to enhance maternal, newborn, and child health equity and health system resilience in Ethiopia
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	12/07/2022
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	11/07/2023

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
Akalewold Tadesse GEBREMESKEL	École de développement international et mondialisation / School of International Development and Global Studies	Chercheur Principal / Principal Investigator
Sanni YAYA	École de développement international et mondialisation / School of International Development and Global Studies	Superviseur / Supervisor

Appendix 10: Ethiopian Public Health Institute, Institutional Review Board (EPHI-RIB) certificate of approval



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Ethiopian Public Health Institute
አዲስ አበባ-ኢትዮጵያ Addis Ababa, Ethiopia

ስልክ - Tel: + 251 11 2133499, +251 11 2751522, ፋክስ Fax: +251 11 2758634,
የመ.ሳ.ቁ-P. O. BOX: 1242/5654 e-mail: ephi@ethionet.et
www.ephi.gov.et

ቁጥር/Ref. No. EPHI
ቀን/Date 08 SEP 2022

Ethiopian Public Health Institute
Institutional Review Board (EPHI-IRB)
Certificate of Approval

Protocol number: **EPHI-IRB-462-2022**
Minutes No: 109

Protocol Title: Paths to transform community health workers program to enhance maternal, newborn and child health equity and health system resilience in rural Ethiopia	
Investigators:	Mr. Akalewold Tadesse Gebremeskel
Institute:	University of Ottawa
Study site/s	Ethiopia
Elements Reviewed (EPHI-IRB AF 01-008/02.0):	☐ Attached ✔ Not attached
Mode of Review	✔ Expedited ☐ Full Board
Decision of the meeting	✔ Approved

I. Elements approved:
1. Protocol Version No: 02
2. Protocol Version Date: 01-09-2022
3. ICF Version No.; 02
4. ICF Version Date: 01-09-2022

II. . Obligations of the PI:
1. Should comply with the standard international &national scientific and ethical guidelines
2. All amendments and changes made in protocol and consent form needs IRB approval
3. The PI should report SAE within 48 hours of the event
4. This approval certificate is valid for only one year (specified below). The PI should Submit continuation request before expire date of approval, if projects is to continue
5. Final report/Thesis and Manuscripts should be submitted to the IRB secretariat after completion of the study.

Institutional Review Board Approval Date: September 1, 2022
Approval Period: From September 01, 2021 to August 31, 2023
Follow up report expected in:
6 months ✔ 9 months _____ one year _____

EPHI-IRB Chairperson EPHI Director General

Appendix 11: Preferred Reporting Items for Systematic Review and Meta-analysis Protocols (PRISMA-P)

Appendix 13: PRISMA Checklist

PRISMA-P 2015 Checklist

This checklist has been adapted for use with protocol submissions to *Systematic Reviews* from Table 3 in Moher D et al: Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews* **2015** 4:1

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
ADMINISTRATIVE INFORMATION					
Title					
Identification	1a	Identify the report as a protocol of a systematic review	☒	☐	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	☐	☒	
Registration	2	If registered, provide the name of the registry (e.g., PROSPERO) and registration number in the Abstract	☒	☐	2
Authors					
Contact	3a	Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author	☒	☐	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	☒	☐	14
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	☐	☒	
Support					
Sources	5a	Indicate sources of financial or other support for the review	☒	☐	14
Sponsor	5b	Provide name for the review funder and/or sponsor	☒	☐	14
Role of sponsor/funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	☐	☒	
INTRODUCTION					

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Rationale	6	Describe the rationale for the review in the context of what is already known	☒	☐	5-7
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	☒	☐	7
METHODS					
Eligibility criteria	8	Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status) to be used as criteria for eligibility for the review	☒	☐	8
Information sources	9	Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage	☒	☐	7
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	☒	☐	7
STUDY RECORDS					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	☒	☐	10
Selection process	11b	State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e., screening, eligibility, and inclusion in meta-analysis)	☒	☐	10
Data collection process	11c	Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	☒	☐	10
Data items	12	List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications	☒	☐	9
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	X☐		9

