

DISSERTATION

Key Elements for Implementing Community Health Workers in  
Non-Communicable Disease Programming: Bridging the  
Healthcare Gap in Rural Uganda

Schlüsselemente für die Implementierung von Community  
Health Workers für nicht übertragbare Krankheiten: Überbrückung  
der Versorgungslücke im ländlichen Uganda

zur Erlangung des akademischen Grades  
Doctor rerum medicinalium (Dr. rer. medic.)

vorgelegt der Medizinischen Fakultät  
Charité – Universitätsmedizin Berlin

von

Rebecca Ingenhoff

Erstbetreuung: Prof. Dr. med. Felix Knauf

Datum der Promotion: 30.06.2024



## Table of contents

List of tables .....	iii
List of figures .....	iv
List of abbreviations.....	v
Abstract .....	1
1 Introduction.....	4
1.1 Global Health and the epidemiologic transition .....	4
1.2 Burden of non-communicable diseases .....	4
1.3 Implementing community health workers .....	6
1.4 Study rationale .....	7
2 Methods.....	9
2.1 Study design .....	9
2.2 Participants .....	9
2.3 Data collection .....	10
2.4 Data analysis .....	11
3. Results .....	15
3.1 Fundamental drivers of successful task shifting.....	17
3.1.1 Provide structured supervision for CHWs.....	17
3.1.2 Access to care through community health workers .....	18
3.1.3 Community involvement .....	18
3.1.4 Provide remuneration and facilitation for CHWs.....	18
3.1.5 Building CHW knowledge and skills through training.....	18
3.2 Task shifting enabling community health worker characteristics .....	19
3.2.1 CHWs portray confidence to perform their role .....	19
3.2.2 CHWs' Intrinsic commitment and motivation .....	19
3.2.3 Leveraging social relations and empathy .....	19
3.3 Behavioral aspects and emotional influences .....	20

---

3.3.1 Establishing trust with communities.....	20
3.3.2 Respect as a prerequisite.....	20
3.3.3 Community recognition of CHWs.....	21
3.3.4 CHWs to demonstrate virtuous behaviors .....	21
4. Discussion.....	22
4.1 Short summary of results.....	22
4.2 Interpretation of results.....	22
4.3 Embedding the results into the current state of research .....	25
4.4 Strengths and weaknesses of the study .....	26
4.5 Implications for practice and future research.....	27
5. Conclusions.....	29
Statutory Declaration .....	35
Declaration of your own contribution to the publication .....	36
Excerpt from Journal Summary List.....	37
Printing copy of the publication.....	42
Curriculum Vitae .....	57
Publication list.....	59
Acknowledgments .....	60

**List of tables**

Table 1: Excerpt from the working analytical framework ..... 12

Table 2: Excerpt from the framework matrix ..... 14

Table 3: Characteristics of participating patients, community health workers and  
healthcare professionals..... 16

Table 4: Illustration of categories and themes ..... 17

**List of figures**

Figure 1: Community health workers bridging the access to healthcare.....7  
Figure 2: Implications for task shifting to community health worker for non-communicable diseases. ....28

## List of abbreviations

ACCESS: African Community Center for Social Sustainability

CD: Communicable Disease

CHW: Community Health Worker

Diabetes: Diabetes Mellitus

FGD: Focus Group Discussion

HCP: Healthcare Professional

HIC: High-Income Country

HIV: Human Immunodeficiency Virus

IDI: In-depth Interview

LMIC: Low- and Middle-Income Country

NCD: Non-Communicable Disease

NGO: Non-Governmental Organization

SSA: Sub-Saharan Africa

VHT: Village Health Teams

WHO: World Health Organization

## Abstract

Not only lately through the Covid-19 pandemic, global health has earned international recognition as a subject that matters to everyone. Globally, countries face a shortage in healthcare workers. This rising trend is particularly concerning for low- and middle-income countries (LMICs). At the same time, chronic or non-communicable diseases (NCDs) such as hypertension and diabetes mellitus (diabetes) are rising at an alarming pace. Non-professional health workers, also known as community health workers (CHWs), can play an important role in settings where the shortage of healthcare workers stresses the already fragile health system. Accordingly, our study set out to explore the perceptions of patients, CHWs and healthcare professionals (HCP) on the implementation of a task shifting to CHW program for the screening and referral of hypertension and diabetes in rural Uganda before the implementation of such a program. Further studies will investigate the program's effectiveness and its health implications.

A qualitative, exploratory study was conducted in Nakaseke district, Uganda in August 2021. Participants included NCD patients, CHWs and HCPs. We conducted 24 in-depth interviews with HCPs and CHWs and 10 focus group discussions with patients. Throughout our data collection, we explored participants' perceptions on task shifting the screening and referral of hypertension and diabetes to CHWs in the study area. The interviews were audio-recorded and transcribed verbatim. The thematic analysis was guided by the framework method.

The thematic analysis determined three components, which may propel the success of a task shifting program in rural Uganda. First, participants identified a crucial set of fundamental drivers such as supervision, patients' access to care, community involvement, remuneration and facilitation, and building CHW knowledge and skills through training. Second, certain CHW characteristics such as confidence, commitment and motivation, as well as social relations and empathy for patients were described as beneficial. Third, participants laid out socioemotional aspects such as trust, virtuous behavior, recognition in the community and the presence of mutual respect as enablers.

The lack of healthcare workers with the trending NCD epidemic displays a global health concern. For screening and referral of hypertension and diabetes, participants in rural Uganda perceived task shifting as useful. A successful program moves beyond sole structural components by incorporating stakeholders concerns that may drive or halt its suc-



cess. Further research on the effectiveness of such programs post implementation is required to shape the successful implementation of task shifting programs in comparable contexts.

## Zusammenfassung

Nicht erst seit der Covid-19-Pandemie ist die globale Gesundheit international ein allgegenwärtiges Thema. Weltweit sind viele Länder mit einem Mangel an Gesundheitspersonal konfrontiert. Dieser steigende Trend betrifft vor allem Länder mit niedrigem und mittlerem Einkommen (LMICs). Gleichzeitig nehmen chronische oder nicht übertragbare Krankheiten (NCDs) wie Bluthochdruck und Diabetes Mellitus (Diabetes) in alarmierendem Ausmaß zu. Nicht-professionelles Gesundheitspersonal, auch bekannt als Community Health Workers (CHWs), kann fragile Systeme, welche einen Gesundheitspersonalmangel haben, entlasten. In einer Studie wurde vor Programmeinführung untersucht, wie Patient\*innen, CHWs und Gesundheitsfachleute (HCP) ein von CHWs geführtes Programm (Task Shifting) zur Früherkennung und Überweisung von Bluthochdruck und Diabetes im ländlichen Uganda wahrnehmen. Weitere Studien werden die Wirksamkeit des Programms und seine Auswirkungen auf die Gesundheit untersuchen.

Eine qualitative, explorative Studie wurde im August 2021 im Distrikt Nakaseke, Uganda, durchgeführt. Zu den Teilnehmenden gehörten NCD-Patient\*innen, CHWs und HCPs. Wir führten 24 Interviews mit HCPs und CHWs und 10 Fokusgruppendifkussionen mit Patient\*innen durch. Wir untersuchten die Ansichten auf das CHW Task Shifting zur Früherkennung und der Überweisung von Bluthochdruck und Diabetes. Die Interviews wurden aufgezeichnet und wortwörtlich transkribiert. Die thematische Analyse wurde durch die Framework Methode geleitet.

Die Analyse ergab drei Komponenten, die den Erfolg eines Task Shifting Programms im ländlichen Uganda bestimmen können. Erstens identifizierten die Teilnehmenden grundlegende Faktoren wie Supervision, Versorgungszugang, Einbeziehung der Gemeinde, Vergütung sowie Aufbau von Wissen und Fähigkeiten der CHWs durch Trainings. Zweitens wurden bestimmte CHW-Eigenschaften wie Selbstvertrauen, Engagement und Motivation sowie soziale Beziehungen und Empathie gegenüber Patient\*innen als vorteilhaft

beschrieben. Drittens nannten die Teilnehmenden sozio-emotionale Aspekte wie Vertrauen, moralisches Verhalten, Anerkennung in der Gemeinde und das Vorhandensein von gegenseitigem Respekt als zentrale Faktoren, die die Arbeit erleichtern.

Der Mangel an medizinischem Personal im Zusammenhang mit der zunehmenden NCD-Epidemie stellt ein globales Gesundheitsproblem dar. Für das Screening und die Überweisung von Bluthochdruck und Diabetes hielten die Teilnehmenden im ländlichen Uganda Task Shifting für sinnvoll. Ein erfolgreiches Task Shifting geht über die reine Programmkomponente hinaus, indem es die Bedenken der Beteiligten einbezieht, die den Erfolg vorantreiben oder aufhalten können. Weitere Untersuchungen zur Wirksamkeit nach Programmeinführung sind erforderlich, um die erfolgreiche Umsetzung von Task Shifting in vergleichbaren Kontexten zu gestalten.