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	☒	☐	9
DATA					
Synthesis	15a	Describe criteria under which study data will be quantitatively synthesized	☐	☒	
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency (e.g., I^2, Kendall's tau)	☐	☒	
	15c	Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)	☐	☒	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	☒	☐	12
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)		x☐	
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (e.g., GRADE)	☒	☐	11

Appendix 12: Search strategies

Search Terms: Medline (OVID)

Set 1: Intervention

A) *MeSH*

Maternal and child adj2 health adj2 (service* or Program*) or community health*

B) *Keyword*

Maternal health / or Under-five child health / exp contraceptive/ or exp antenatal care/ or exp delivery/ or exp postnatal care/ or exp breastfeeding/ or nutrition/ or exp immunization/ or exp vaccination / or exp newborn services

C) Keyword

Empowerment and financial or in kind resources or career development opportunity or training or motivation or certificate

Set 2: Population

A) *MeSH*

exp health auxiliary/ or Community health worker*or CHWs/ or Lay health worker*

B) Keyword

Sub-Saharan Africa and all names of each country and the regions (Eastern, Central, Western and Southern Africa

Set 3: Search Alone

Section/topic	#	Checklist item
TITLE		
Title	1	Identify the report as a systematic review, meta-analysis, or both.
ABSTRACT		
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criter participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.
INTRODUCTION		
Rationale	3	Describe the rationale for the review in the context of what is already known.
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).
METHODS		
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).

Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistenc (e.g., I^2) for each meta-analysis.

A) MeSH

Women/

B) Keyword

Wom?n or or female*

Set 4: Study Design

Qualitative Research/ or Interview/ or Mixed research or multi level research

Set 5: Outcomes

CHWs perception and barriers/facilitators and effectiveness

Search Summary: Set 1 (A or B or C) and Set 2 (A or B) and Set 3 (A or B) and Set 4 and Set 5

Appendix 13: PRISMA Checklist

Section/topic	#	Checklist item
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., pub within studies).
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-re were pre-specified.
RESULTS		
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, wi stage, ideally with a flow diagram.
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, F provide the citations.
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessmen

Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple sum group (b) effect estimates and confidence intervals, ideally with a forest plot.
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-r
DISCUSSION		
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome groups (e.g., healthcare providers, users, and policy makers).
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g research, reporting bias).
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and imp
FUNDING		
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of systematic review

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: **www.prisma-statement.org**.

Appendix 14: Consolidated Criteria for Reporting Qualitative Research (COREQ)

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist:

No. Item	Guide questions/description	Reported
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	**Which author/s conducted the interview or focus group?** AG coordinated and directed interviews	Methods
2. Credentials	**What were the researcher's credentials? E.g. Ph.D., MD** The authors' credentials are as follows: • Akalewold T. geberemeskel, MSc, PhD-c • Ogochukwu Udenigwe, MSc, PhD-c • Josephine Etowa, MSc, PhD • Sanni Yaya, MSc,PhD	N/A
3. Occupation	**What was their occupation at the time of the study?** AG: Doctoral Candidate OU: Doctoral Candidate SY: Supervisor, Professor	N/A
4. Gender	**Was the researcher male or female?**	N/A