# 1 Introduction

## 1.1 Global Health and the epidemiologic transition

In global health, countries share their resources and expertise to address current health challenges.[1] Just recently, the Covid-19 pandemic drove global public health professionals and medical experts around the globe to the need to address health as a transnational concept. The aim of global health is to deliver equitable health services to all while recognizing global health as a human right.[2] The global in global health refers to diseases of a worldwide concern, alluding to diseases that transcend national boundaries. Global health problems affect several countries at once, rather than a specific site only. Global health focuses on population health, putting an emphasis on preventive medicine while also encompassing curative interventions and patient care. It moves beyond public health as it further involves capacity-building efforts to strengthen healthcare professionals in high-income countries (HICs) and low- and middle-income countries (LMICs). Multidisciplinary approaches that include a variety of disciplines such as medicine, epidemiology, economics, law, political science and anthropology are common and respected in global health practice. Herein, global health requires the knowledge of experts beyond the medical sciences while strongly promoting interdisciplinary collaboration.[1]

Global health disparities that are particularly visible in LMICs continue to limit patients' access to healthcare. We are currently observing an epidemiological transition, from communicable diseases (CDs) to NCDs. This transition is particularly visible in Sub-Saharan Africa (SSA). Unfortunately, LMICs in SSA are disproportionately suffering from both CDs and NCDs compared to other parts of the world. Data on the NCD burden in SSA is sparse which continues to limit the access to care and knowledge about risk factors.[3] This data limitation inhibits the development of policies that aim for the prevention of and care for non-communicable diseases (NCDs) such as hypertension and diabetes mellitus (diabetes). While treatment or detection for these chronic diseases is typically available in HICs, the access to detection, care, prevention and education opportunities presents a challenge in many LMICs like Uganda, even more so in rural areas. [4, 5]

## 1.2 Burden of non-communicable diseases

The rise in NCDs such as hypertension and diabetes presents a global public health challenge, particularly in LMICs. Each year, NCD are responsible for the death of 41 million

people, which is equivalent to 74 % of all deaths worldwide.[6] This disease burden affects countries of all socio-economic scales. However, LMICs such as many countries in SSA are particularly vulnerable towards the rising NCD burden, as 86 % or 31.4 Million of these premature deaths occur in LMICs, trend rising.[6] In addition, many LMICs such as Uganda are not readily equipped to face the NCD epidemic, as challenges in infrastructure, awareness and funding persist.[5]

Four disease groups account for over 80 % of all premature NCD driven deaths. The most concerning are cardiovascular diseases such as hypertension which are responsible for 17.9 million deaths yearly.[6] Disease morbidity is a growing concern as hypertension currently affects 1.13 billion people of which most live in LMICs as estimates suggest.[7] Moreover, globally cancer (9.3 million) and chronic respiratory diseases (4.1 million) account for a large share of NCD deaths. Further, diabetes and kidney disease secondary to diabetes drive worldwide mortality with 2.0 million deaths per year.[6] Diabetes morbidity is estimated to affect 8.5 % of adults globally and predicted to even rise in the next years.[8, 9]

Both hypertension and diabetes are worrying chronic diseases, as they are major risk factors for cardiovascular complications such as heart attacks and strokes. Often, patients suffer from multi-morbidity which decreases one's quality of life significantly.[9] There is a linkage between poverty and NCDs. Healthcare increases household expenses significantly. Large health-related expenses, the limited access to healthy diets or the exposure to harmful products puts vulnerable or marginalized groups in LMICs further at risk of suffering or dying from a NCD.[6] In Uganda, more than 40 % of annual deaths are attributable to NCDs, which poses a major public health concern for the country.[10] Most recent evidence suggests that more than a quarter of the Ugandan population suffer from hypertension.[11] In addition, a study estimates that 1.4 % of Ugandans have diabetes.[12] A community-based Ugandan study suggests that only 9.4 % of adults with hypertension had their blood pressure adequately controlled while patient awareness on their disease was only 28.2 %.[13]

Prevention and control of NCDs by reducing the risk factors such as lifestyle, diet and tobacco consumption is crucial in limiting the growing NCD burden. In addition, NCD management surrounding the detection, screening and treatment of these chronic diseases is imperative.[6] Unfortunately, due to limited access to NCD care in rural Uganda the majority of NCDs remain undiagnosed. To overcome this detection gap, community-

based approaches consisting for instance of disease screening and referral programs to detect and manage NCDs in rural settings are required.[12, 14-16]

### **1.3 Implementing community health workers**

The healthcare environment is experiencing a detrimental shortage of nurses and physicians. Countries like Uganda where healthcare structures are less established and resources more limited than in HICs are notably suffering from this shortage.[17] This constraint in trained healthcare professionals (HCPs) together with a rising NCD burden puts already unstable healthcare systems at risk, presenting an immense challenge in rural areas where major care gaps between patients and medical centers persist. Many countries have harnessed the potential of employing CHWs to bridge this healthcare divide.[17, 18] The Ugandan Ministry of Health currently creates programs that address these challenges through employing CHWs in differing parts of the country. In general, CHWs are members of a community that serve as volunteers following the aim of bridging their communities with the health sector. While working as volunteers, CHWs may receive a small remuneration package to cover transport, equipment or other expenses related to work. Currently, in Uganda, CHWs typically support activities such as disease monitoring or data collection.[19-21] Task shifting has been successfully implemented in diverse settings and results indicate improved access to healthcare, higher coverage and superior quality of care. The term task shifting implies that physicians delegate tasks to less-specialized health workers such as CHWs. [22, 23] Initially, CHWs successfully worked in the management of CDs such as the Human Immunodeficiency Virus (HIV), malaria or tuberculosis.[24] Current evidence on the perceptions and outcomes of utilizing CHWs for the management of NCDs such as hypertension or diabetes in LMICs is limited.[23, 25]. However, previous studies indicate task shifting to lay health workers as a valid method to reduce the rising burden of NCDs in LMICs like Uganda. Evidence suggests that the employment of CHWs for NCDs may be particularly beneficial in rural areas where a shortage of healthcare workers is present.[18, 23, 26, 27] As visible in Figure 1, CHWs can act as a bridge between NCD patients and health centers by establishing a continuum of services that comprises of household visits, NCD screening and patients referrals. CHW services aid to overcome the limited access to healthcare.

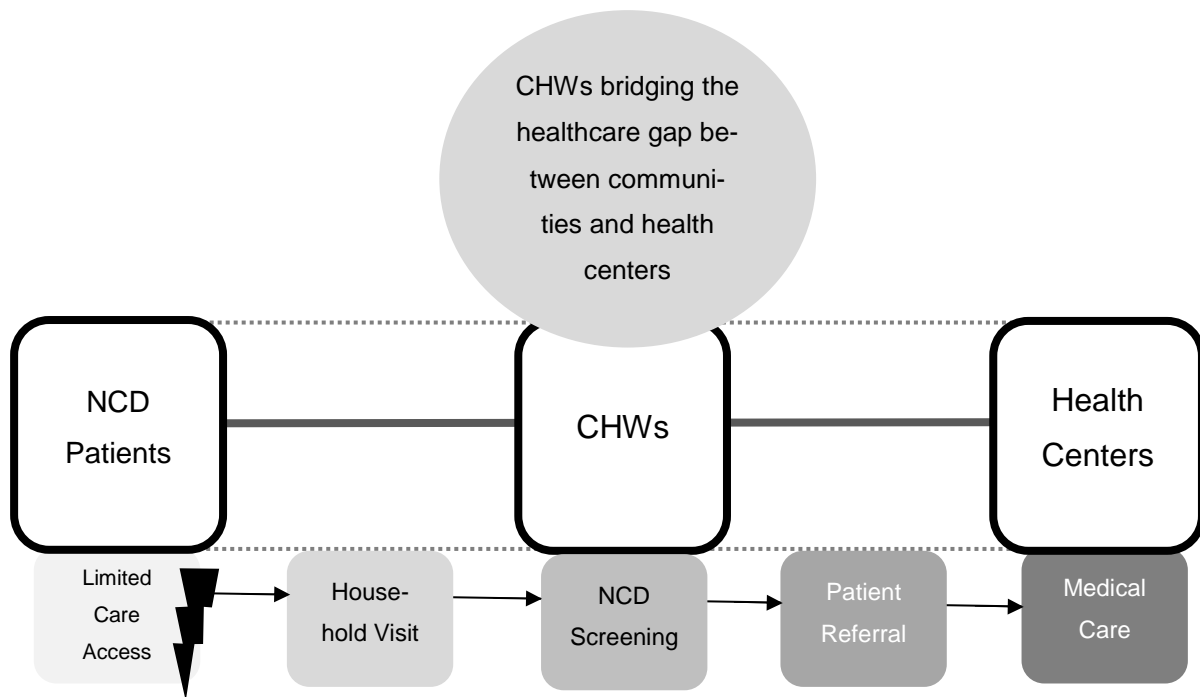


Figure 1: Community health workers bridging the access to healthcare, community health workers (CHWs), non-professional local health advocates, serve as a crucial link connecting non-communicable disease (NCD) patients to healthcare centers. Their comprehensive services, including home visits, NCD screening, and patient referrals, effectively address limited healthcare access, significantly enhancing healthcare accessibility for NCD patients, Own illustration 2023