	The authors' identified genders are as follows: AG: Male OU: Female SY: Male	
5. Experience and training	**What experience or training did the researcher have?** -AG: quantitative and qualitative training and extensive experience in maternal and child health, including sexual and reproductive health program intervention coordination, monitoring and Evaluation, - OU: quantitative and qualitative research training and experience in qualitative research, and extensive experience in maternal and child health, - SY: quantitative and qualitative training and extensive experience in global maternal and child health, including sexual and reproductive health care.	N/A
Relationship with participants		
6. Relationship established	**Was a relationship established prior to study commencement?** AG has more than 8 years in community health program management in Ethiopia and worked in different contexts of health programs implementation and evaluation in Ethiopia, had established communication with Mr. Abebe Tadess, who was the former west Shewa Zone Health Director.	N/A
7. Participant knowledge of the interviewer	**What did the participants know about the researcher? e.g. personal goals, reasons for doing the research.** The study objectives were disclosed to participants as part of the informed consent procedure.	Method
8. Interviewer characteristics	**What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic** A research assistant was assigned to take notes during the FGDs after a brief training about the research ethics and process by AG. The research assistant was fluent in local Oromo language(FGD participants' working language), has a BSc degree and related work experience.	Method
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	**What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis** This study is a qualitative case study using document review, Focus group Discussion (FGDs)) and Key Informant Interview (KII). Qualitative case study is a research methodology that helps in the exploration of a phenomenon within some particular context. Desai and Potter (48) stressed that development study requires the use of a wide range of research methods: the mix of methods enables the different techniques and their results to be compared against each other, allowing judgements to be made as to which method (or combination of methods) is the most appropriate for any particular purpose. In a case study, a real time phenomenon is explored within its naturally occurring context, with the aim of answering the "how" and "why" questions (49,50). Our study was guided by different theoretical frameworks to inform the research processes and analysis. First, the socio-ecological framework to inform the description of the multilevel determinants of the CHWs' program effectiveness(44,45). Second, our study was informed by the WHO's Health System Framework, a leading structure of discourse on health systems building(45). Third, we used the *Synergetic model*: *synergetic model* shifts the focus from state-private business coproduction to ideas that involve state-society organization cooperation (28). Forth, we draw on Kingdon's multiple streams framework(47).: Kingdon's	Methods, page

	approach provides the conceptual framework for the analysis of the three streams – problems, policies, and politics. A purposive sampling technique was used to recruit the FGD and KII participants.	
Participant selection		
10. Sampling	**How were participants selected? e.g. purposive, convenience, consecutive, snowball** AG identified and purposefully recruited all participants, CHWs/HEWs had to be adults ranging from the ages of 21 and 64 who had been residents of the district (work site), in West Shewa Zone health office. The participants must have had one-year experience working as a CHWs/MNCH before COVID-19; three and more years of CHW/MNCH work experience in a rural area; over one year of HEWs national training, must be full time employee and be salaried. The study did not exclude HEWs/CHWs by their gender or sex; based on the lead author's practical experience, it was expected that CHWs would be all Female in agrarian areas of Ethiopia. **KII participant:** Key informants were recruited based on their known involvement in the policy process leading to the planning and the implementation of CHWs/ MNCH program. Snowball sampling were used to recruit participants, suggested by other participants	Methods,
11. Method of approach	**How were participants approached? e.g. face-to-face, telephone, mail, email** **FGD recruitment:** Using purposive sampling, AG worked with the Oromia Regional Health Bureau (ORHB) and zone health administration in an attempt to select the two districts. Then AG contacted and worked with the district health office in an attempt to recruit potential FGD participants to send the recruitment poster to potential participants via the districts' regular means of communication; telegram, email and announcements during review meeting. **KII recruitment:** Snowball sampling was used to recruit participants. AG worked with the MoH, ORHB, and zone health administration in an attempt to select the first potential participant in the KII. The PI started by sending an invitation email with the study, KII recruitment poster. Then the chain continued with only one referral from potential participants. We used a first come-first served basis for enrolment. Prior to participating in this study, participants were asked to provide their free and informed consent by signing a consent form All FGDs and 11 KII were conducted face-to-face, 1 KII was conducted using zoom.	Methods
12. Sample size	**How many participants were in the study?** A total of 16 female CHWs in the FGDs. A total of 12(8 males & 4 Females) policymakers participated in the study.	Methods
13. Non-participation	**How many people refused to participate or dropped out? Reasons**? None	N/A
Setting		
14. Setting of data collection	**Where was the data collected? e.g. home, clinic, workplace** Data collection took place at different locations depending on participants. The FGDs were conducted in a rented hotel hall while KII with policy makers were conducted in convenient locations for participants such as their offices.	Methods
15. Presence of non-participants	**Was anyone else present besides the participants and researchers?** No, non-participants were present during the group discussions.	N/A
16. Description of sample	**What are the important characteristics of the sample? e.g. demographic data** In FGD, a total of 16 Female health extension from tow district of west Shewa Zone. All the FGD participants, HEWs/CHWs are female, and majority 15(93.75 %) of them are in the age range of 25-40 and only one person is in the age range of 20-24 years old. In terms of their current relationship or marital status, married 12(75%), single 2(12.5%) and widowed / separated/divorced 2(12.5%). The highest level of education or training that they have completed: collage diploma 12(75%) and over one year HEWs training 4(25%).	

	KII: A total of twelve public health experts were recruited to participate in the KIIs. Eight participants (66.6%) were recruited from three levels of government health structures (three participants from MoH, two participants from Oromiya Health Bureau, and three participants from West Shewa and two district level health offices). Four (33.3%) participants were recruited from NGOs (two from the National level and two from the regional level. In terms of gender, four (33.3%) women and eight men (66.6%) participated. Most of the participants have post-graduate level (MSc) educational backgrounds in health and related study programs and they have more than 10 years of public health related extensive experience in different levels of responsibilities.	
Data collection		
17. Interview guide	**Were questions, prompts, guides provided by the authors? Was it pilot tested?** AG carefully crafted FGD and KII guides in English and translated to Oromo and Amharic languages. The guides were carefully crafted following the theoretical frameworks. The KII was guide was piloted with two health policy experts, in West Shewa Zone, Oromiya region and they were not participated/contacted during the actual data collection. Based on their response minor modificataion was applied on the KII guide for the final version of the gude.	Method
18. Repeat interviews	**Were repeat inter views carried out? If yes, how many?** Repeat interviews were not carried out.	N/A
19. Audio/visual recording	**Did the research use audio or visual recording to collect the data?** FGD and KII were audio-recorded after obtaining participants' permission to record.	Method
20. Field notes	**Were field notes made during and/or after the interview or focus group?** Yes, filed note was aken by trained research assistants during FGD	Methods
21. Duration	**What was the duration of the inter views or focus group?** FGD lasted about 80-90 minutes and ended when no further issues arose. Each KII lasted approximately 60-90 minutes.	Method
22. Data saturation	**Was data saturation discussed?** The principal investigator (AG) estimated the saturation of data between 6-8 individuals based on previous similar approaches. Yin (34) suggests multiple cases enable replication logic, allowing researchers to confirm or disconfirm inferences drawn from each case. We conducted two FGDs , the move from single-case to paired comparison offers a balanced combination of descriptive depth and analytical challenge that progressively declines as more cases are added. The principal investigator (AG) estimated the saturation of data between 10-12 interviews. For KII, data saturation can be attained in as little as 12 interviews depending on the diversity of data and the sample population, however, the concept of data saturation is also contested within research designs such as qualitative description that stress the uniqueness of each individual's experience. The authors acknowledge that information obtained from 12 public health policy experets may never truly reach data saturation, the key however, was to strive to attain thick and rich data. Based on the diverse policymakers interviewed for this study, the authors believe that the data obtained is detailed, nuanced and intricate.	Method
23. Transcripts returned	**Were transcripts returned to participants for comment and/or correction?** No transcript was returned to participant	N/A
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	**How many data coders coded the data?** The authors AG, OU,JE and SY coded the data	Methods
25. Description of the coding tree	**Did authors provide a description of the coding tree?**	Methods

	The transcript was read and coded based on identified similarities and patterns in the data.	
26. Derivation of themes	**Were themes identified in advance or derived from the data?** Data analysis followed the analytical strategies for qualitative description. Codes were developed after an initial review of the transcripts. First, after familiarization to the transcript , AG & OU read the data line by line, recorded insights, and proceeded to coded the transcript , FGD and KII, they coded individually and compared their codes. After debriefing and consensus the transcript was coded accordingly. After debriefing, JE, SY and OU, randomly chosen and compared to check alignment or discrepancies of the coding of the transcript. Next, coded information were sorted to identify patterns and themes from which similarities and differences were identified and extracted for further consideration and analysis. Similar themes generated sub-categories which gave a more general description of the content. Emerged themes were based on an iterative process of inductive and deductive approaches.	Method
27. Software	**What software, if applicable, was used to manage the data?** No software was used	N/A
28. Participant checking	**Did participants provide feedback on the findings?** No, the participants did not provide feedback on the findings	N/A
Reporting		
29. Quotations presented	**Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number** Participants' quotations were presented to illustrate themes and findings.	Results,
30. Data and findings consistent	**Was there consistency between the data presented and the findings?** Yes.	Results
31. Clarity of major themes	**Were major themes clearly presented in the findings?** Yes, we organized the findings by major themes.	Result
32. Clarity of minor themes	**Is there a description of diverse cases or discussion of minor themes?** Yes, we discussed minor themes in the manuscript and situated them within the broader literature.	Discussio