#### 1.4 Study rationale

As laid out above, the Uganda Ministry of Health along with its stakeholders and local, regional, national and international partners is targeting to scale-up task shifting to CHWs programs to tackle the rising NCD burden.[19, 20] The current challenge is the limited evidence on acceptance and the design of programmatic structures with the interventions' effectiveness.[17, 19, 21, 25, 28]. A lack of evidence is particularly visible in rural areas, where a sustainable method to bridge communities and health centers is required most urgently. Only a few holistic mixed-methods studies investigated the opinion of multiple stakeholders involved in the design and implementation of task shifting programs.[28] A qualitative study set out to explore the perceptions of patients, CHWs and HCPs involved in a task shifting to CHWs intervention for the screening and referral of hypertension and diabetes in Nakaseke, rural Uganda before the implementation of the community-based

program. The study team perceived the approach that addresses the opinions of a diverse set of stakeholders as crucial to understand the diverse layers of consideration on implementing a task shifting to CHWs program for NCDs in the rural Ugandan care setting. We used a qualitative approach to explore the research question *“What are patient, CHWs and HCPs views on task shifting screening and measurement of blood pressure and blood sugars by CHWs for early detection and referral of hypertension and diabetes in rural Uganda?”*[18]

## 2 Methods

### 2.1 Study design

The methodology and results of this study are part of a larger set of mixed-methods studies investigating the acceptance, feasibility and effectiveness of CHW-driven screening, referral and education interventions for hypertension, diabetes and chronic obstructive pulmonary disease in rural Uganda.[18, 21] We followed the Exploration, Programming, Implementation and Sustainability Framework (EPIS), a scientifically reviewed framework and proven method in implementation science.[29] We chose this framework to guide the programmatic implementation process, as the evidence-based successful implementation of health services remains a challenge. This qualitative study comprises the exploration phase, where we considered the needs and opinions of various stakeholders involved in the design and implementation of a task shifting intervention. Through the exploration phase, implementers became aware of the environmental challenges and opinions that may act as barriers or enablers for the integration of the desired program. The findings outlined in the results sections are crucial to ensure that patients accept and adopt the health intervention.[29]

We chose an exploratory, qualitative study design to carry out focus group discussions (FGDs) with patients and individual in-depth interviews (IDIs) with CHWs and HCPs. The study team chose a qualitative approach to investigate the perceptions of all stakeholders in-depth. Qualitative approaches have proven particularly valuable as they allow for a deeper exploration of certain topics, which may be neglected by sole quantitative approaches. Qualitative methods may contribute to the explanation of phenomena, providing personal lived experiences and opinions on the exploration of health systems. They provide insights into individual drivers or concerns on complex challenges. Through the recording, interpreting and analyzing of non-numeric data such as interviews or FGDs, we studied in-depth perceptions on health care needs and the design and acceptability of interventions.[30]

### 2.2 Participants

We divided the participants selected for the study in three target groups: Patients, CHWs and HCPs.[18] We selected participants through a purposeful sampling approach that ensured an equal representation of characteristics such as disease status or occupation



in the three participant groups. We approached the CHWs and HCPs to be interviewed for the study directly. The heterogeneous sample of patients was selected from a former community census on self-reported NCDs in the study area.[31] We ensured a representation of different age groups, gender and disease status.

Patients who were previously diagnosed with hypertension and/or diabetes and who currently resided in Nakaseke district were recruited. The place of recruitment were two public hospitals, namely Nakaseke District Hospital and Semuto Health Centre IV, in Nakaseke district. The CHWs selected for this study also lived in Nakaseke district and currently or previously worked for the Ugandan non-governmental organization (NGO) the African Community Center for Social Sustainability Uganda (ACCESS). ACCESS is a local NGO, which designs education and health programs for the population in Nakaseke. The HCPs were identified from the local district government in Nakaseke such as Nakaseke Hospital or were health experts from the capital Kampala with specific knowledge in NCD or CHW interventions on a local, regional or national scale.[18]

### **2.3 Data collection**

The research team conducted the study in Nakaseke, a rural district located in the central part of Uganda in August 2021. Nakaseke is situated roughly 66 km north of Kampala, the capital of Uganda, with 202,200 estimated inhabitants.[32] Nakaseke features nine sub-counties including Semuto Town Council and Nakaseke Town Council. Two HCP interviews took place in Kampala while one was conducted digitally using a video software to adhere to movement restrictions during the Covid-19 pandemic.

We developed three differing interview guides, one for each target group, which can be found as supplementary material of Ingenhoff et al., 2022.[18] Interview guide 1 was designed to conduct the patient FGDs and targeted questions on personal experiences and opinions on CHWs. Interview guide 2 was developed for the IDIs with CHWs, encompassing questions on CHW experiences and recommendations. Interview guide 3 was utilized for HCPs, targeting research and programmatic experiences and current challenges for integrating CHWs in the Ugandan health system. We collaborated with an experienced team of research assistants who had a social science background to collect the data. Research assistants were fluent in English and Luganda, which is the most commonly spoken dialect in Nakaseke. Fluent knowledge of Luganda was required as

the patient interviews were conducted in Luganda. Prior to implementation of the qualitative study, we conducted a training for the research assistant to ensure conformity with the study objectives and understanding of the data collection tools. Study members from ACCESS Uganda who ran community-based health and research programs for several years supervised the study. Throughout the training, we conducted pilot interviews to ensure that the tools fit the study needs and sociocultural context. The study team reached out to participants in-person or by phone. All patient FGDs were obtained in Luganda, HCP interviews were conducted in English while CHWs chose either English or Luganda as their preferred interview language. The research assistants recorded and transcribed Luganda interviews verbatim to English. Interviews conducted in English were recorded and transcribed to English. While FGDs lasted an hour, IDIs took between 30 minutes to 45 minutes.[18] Data saturation was obtained when the possibility to generate new themes was attained and coding was regarded as no longer beneficial.[33]

## **2.4 Data analysis**

To analyze the data, we conducted an inductive approach to thematic analysis.[18] This approach proposes that the research team derives the themes directly from the data.[34, 35] We utilized the framework method as a validated and commonly used thematic data analysis method in multidisciplinary health research.[36] Analyzing the data via this method is a six-stage process.

In the first stage, the research assistants transcribed the recorded interviews verbatim. During the second stage, the researchers familiarized themselves with the transcripts by having read each of them line by line several times. The third stage encompassed the coding of the data, where the researcher analyzed the data and applied label or code line-by-line while carefully re-reading the data.[36] I hereby collaborated closely with a Ugandan colleague who is a medical doctor and public health researcher to create the initial codebook or working analytical framework. For several weeks, we met via an online video platform to discuss arising themes derived from the transcripts that we coded line-by-line individually. Collaboration by multidisciplinary teams as such are vital in qualitative health research to allow for the development of diverse opinions during inductive approaches.[36] After several discussions of transcripts from each participant group, we agreed on an initial set of codes.

These codes led to the fourth stage, the development of a working analytical framework. Hereby we categorized codes under three main topics, to ensure that all arising topics are captured. We continuously discussed the process of developing the working analytical framework as presented below with the senior researcher supervising the study while requesting feedback from the research team. This working analytical framework included a large set including 53 codes, summarized in twelve categories under three main topics each with a description. The excerpt of the working analytical framework below presents the three main topics and three examples of categories with their assigned codes and descriptions on community health worker (CHW) programming in Table 1 below.

<b>Table 1: Excerpt from the working analytical framework</b>		
<b>Topic 1 : Structural challenges and opportunities</b>		
Category	Codes	Description
Linkages to Health System	Integration of care, decentralization of care, fragmentation, collaboration, structural challenges	Policies that integrate CHWs in health system planning and provide logistical support to sustain CHWs at district, regional and national levels. Decentralization of care to CHWs.
<b>Topic 2: Programmatic components</b>		
Category	Codes	Description
Supervision and Monitoring	Supervision and monitoring, control, data & reporting	Supervision of CHWs to review their performance, monitor progress and receive feedback covering skill development, problem solving, and data auditing.
<b>Topic 3: Perceptions</b>		
Category	Codes	Description
Perceptions of CHWs	Working conditions, challenges, fear, impact, confidence, non-communicable disease knowledge & Skills, commitment/motivation, trust, community involvement	Perceptions and feelings of CHWs regarding what hinders or enables their work.

Own representation. 2022

Following, in the fifth stage, I applied the working analytical framework to the subsequent transcripts by using MAXQDA qualitative data analysis software. This software helps tremendously in organizing codes and data.

After in-depth discussions of the analytical framework (Table 1), the research team decided to focus the publication on a holistic understanding of the perceptions of patients, CHWs and HCPs on principal requirements for integrating task shifting to CHWs for NCDs in rural Uganda.[18] We identified this focus as most beneficial as it provides new knowledge to implementers and policy makers for designing context-appropriate CHW

programs that sustain the access to NCD care in rural settings. Hence, in the sixth stage, I chartered the codes in the framework matrix, where original quotes are featured with summarized sections of the data. As qualitative data typically presents a large amount of data, finding the balance between reduction and the retention of important themes is crucial at this step.[36] Accordingly, in the framework matrix, having the above-discussed research focus in mind and using Microsoft Excel, I re-categorized the codes under emerging themes to allow for a better data structure that acknowledges similarities and discrepancies within and across themes. The new structure featured three categories and twelve themes as they appeared in Ingenhoff et al., 2023 and will be outlined in the following results section.[18] Below, Table 2 demonstrates a simplified excerpt of the chartered framework matrix. This segment is structured in participants, data summaries and quotes as well as their assigned categories and themes portraying the various needs on community health worker (CHW) integration.