Appendix 15: List of Ethiopian HEP//MNCH related policy documents

List of Ethiopian HEP and related MNCH policy documents reviewed for this study

#	Title of the document
1	MoH.2020. Realizing universal health coverage through primary healthcare A Roadmap for Optimizing the Ethiopian Health Extension Program 2020 – 2035 http://repository.iifphc.org/handle/123456789/1175
2	MoH. 2020. An implementation manual for Optimizing Health Extension Program Ministry of Health, Addis Ababa, Ethiopia
3	Roadmap towards maximizing newborn and child survival and wellbeing by 2030 ministry of health, Ethiopia January 2022
4	MoH. 2020. Integrated management of newborn and childhood illness facilitator guide Addis Ababa, Ethiopia
5	MoH. 2021. National strategy for newborn and child health and development in Ethiopia November 2021
6	MoH. 2021. Integrated management of newborn and childhood illness May 2021 Addis Ababa, Ethiopia
7	MoH.2021. Ethiopia National Expanded Program on Immunization comprehensive multi-year plan (2021-2025) Federal Ministry of Health Addis Ababa July 2021
8	MoH.2021. Ethiopia National Expanded Program on Immunization comprehensive multi-year plan (2021-2025) Federal Ministry of Health Addis Ababa July 2021
9	MoH.2021. Family planning service integration national implementation GUIDELINE MCHN directorate, MoH August, 2021 Addis Ababa, Ethiopia
10	MoH.2022. Health Equity and System Strengthening Monitoring and Evaluation Guideline June, 2022 Addis Ababa, Ethiopia
11	MoH.2022. National Antenatal Care Guideline, Ensuring Positive Pregnancy Experience! February 2022
12	MoH.2013. National strategic plan for elimination of obstetric fistula 2021-2025 (2013-2017 EFY)
13	MoH.2021. Reproductive health (RH)-StrategicPlan_2021
14	MoH.2021. Federal Democratic Republic of Ethiopia National Food and Nutrition Strategy May 2021

15	A Roadmap for Optimizing the Ethiopian Health Extension Program 2020 - 2035 1 st Edition July 2020 Addis Ababa, Ethiopia
16	ORHB. 2022. Biiroo Fayyaa Oromiyaa Daayirektoretii Wal'aansa Fi Hooggansa Dhaabbile Fayyaa Karoora Hojii Garee Tajaajila Sagantaa Ekisteenshini Fayyaa Kan Bara 2015 Hagaya 2014 Finfinnee
17	MoH.2020. Revised Community Engagement Approaches in Rural Agrarian Ethiopia: An Implementation Guide for piloting of the community engagement approaches, August 2020, Addis Ababa
18	MoH.2022. የጤና ኤክስቴንሽን ፕሮግራምና የመጀመሪያ ደረጃ ጤና ክብካቤ ዳይሬክቶሬት የ2014 በጀት ዓመት የአመታዊ ዕቅድ አፈጻጸም ሪፖርት. ቅጽ. 4. ሪፖርቱ የሚሸፍነው ጊዜ፡ ከሐምሌ 1/2013 ዓ.ም. እስከ ሰኔ 30/2014 ዓ.ም.
19	MOH _ National Implementation Guideline for Expanded Program on Immunization (Revised edition) June 2021 Addis Ababa, Ethiopia http://repository.iifphc.org/bitstream/handle/123456789/1681/National-Implementation-Guidline-for-Expanded-Program-on-Immunization.pdf?sequence=1&isAllowed=y
20	Oromiya Bureau of Finance and Economic Development 2010. NGOs Affairs Work Process, revised. Terms of Collaboration Between Oromiya National Regional Government and NGOs Operating in the State, Finfinne May 2010