**Table 2:** Excerpt from the framework matrix

Participant	Data summaries & Quotes	Category	Theme
Healthcare professional	<ul style="list-style-type: none"> <li>CHWs need to be trained &amp; re-trained on equipment usage</li> <li>How to build relationships and approach people should be part of training</li> </ul> <p><i>“Therefore if well equipped; they will need to be trained on how to engage and create rapport with these patients especially at that first sight”</i></p>	Fundamental factors driving success	Building knowledge & skills through training
Patient	<ul style="list-style-type: none"> <li>CHWs are accessible, easier to do monthly or spontaneous and flexible disease monitoring. Saves patient transport.</li> </ul> <p><i>“Transport is very hectic. So having got someone in our community who can do the job, it will save us the more [money].”</i></p>	Fundamental factors driving success	Access to CHWs
CHW	<ul style="list-style-type: none"> <li>CHWs portray a high degree of motivation</li> <li>Want to empower patients to know their disease status</li> <li>Acquired knowledge also motivates CHWs to the work</li> <li>CHWs are committed to helping patients</li> </ul> <p><i>“CHW work is beneficial to my people, I also feel self-motivated.”</i></p>	CHW characteristics as task-shifting enablers	Intrinsic commitment and motivation
Patient	<ul style="list-style-type: none"> <li>Patients don't take CHWs serious e.g. when diagnosed by a young CHW</li> <li>Little respect towards younger CHWs, especially when knowing the CHWs since a very early age</li> </ul> <p><i>“They were coming to check me and I refuse I don't take them seriously.”</i></p>	Behavioral aspects and emotional influences	Respect
Healthcare professional	<ul style="list-style-type: none"> <li>Trust that CHWs can perform their roles in non-communicable disease prevention and control</li> <li>Need to engage local leaders to build trust</li> </ul> <p><i>“So we engage local leaders and Village Health Teams to recommend teams of people they trust.”</i></p>	Behavioral aspects and emotional influences	Trust
CHW	<ul style="list-style-type: none"> <li>Being affiliated with a local organization and local leader helps building trust</li> <li>Medical equipment establishes trust</li> <li>Community has confidence in them</li> </ul> <p><i>“It [trust] came as a result of this because people got to know me in the community and I was caring so much about them”</i></p>	Behavioral aspects and emotional influences	Trust

### 3. Results

A total of 101 participants were included in the qualitative study, who we divided into three groups: HCPs, CHWs and patients. An overview of their socioeconomic details such as age, gender, occupation or disease status are provided in Table 3 below (derived from Ingenhoff et al., 2023).[18] In summary, we conducted twelve IDIs with community health workers (CHWs) and twelve with healthcare professionals (HCPs). In addition, 77 patients participated in ten FGDs. Inclusion criteria for patients were having been diagnosed with hypertension and/or diabetes and currently being a patient at Nakaseke district hospital or Semuto Health Centre IV. These patients were chosen from a NCD census study, which was previously conducted in Nakaseke district.[31] CHWs were recruited from our partner organization ACCESS. The CHWs received basic NCD training in the past as part of the NCD census study but did not participate in task shifting activities.[31] While the CHWs presented a quite homogenous group, the HCPs were selected nurses, doctors, project implementers and government employees from differing fields such as medicine or public policy. The HCPs were included due to their expertise in the NCD and CHW sector and the implementation of care programs in Nakaseke district. We ensured a representation of all age groups and equal gender, particularly in the CHW and HCP group.[18]

**Table 3:** Characteristics of participating patients, community health workers and healthcare professionals

Age, Sex, Diagnosis	Patients (N=77)	CHWs (N=12)	HCPs (N=12)
<b>Age</b>			
18-30	7	5	0
31-40	6	2	4
41-50	19	5	4
51-60	22	0	4
61-70	13	0	0
71-80	4	0	0
Age unknown	6	0	0
<b>Sex</b>			
Female	54	5	6
Male	23	5	6
<b>Diagnosis</b>			
Hypertension	15		
Diabetes mellitus	18		
Hypertension and diabetes mellitus	30		
Hypertension and/or diabetes mellitus	14		

Socio-medical characteristics as derived from Ingenhoff et al. 2023, page 4 [18]

Through the thematic analysis, three categories and twelve themes emerged.[18, 36] Table 4 illustrates the categories and themes of the patient, community health worker (CHW) and HCP perceptions of task shifting for screening and referral of hypertension and diabetes in rural Uganda as derived from the qualitative data. The following section outlines categories and themes in detail as they appeared previously in Ingenhoff et al., 2023, supported by quotations from patients, CHWs and HCPs.[18]

**Table 4:** Illustration of categories and themes

<i>Category 1</i>	<i>Category 2</i>	<i>Category 3</i>
<b>Fundamental drivers of successful task shifting</b>	<b>Task shifting enabling community health worker characteristics</b>	<b>Behavioral and emotional influences</b>
<i>Theme 1.1</i> Provide structured supervision for CHWs	<i>Theme 2.1</i> CHWs portray confidence to perform their role	<i>Theme 3.1</i> Establishing trust with communities
<i>Theme 1.2</i> Access to care through CHWs	<i>Theme 2.2</i> CHWs' Intrinsic commitment and motivation	<i>Theme 3.2</i> Respect as a prerequisite
<i>Theme 1.3</i> Community Involvement	<i>Theme 2.3</i> Leveraging social relations and empathy	<i>Theme 3.3</i> Community recognition of CHWs
<i>Theme 1.4</i> Provide remuneration and facilitation for CHWs		<i>Theme 3.4</i> CHWs to demonstrate virtuous behaviors
<i>Theme 1.5</i> Building CHW knowledge and skills through training		

Categories and themes as derived from Ingenhoff et al. 2023, page 5 [18]

### 3.1 Fundamental drivers of successful task shifting

The following themes and quotations portray a group of fundamental drivers, which participants described as crucial in implementing task shifting programs.

#### 3.1.1 Provide structured supervision for CHWs

Participants consented that supervision is elementary to task shifting. As a HCP outlines, the ongoing monitoring of CHWs while clearly communicating roles and tasks should be at the programs' core. *'If we do community work today; we must meet the following day to discuss the field experiences. (...) We (...) monitor them, support them and make changes based on lessons learnt' (HCP-04).*

CHWs perceived supervision and feedback on their performance as beneficial and positive. Patients further emphasized the need to have structured supervision to ensure the adherence to screening and referral guidelines. *'If these CHWs are well supervised; they will do the work' (Patient, FGD-02).*



### 3.1.2 Access to care through community health workers

Patients contributed strongly to the emergence of this theme as they described the need of having access to healthcare on a household level. CHWs provide disease monitoring in remote areas while preventing patients from having to spend tremendous amounts on transport. (...) *Most of us find a challenge in moving from our areas to hospital. (...) CHWs will extend these services to our communities (...)* (Patient, FGD-08).

In addition, patients emphasized high expectations on CHWs' availability and reliability such as sharing personal contact information.

### 3.1.3 Community involvement

All participants defined the engagement of community leaders as a fundamental aspect when designing and implementing task shifting. *'All [CHWs] need to go through the community leaders'* (Patient, FGD-04). As HCPs described, community leaders build trust within their community and can support CHWs throughout their work.

### 3.1.4 Provide remuneration and facilitation for CHWs

HCPs and patients agreed that CHWs need a formal remuneration package to perform their tasks and stay motivated. *'If provided with sufficient allowance; they will comfortably serve us'* (Patient, FGD-02).

The skill set expected from CHWs in the screening and referral of NCDs is complex and should be acknowledged financially. Moreover, participants urged that CHWs require facilitation including the necessary equipment to ensure correct screening. In addition, CHWs described the desire for financial support for expenses related to their work. *'Provision of adequate transport facilitation; provision of meals during fieldwork; provision of sufficient salary; Life Insurance policy (...)* (CHW-05).

### 3.1.5 Building CHW knowledge and skills through training

HCP, CHWs and patients outlined that CHWs require intensive training to perform their task shifting roles. While training medical screening skills is a central factor, patients described training communication skills as vital. *'(...) They [CHWs] will need to be trained on how to engage and create rapport with these patients (...)*. (HCP-08). *'I will train them on how to friendly handle the patient'* (Patient, FGD-02).

Currently, patients presented doubts whether CHWs are able to perform NCD screening and referral roles. *'They lack some necessary skills to cater for NCDs (...)' (Patient, FGD-05).*

### **3.2 Task shifting enabling community health worker characteristics**

CHW interviews shaped this second category while patients and HCP reinforced CHW statements.

#### **3.2.1 CHWs portray confidence to perform their role**

Overall, CHWs presented strong confidence in their knowledge and abilities to perform their roles. CHWs acknowledged training as a confidence-boosting factor. *'I was well trained and I have been exposed to this field (...). I am well prepared to support my community members who are struggling with NCDs' (CHW-04).*

#### **3.2.2 CHWs' Intrinsic commitment and motivation**

CHWs illustrated a strong motivation to serve their communities in which they live and work. *'CHW work is beneficial to my people, I also feel self-motivated' (CHW-05).* Moreover, CHWs expressed how they are role models in their community, which affects their own life and health positively. The knowledge and skills they are able to gain through the training shapes their commitment positively. Furthermore, CHW motivation thrives on community members acknowledging CHWs for their medical skills. *'I am considered as a counselor and I get so many people seeking for my counseling services' (CHW-09).*

#### **3.2.3 Leveraging social relations and empathy**

The strong ties and popularity CHWs have with their own communities simplifies entering these communities for screening and referral. *'CHWs are very popular in communities as opposed to us (...)' (HCP-08).* CHWs have established strong relations within their communities, which helps in providing services. *'People now know me very well in the community so once I got back it will be very easy' (CHW-08).*

HCP and patients outlined empathy as a major constituent of CHWs, particularly when delivering unfortunate news to patients. Some patients suggested that recruiting CHWs who also suffer from a NCD could be beneficial. *'I will ensure that I recruit well behaved, social and empathetic persons who are ready to serve' (Patient, FGD-05).*

### 3.3 Behavioral aspects and emotional influences

Patients shaped this third category by introducing barriers and enablers on behavioral and emotional perceptions. As visible in the quotations, HCPs and CHWs partly supported these themes but also did not engage with some of them.

#### 3.3.1 Establishing trust with communities

The community engagement of local leaders nurtures trust, according to HCP. CHWs emphasized, that building long-term relationships is key in establishing trust. *'It [Trust] came as a result of this because people got to know me in the community and I was caring so much about them'* (CHW-06).

Moreover, presenting medical screening equipment to patients, being attached to a health center and wearing a uniform makes CHWs appear professional, enhancing trust among patients. *'(...) Some people used to underestimate me because I lived with them so they were wondering how I became a health worker but because I was putting on a uniform of life care [clinic of ACCESS] and equipment some could pay attention'* (CHW-10).

However, patients laid out concerns and mistrust regarding CHWs, particularly on their limited knowledge and skills for NCD screening. As patients described, the closeness that CHWs feature to the community may act as an enabler in accessing services but may also reduce patients' trust in CHWs' competence. *'From a CHW they have been with for a long time, (...) he [the patient] might (...) think this person is not competent enough (...)'* (Patient, FGD-02).

#### 3.3.2 Respect as a prerequisite

Foremost patients described respect for CHWs as a major barrier for task shifting. According to patients, various factors such as age or knowing their previous occupation or level of education inhibit respect. *'The other one's daughter who just stopped in P7 [elementary school] where did they get that knowledge, (...) I would rather die with my disease'* (Patient, FGD-01).

Patients recommended that a trained health worker should accompany CHWs. *'(...) We disrespect these CHWs because we have known them for a very long time (...). If I see our CHW moving with a well-trained health worker, I will be very confident that the team knows what to do'* (Patient, FGD-06).

In addition, patients identified training and commitment as an important component in building respect. *'CHWs should (...) take this role as their full time responsibility, [then] we shall collaborate with them and respect their advices' (Patient, FGD-06).*

### 3.3.3 Community recognition of CHWs

Community recognition drives CHWs behaviors and motivation as HCP and CHWs described. *'They [CHWs] get motivated by being recognized within their communities (...)' (HCP-02).* Similar, CHWs demonstrated that the responsibility and recognition of patients drives their motivation to work.

Meanwhile, patients emphasized that they acknowledge CHWs as first contact points for medical questions. *'They are the first helpers and I think of them as the ones to guide people to go to another level' (Patient, FGD-07).*

### 3.3.4 CHWs to demonstrate virtuous behaviors

Once again, patients' voices drove this theme by outlining a set of characteristics expected from a CHW such as honesty and eagerness. *'(...) Those VHTs should be energetic, able to move around the village' (Patient, FGD-07).*

Patients described their expectations on CHWs to demonstrate virtuous behaviors beyond their work such as during community gatherings. If misbehavior in public is observed, patients' trust may be reduced. *'Lack of trust in CHWs that s/he is not capable to do the assignment accurately. This might result from the bad social behaviors of the CHW' (Patient, FGD-07).*

Further misbehaviors that may limit the implementation of a CHW-led task shifting program include embezzlement or unrightfully charge of medication, as patients questioned CHW intentions. *'He/she is there on the village just to make money' (Patient, FGD-01).*

## 4. Discussion

### 4.1 Short summary of results

The study explored the essentials for establishing task shifting to CHWs for the screening and referral of hypertension and diabetes in Nakaseke, a rural district of Uganda. We investigated patient, CHW and HCP perceptions to draw holistic conclusions on necessary task shifting components. Based on our results, we emphasize that a successful task shifting intervention requires a strong foundation of programmatic structures. In addition, ensuring that CHWs portray a certain set of beneficial characteristics may enhance patients' acceptance. Lastly, behavioral and socioemotional influences may enable or inhibit this community based program. Thus, an integrated implementation framework moves beyond sole programmatic structures to a holistic approach, establishing trust as a key component while taking into account favorable CHW characteristics as well as positively perceived behaviors and emotions.[18]

### 4.2 Interpretation of results

As patients, CHWs and HCPs suggested, establishing a fundamental set of structures is the first key step in building a task shifting to CHWs program. These structures shall include but are not limited to the training of CHWs, supervision, remuneration, involvement of the community and ensuring patients' access to care.[18] These findings match current policy recommendations from the official World Health Organization guideline on health policy and system support for CHWs programs.[37] Accordingly, findings from CDs and NCDs research in Uganda and Rwanda support our results by indicating that the collaboration with community leaders through community involvement enhances access to care.[16, 38, 39] Local leaders may not only aid in the identification of participants but also play a crucial role in following-up patients and ensuring retention to treatment. The close collaboration between CHWs and local leaders has proven particularly successful in the Rwandan context.[39]

Costs associated with CHW activities as well as low (resources for) salaries are structural concerns to be addressed when aiming to build a sustainable task shifting program.[4, 37] The issue of transport costs arose as a major implementation challenge from our data. A previous study conducted in Uganda aligns with our findings by describing transport costs as a burden to CHWs.[28] Particularly in light of the current global inflation of gas

prices, transport costs remain a challenge in rural areas where public transport opportunities are absent. A study conducted in a wide Asian-African context presents transport challenges in hard-to-reach communities as a major barrier to work performance for CHWs. CHWs need to walk long distances while carrying heavy medical equipment, which creates additional burden besides their complex roles.[40] In addition, a study placed in Nepal evaluated transport as the second largest cost driver of CHW programs, after personnel expenses.[41] Hence, it is clear that CHWs need to receive a stable remuneration package including adequate transport means to ensure that they can thrive in their roles.

Moreover, in our study, patients and HCPs mentioned concerns on limited capacities of CHWs in the screening and management of NCDs. Previous evidence from the same study site noted that these concerns are often visible in CHW programs as lay people start providing health services.[4] CHWs require training and supervision to navigate client relationships while being able to establish patient trust.[42] Based on patient, CHW and HCP recommendations outlined in our findings, trainings must encompass a number of modules such as medical skills, patient communication and reporting. Supervision shall feature positive relations between CHWs and their attached organization, clear role definition as well as fair monitoring and evaluation structures. These structures may aid in overcoming community concerns by building trust-based and professional task shifting programs and equip CHWs with the necessary capacities.

Furthermore, the second pillar of a successful task shifting to CHWs program is a set of beneficially perceived CHW characteristics.[18] CHWs outlined a strong intrinsic commitment and motivation to serve their community, which is consistent with previous findings from Uganda.[28, 43] CHWs appreciate the recognition of the community. Considering that they often work as volunteers or are paid solely a small amount, commitment and motivation are an important characteristic to perform and succeed.[19] Furthermore, through our results, the topic of CHW confidence emerged. Studies performed in Mozambique and Indonesia identified confidence as a task shifting enabler.[44, 45] HCPs confirmed that confidence of CHWs is key in establishing patient relations and successful task shifting. However, our results outline that CHWs portrayed a high degree of confidence even before being exposed to NCD screening and referral. A study performed in Ghana suggests that community-based agents presented overly confidence by perform-

ing further tasks than initially instructed by supervisors.[46] Hence, we suggest that training CHWs and ensuring performance within their assigned roles while acknowledging their limitations is crucial in building a safe task shifting mechanism.

Additionally, social connections between CHWs and community members may function as task shifting enablers or barriers. On the one hand, patients suggested that they trust CHWs from within their community, which is beneficial in accepting service provision at the household level. A Malawian study that explored the social connectedness of CHWs on a household level supports this finding as it outlines the positive relationships CHWs can establish with community members.[47] On the other hand, patients furthermore described certain barriers that the closeness to CHWs may create. A younger CHW may create patients' doubts on CHWs capacities in healthcare. A study from Indonesia confirms that young CHWs were perceived as less capable and less trusted than their older peers.[45] A comparative study conducted in Ethiopia, Kenya, Malawi and Mozambique presents a stronger tie between communities and CHWs that serve their area of origin and hence share similar socio-cultural characteristics. These ties lead to stronger trust-based relationships.[48] For a successful task shifting implementation, program managers should be aware of these considerations and acknowledge them through formative studies that address community members' preferences.[49]

Summarized in emotions and behaviors, respondents shaped the third category of perceptions that are essential for a task shifting program.[18] Overall, patients outlined their high expectations on CHWs. These expectations relate not only to their performance in providing medical care but also encompass CHWs behaviors beyond their work. Confirming findings from a previous Ugandan study, a patient described that CHWs shall have excellent behaviors during social events.[38] It almost appears, as CHWs have to demonstrate –what the community perceives to be- perfect social behaviors at all times. These community expectations may put pressure and stress on CHWs as a rural Iranian study describes.[50] To ensure that CHWs can perform in a supportive work environment, organizations must manage community expectations on CHWs.

The issue of confidentiality arose in many patients' interviews, as patients doubted whether CHWs would keep their results confidential. A study conducted in Kenya presents similar findings showing that poor confidentiality may limit NCD program effectiveness.[51] The comparative study from four Sub-Saharan countries underlines this challenge as community members shared concerns regarding CHWs confidentiality on their medical results.[48] However, these results in our setting were partly surprising to the

research team as villages are very close-knit and patients tend to attend NCD clinics jointly and hence are aware of other's disease status naturally. A finding from Malawi that could be applicable to our context relates this fear to the stigma associated with CDs such as HIV or tuberculosis. Participants interviewed in the Malawian study shared that a CHW visit is often associated with a positive HIV or tuberculosis test, which creates stigma and discrimination from the community.[47] Evidence from Uganda and Kenya indicates that rural communities experience a high external stigma on HIV and HIV-testing through exclusion or distancing but further internalized stigma such as feelings of shame or self-isolation.[52] Accordingly, CHWs need to establish trustful relationships with patients that include keeping any medical results confidential.

### **4.3 Embedding the results into the current state of research**

Our results feed into a growing body of evidence that shapes the integration of CHWs for NCDs. In global health, CHWs continue to gain recognition. While they were initially employed for aiding the tackling of CDs, their involvement in NCDs prevention and detection gained scientific, programmatic and policy attention over the past years.[14, 24] The generation of knowledge on what drives or halts such CHW programs may support the prevention of NCDs such as hypertension or diabetes longitudinally. There are numerous studies investigating the effectiveness of CHWs in the NCDs sphere in diverse settings. Especially in rural areas, these studies indicate positive patient outcomes and acceptance compared to providing health services at the health centers.[14, 16, 21, 23, 28, 53-55] These results are particularly valuable for rural areas where transport costs and distances present tremendous healthcare access challenges to patients. However, patients' acceptability for CHW programs may stall if trust concerns such as issues of confidentiality arise.[42]

Moreover, financing poses a major challenge to global health interventions.[56] A lack of political support in achieving Universal Health Coverage is emphasized by the Ugandan governments' focus on productive sectors and emerging markets.[57] Sustainable financing mechanisms are required to build task shifting programs that benefit the population longitudinally while being independent of third party donations. Nevertheless, health-financing efforts are shattered while governmental support for community-based initiatives remains extremely limited.[57] Governments need to be held accountable to increase



their funding for NCDs through comparable binding commitments such as the Abuja declaration on HIV/AIDS, tuberculosis and other related infectious diseases.[58] As our results indicate, the establishment of a task shifting to CHWs program comes with inherent costs for –among other- salaries, supervision and program administration. These costs pose a major barrier for implementation to countries like Uganda, where funding for primary health care interventions are already limited.[17, 56, 59] While the majority of NCD funding comes from development assistance or bilateral programs between LMICs and HICs, NCDs remain non-prioritized by global health actors.[60] This lack of financing support for NCD disease prevention, treatment and care creates a challenge for the design and implementation of community-based programs targeting NCDs. Nonetheless, evidence proves that the early prevention of NCDs is not only beneficial from an individual health perspective but also economically fruitful.[61]

Our study provides evidence on the implementation of a task shifting program in a rural East African context. The generation of evidence through population-based studies is imperative to shape positive policy outcomes, which increase national fiscal support and global health actor attention to NCD prevention efforts (Figure 2).

#### **4.4 Strengths and weaknesses of the study**

This is the first study assessing a holistic view on stakeholders' opinion on the task shifting for NCDs, specifically hypertension and diabetes screening and referral, in Nakaseke, rural Uganda. A strength of this study is its inclusion of diverse stakeholders, allowing for an integrated investigation of the research topic. The unique study setting allows for the longitudinal assessment of disease and acceptance and effectiveness of interventions following a patient cohort.[21, 31, 62] Future studies will continue to monitor progression, patient satisfaction, program acceptance and clinical outcomes. From a global health perspective, this study is an example of successful collaboration between a HIC and a LMIC, where mutual research interests lead to the establishment of a joint research project promoting decision-making and leadership on eye level. This does not only aid the production of knowledge but benefits both partner countries through the sharing of resources and the establishment of independent, locally-led research and programmatic structures. Some study limitations are worth mentioning. The study is limited to one unique research location in rural Uganda, which has several years of experience in running community-based programs and is well recognized within the community. This reputation along with

possible interpersonal relationships between patients and CHWs may have influenced the production of knowledge on patients' perceptions.[18] Nonetheless, the interviewers reassured patients to share their opinions freely. The CHWs participating in the study present unique traits as they were attached to the same research organization and previously received training on NCDs and exposure to NCD patients. Additionally, the views in this study were taken from a relatively small sample and may not represent the opinions of other communities. As a qualitative study, it may be difficult to translate these findings directly to other rural or urban areas in Uganda or Sub-Saharan Africa. In addition, the study focuses on the screening and referral of hypertensive and diabetic patients. As the screening process for these diseases is relatively non-invasive, the perceptions from stakeholders on more invasive screening methods may differ. Moreover, in qualitative research and considering research reflexivity, the production of knowledge in a study depends on the researchers' academic background and even the coding method.[63] Hence, the thematic analysis may have put a focus on certain themes while other topics were neglected.

#### **4.5 Implications for practice and future research**

In global health, the importance of employing interdisciplinary approaches to health sciences is fundamental.[1] Accordingly, including Social Sciences approaches that investigate the perceptions of stakeholders in the development and implementation of a health or research program is imperative. Health research interventions are moving far beyond the sole application of medical practice. Thus, researchers should investigate underlying notions that may act as enablers or barriers of health interventions. Addressing concerns of lay people such as patients who are the programs' target group delivers valuable insights through qualitative approaches. [49] Mixed-methods approaches move beyond solely statistics and numbers but use bottom-up approaches that shape interventions based on stakeholder needs.

For medical practice, particularly in countries with limited access to healthcare resources, our results demonstrate that patients, CHWs and HCPs perceive task shifting to CHWs as useful. If applied in a culturally and context sensitive matter, such community-based programs have the potential to aid in the detection, referral and prevention of NCDs. As trust was derived as a key enabler or barrier, responsible parties should ensure its presence and nurture it at all times.[18] Continuous monitoring and evaluation can provide

ongoing insights into the needs and successes of community-based programs. Further research is required to investigate program effectiveness and stakeholder perceptions post-implementation in various socioeconomic and geopolitical contexts.

Moreover, this study indicates international collaborations as useful in the generation of evidence in public health research. To ensure that the future generation of public health researchers are equipped with the necessary knowledge and skills to build sustainable health interventions, bidirectional exchanges between participating research institutions may be valuable for driving medical and research education in the global health field.[64] Through capacity building, programs that HIC and LMIC institutions equally direct, research collaborations and education exchanges can enhance medical practice and future health outcomes. Program, policy and research implications as laid out in the previous sections are summarized in Figure 2 below.

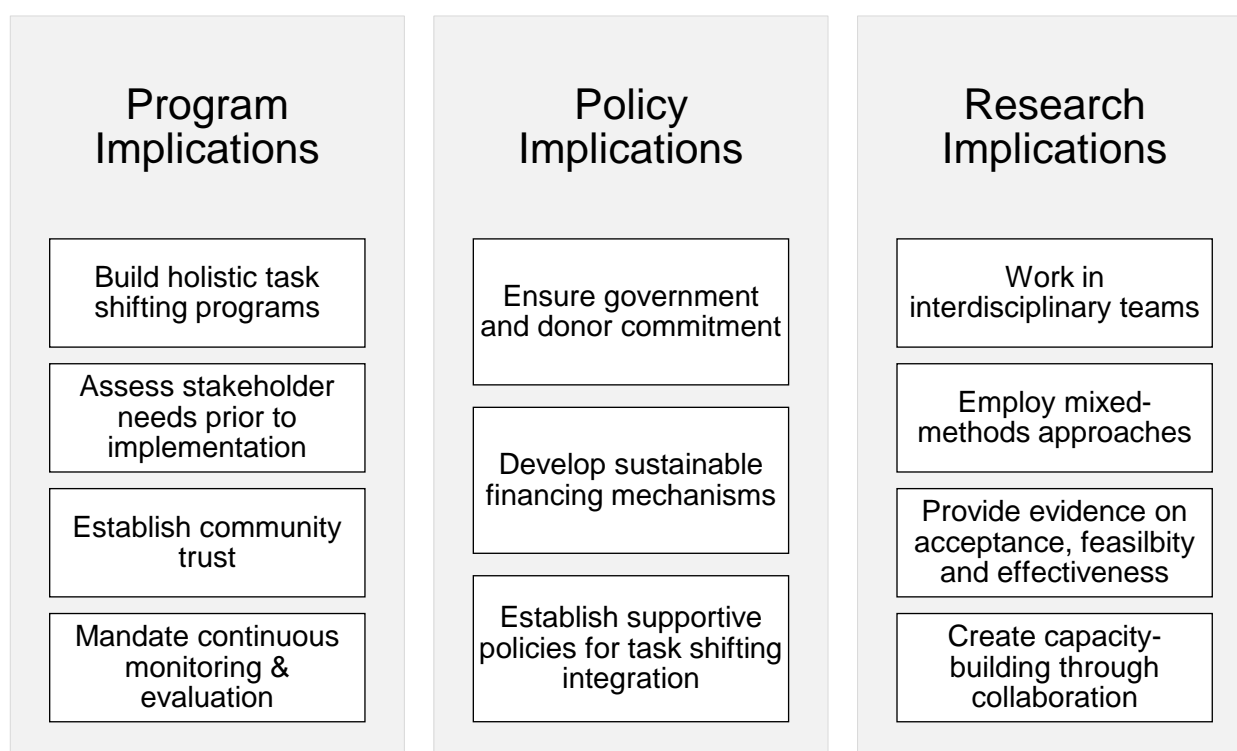


Figure 2: Implications for task shifting to community health worker for non-communicable diseases, Own illustration 2023

## 5. Conclusions

Globally, the double burden of a limited healthcare workforce along with a rising burden of NCDs portray a worrying global health issue. Evidence suggests that CHWs are valuable in creating a bridge between populations and health centers for primary health care services. Patients, CHWs and HCPs perceived task shifting NCD screening and referral for hypertension and diabetes to CHWs in rural Uganda as beneficial. Task shifting essentials in this context are fundamental factors, beneficial perceived CHW characteristics, as well as behavioral influences and emotional aspects. Based on our results, we argue that researchers and program implementers shall think beyond solely considering programmatic aspects when designing task shifting to CHW programs. In particular, it may be favorable to program acceptance to address the concerns of patients before task shifting implementation. Trust between implementers, CHWs and patients is imperative for the success of task shifting. When functioning on eye level, international collaborations may support the development of research capacity through the exchange of resources. To build sustainable, independent task shifting programs that address the creeping NCD epidemic, policy support and financial backing globally and in the implementing countries is crucial. Hence, further research should focus on building holistic evidence on the acceptance, feasibility and effectiveness of CHWs programs to gain political will to support and scale-up task shifting programs longitudinally.

## Reference list

1. Koplan JP, Bond TC, Merson MH, Reddy KS, Rodriguez MH, Sewankambo NK, Wasserheit JN, Consortium of Universities for Global Health Executive B: Towards a common definition of global health. *Lancet* 2009, 373(9679):1993-1995.
2. Rifkin SB: Alma Ata after 40 years: Primary Health Care and Health for All-from consensus to complexity. *BMJ Glob Health* 2018, 3(Suppl 3).
3. Dalal S, Beunza JJ, Volmink J, Adebamowo C, Bajunirwe F, Njelekela M, Mozaffarian D, Fawzi W, Willett W, Adami HO, Holmes MD: Non-communicable diseases in sub-Saharan Africa: what we know now. *Int J Epidemiol* 2011, 40(4):885-901.
4. Chang H, Hawley NL, Kalyesubula R, Siddharthan T, Checkley W, Knauf F, Rabin TL: Challenges to hypertension and diabetes management in rural Uganda: a qualitative study with patients, village health team members, and health care professionals. *Int J Equity Health* 2019, 18(1):38.
5. Stephens JH, Alizadeh F, Bamwine JB, Baganizi M, Chaw GF, Yao Cohen M, Patel A, Schaeffle KJ, Mangat JS, Mukiza J, Paccione GA: Managing hypertension in rural Uganda: Realities and strategies 10 years of experience at a district hospital chronic disease clinic. *PLoS One* 2020, 15(6):e0234049.
6. World Health Organization: Noncommunicable diseases. In.; 2022.
7. World Health Organization: Hypertension Fact Sheet. In.; 2021.
8. World Health Organization: Global Health Observatory (GHO) Data NCD mortality and morbidity. In.; n.d.
9. World Health Organization: Diabetes. In.; 2021.
10. Schwartz JI, Guwatudde D, Nugent R, Kiiza CM: Looking at non-communicable diseases in Uganda through a local lens: an analysis using locally derived data. *Global Health* 2014, 10:77.
11. Guwatudde D, Mutungi G, Wesonga R, Kajjura R, Kasule H, Muwonge J, Ssenono V, Bahendeka SK: The Epidemiology of Hypertension in Uganda: Findings from the National Non-Communicable Diseases Risk Factor Survey. *PLoS One* 2015, 10(9).
12. Bahendeka S, Wesonga R, Mutungi G, Muwonge J, Neema S, Guwatudde D: Prevalence and correlates of diabetes mellitus in Uganda: a population-based national survey. *Trop Med Int Health* 2016, 21(3):405-416.
13. Musinguzi G, Nuwaha F: Prevalence, awareness and control of hypertension in Uganda. *PLoS One* 2013, 8(4):e62236.
14. Jeet G, Thakur JS, Prinja S, Singh M: Community health workers for non-communicable diseases prevention and control in developing countries: Evidence and implications. *PLoS One* 2017, 12(7):e0180640.
15. Chiwanga FS, Njelekela MA, Diamond MB, Bajunirwe F, Guwatudde D, Nankya-Mutyoba J, Kalyesubula R, Adebamowo C, Ajayi I, Reid TG, Volmink J, Laurence C, Adami HO, Holmes MD, Dalal S: Urban and rural prevalence of diabetes and pre-diabetes and risk factors associated with diabetes in Tanzania and Uganda. *Glob Health Action* 2016, 9.
16. O'Neil DS, Lam WC, Nyirangirimana P, Burton WB, Baganizi M, Musominali S, Bareke D, Paccione GA: Evaluation of care access and hypertension control in a community health worker driven non-communicable disease programme in rural Uganda: the chronic disease in the community project. *Health Policy Plan* 2016, 31(7):878-883.

17. Baine SO, Arabat K: A scoping study on task shifting; the case of Uganda. *BMC Health Services Research* 2014, 14(184).
18. Ingenhoff R, Munana R, Weswa I, Gaal J, Sekitoleko I, Mutabazi H, Bodnar BE, Rabin TL, Siddharthan T, Kalyesubula R, Knauf F, Nalwadda CK: Principles for task shifting hypertension and diabetes screening and referral: a qualitative study exploring patient, community health worker and healthcare professional perceptions in rural Uganda. *BMC Public Health* 2023, 23(1):881.
19. O'Donovan J, Stiles CE, Sekimpi D, Ddumba I, Winters N, O'Neil E, Jr.: Potential challenges of implementing the Community Health Extension Worker programme in Uganda. *BMJ Glob Health* 2018, 3(4).
20. Ministry of Health Uganda: Village Health Team Strategy and Operational Guidelines: Ministry of Health Uganda; 2010.
21. Ingenhoff R, Nandawula J, Siddharthan T, Ssekitoleko I, Munana R, Bodnar BE, Weswa I, Kirenga BJ, Mutungi G, van der Giet M, Kalyesubula R, Knauf F: Effectiveness of a community health worker-delivered care intervention for hypertension control in Uganda: study protocol for a stepped wedge, cluster randomized control trial. *Trials* 2022, 23(1):440.
22. Lehmann U, Van Damme W, Barten F, Sanders D: Task shifting: the answer to the human resources crisis in Africa? *Hum Resour Health* 2009, 7:49.
23. Joshi R, Alim M, Kengne AP, Jan S, Maulik PK, Peiris D, Patel AA: Task shifting for non-communicable disease management in low and middle income countries-a systematic review. *PLoS One* 2014, 9(8).
24. Perry HB, Zulliger R, Rogers MM: Community health workers in low-, middle-, and high-income countries: an overview of their history, recent evolution, and current effectiveness. *Annu Rev Public Health* 2014, 35:399-421.
25. Joshi R, Thrift AG, Smith C, Praveen D, Vedanthan R, Gyamfi J, Schwalm JD, Limbani F, Rubinstein A, Parker G, Ogedegbe O, Plange-Rhule J, Riddell MA, Thankappan KR, Thorogood M, Goudge J, Yeates KE: Task-shifting for cardiovascular risk factor management: lessons from the Global Alliance for Chronic Diseases. *BMJ Glob Health* 2018, 3(Suppl 3).
26. Jafar TH, Gandhi M, de Silva HA, Jehan I, Naheed A, Finkelstein EA, Turner EL, Morisky D, Kasturiratne A, Khan AH, Clemens JD, Ebrahim S, Assam PN, Feng L, Cobra-Bps Study Group: A Community-Based Intervention for Managing Hypertension in Rural South Asia. *N Engl J Med* 2020, 382(8):717-726.
27. Musoke D, Atusingwize E, Ikhile D, Nalinya S, Ssemugabo C, Lubega GB, Omodara D, Ndejjo R, Gibson L: Community health workers' involvement in the prevention and control of non-communicable diseases in Wakiso District, Uganda. *Global Health* 2021, 17(1):7.
28. Ndejjo R, Musinguzi G, Nuwaha F, Wanyenze RK, Bastiaens H: Acceptability of a community cardiovascular disease prevention programme in Mukono and Buikwe districts in Uganda: a qualitative study. *BMC Public Health* 2020, 20(1):75.
29. Moullin JC, Dickson KS, Stadnick NA, Rabin B, Aarons GA: Systematic review of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework. *Implement Sci* 2019, 14(1):1.
30. Renjith V, Yesodharan R, Noronha JA, Ladd E, George A: Qualitative Methods in Health Care Research. *Int J Prev Med* 2021, 12:20.
31. Siddharthan T, Kalyesubula R, Morgan B, Ermer T, Rabin TL, Kayongo A, Munana R, Anton N, Kast K, Schaeffner E, Kirenga B, Knauf F, Rural Uganda Non Communicable Disease Study Investigators: The rural Uganda non-communicable

- disease (RUNCD) study: prevalence and risk factors of self-reported NCDs from a cross sectional survey. *BMC Public Health* 2021, 21(1).
32. Uganda Bureau of Statistics: National Population and Housing Census. In.; 2022.
  33. Guest G, Bunce A, Johnson L: How Many Interviews Are Enough? *Field Methods* 2016, 18(1):59-82.
  34. Braun V, Clarke V: Using thematic analysis in psychology. *Qualitative Research in Psychology* 2006, 3(2):77-101.
  35. Patton MQ: *Qualitative evaluation and research methods*, vol. 2nd edition: Sage Publications; 1990.
  36. Gale NK, Heath G, Cameron E, Rashid S, Redwood S: Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology* 2013, 13(117).
  37. World Health Organization: WHO guideline on health policy and system support to optimise community health worker programmes. In.: World Health Organization; 2018.
  38. Singh D, Cumming R, Negin J: Acceptability and trust of community health workers offering maternal and newborn health education in rural Uganda. *Health Educ Res* 2015, 30(6):947-958.
  39. Mutagoma M, Sebuho D, Nyemazi JP, Mills EJ, Forrest JI, Remera E, Murindabigwi A, Semakula M, Nsanzimana S: The role of community health workers and local leaders in reducing attrition among participant in the AIDS indicator survey and HIV incidence in a national cohort study in Rwanda. *BMC Public Health* 2018, 18(1):338.
  40. Olaniran A, Banke-Thomas A, Bar-Zeev S, Madaj B: Not knowing enough, not having enough, not feeling wanted: Challenges of community health workers providing maternal and newborn services in Africa and Asia. *PLoS One* 2022, 17(9):e0274110.
  41. Nepal P, Schwarz R, Citrin D, Thapa A, Acharya B, Acharya Y, Aryal A, Baum A, Bhandari V, Bhatt L, Bhattarai D, Choudhury N, Dangal B, Dhimal M, Dhungana SK, Gauchan B, Halliday S, Kalaunee SP, Kunwar LB, Maru D, Nirola I, Paudel R, Raut A, Rayamazi HJ, Sapkota S, Schwarz D, Thapa P, Thapa P, Tiwari A, Tuitui R, Walter E, Maru S: Costing Analysis of a Pilot Community Health Worker Program in Rural Nepal. *Glob Health Sci Pract* 2020, 8(2):239-255.
  42. Grant M, Wilford A, Haskins L, Phakathi S, Mntambo N, Horwood CM: Trust of community health workers influences the acceptance of community-based maternal and child health services. *Afr J Prim Health Care Fam Med* 2017, 9(1):e1-e8.
  43. Brunie A, Wamala-Mucheri P, C CO, Akol A, M MC, Bufumbo L, Weaver M: Keeping community health workers in Uganda motivated: key challenges, facilitators, and preferred program inputs. *Global health, science and practice* 2014, 2(1):103-116.
  44. Mabunda D, Oliveira D, Sidat M, Cournos F, Wainberg M, Mari JJ: Perceptions of Community Health Workers (CHW) on barriers and enablers to care for people with psychosis in rural Mozambique: findings of a focus group discussion study using the Capability, Opportunity, Motivation and Behaviour framework (COM-B framework). *Hum Resour Health* 2022, 20(1):44.
  45. Surjaningrum ER, Jorm AF, Minas H, Kakuma R: Personal attributes and competencies required by community health workers for a role in integrated mental health care for perinatal depression: voices of primary health care stakeholders from Surabaya, Indonesia. *Int J Ment Health Syst* 2018, 12:46.

46. Chinbuah AM, Gyapong JO, Pagnoni F, Wellington EK, Gyapong M: Feasibility and acceptability of the use of artemether-lumefantrine in the home management of uncomplicated malaria in children 6-59 months old in Ghana. *Trop Med Int Health* 2006, 11(7):1003-1016.
47. Ndambo MK, Munyaneza F, Aron M, Makungwa H, Nhlema B, Connolly E: The role of community health workers in influencing social connectedness using the household model: a qualitative case study from Malawi. *Glob Health Action* 2022, 15(1):2090123.
48. Kok MC, Ormel H, Broerse JEW, Kane S, Namakhoma I, Otiso L, Sidat M, Kea AZ, Taegtmeier M, Theobald S, Dieleman M: Optimising the benefits of community health workers' unique position between communities and the health sector: A comparative analysis of factors shaping relationships in four countries. *Glob Public Health* 2017, 12(11):1404-1432.
49. LeBan K, Kok M, Perry HB: Community health workers at the dawn of a new era: 9. CHWs' relationships with the health system and communities. *Health Res Policy Syst* 2021, 19(Suppl 3):116.
50. Salehi Zalani G, Bayat M, Shokri A, Mirbahaeddin SE, Rasi V, Alirezaei S, Manafi F: Affecting Factors on the Performance of Community Health Workers in Iran's Rural Areas: A Review Article. *Iran J Public Health* 2016, 45(11):1399-1410.
51. Rachlis B, Naanyu V, Wachira J, Genberg B, Koech B, Kamene R, Akinyi J, Braitstein P: Community Perceptions of Community Health Workers (CHWs) and Their Roles in Management for HIV, Tuberculosis and Hypertension in Western Kenya. *PLoS One* 2016, 11(2).
52. Akatukwasa C, Getahun M, El Ayadi AM, Namanya J, Maeri I, Itiakorit H, Owino L, Sanyu N, Kabami J, Ssemmondo E, Sang N, Kwarisiima D, Petersen ML, Charlebois ED, Chamie G, Clark TD, Cohen CR, Kanya MR, Bukusi EA, Havlir DV, Camlin CS: Dimensions of HIV-related stigma in rural communities in Kenya and Uganda at the start of a large HIV 'test and treat' trial. *Plos One* 2021, 16(5).
53. Koorts H, Gillison F: Mixed method evaluation of a community-based physical activity program using the RE-AIM framework: practical application in a real-world setting. *BMC Public Health* 2015, 15:1102.
54. Neupane D, McLachlan CS, Mishra SR, Olsen MH, Perry HB, Karki A, Kallestrup P: Effectiveness of a lifestyle intervention led by female community health volunteers versus usual care in blood pressure reduction (COBIN): an open-label, cluster-randomised trial. *The Lancet Global Health* 2018, 6(1):e66-e73.
55. Ursua RA, Aguilar DE, Wyatt LC, Trinh-Shevrin C, Gamboa L, Valdellon P, Perrella EG, Dimaporo MZ, Nur PQ, Tandon SD, Islam, NS: A community health worker intervention to improve blood pressure among Filipino Americans with hypertension: A randomized controlled trial. *Prev Med Rep* 2018, 11:42-48.
56. Masis L, Gichaga A, Zerayacob T, Lu C, Perry HB: Community health workers at the dawn of a new era: 4. Programme financing. *Health Res Policy Syst* 2021, 19(Suppl 3).
57. Nannini M, Biggeri M, Putoto G: Health Coverage and Financial Protection in Uganda: A Political Economy Perspective. *Int J Health Policy* 2021.
58. Gichaga A, Masis L, Chandra A, Palazuelos D, Wakaba N: Mind the Global Community Health Funding Gap. *Glob Health-Sci Prac* 2021, 9:S9-S17.
59. Musoke D, Ndejjo R, Atusingwize E, Ssemugabo C, Ottosson A, Gibson L, Waiswa P: Panacea or pitfall? The introduction of community health extension workers in Uganda. *BMJ Glob Health* 2020, 5(8).



60. Jailobaeva K, Falconer J, Loffreda G, Arakelyan S, Witter S, Ager A: An analysis of policy and funding priorities of global actors regarding noncommunicable disease in low- and middle-income countries. *Global Health* 2021, 17(1):68.
61. Bertram M, Banatvala N, Kulikov A, Belausteguigoitia I, Sandoval R, Hennis A, Webb D, Tarlton D: Using economic evidence to support policy decisions to fund interventions for non-communicable diseases. *Bmj-Brit Med J* 2019, 365.
62. Ingenhoff R, Ganten D, Knauf F: Nephrology and Global Health? An interim report on the development of patient care in rural Uganda. *Nieren- und Hochdruckkrankheiten* 2021, 5:194-199. .
63. Saldana J: *The Coding Manual for Qualitative Researchers*. Los Angeles, CA: Sage Publications; 2009.
64. Ingenhoff R, Brewster U, Rastegar A, Kalyesubula R, Knauf F: Global Health Education in Nephrology: The Time has Come. *J Am Soc Nephrol* 2021, 32(12):2990-2993.

## Statutory Declaration

“I, Rebecca Inghoff, by personally signing this document in lieu of an oath, hereby affirm that I prepared the submitted dissertation on the topic “Key Elements for Implementing Community Health Workers in Non-Communicable Disease Programming: Bridging the Healthcare Gap in Rural Uganda”; “Schlüsselemente für die Implementierung von Community Health Workers für nicht übertragbare Krankheiten: Überbrückung der Versorgungslücke im ländlichen Uganda” independently and without the support of third parties, and that I used no other sources and aids than those stated.

All parts, which are based on the publications or presentations of other authors, either in letter or in spirit, are specified as such in accordance with the citing guidelines. The sections on methodology (in particular regarding practical work, laboratory regulations, statistical processing) and results (in particular regarding figures, charts and tables) are exclusively my responsibility.

Furthermore, I declare that I have correctly marked all of the data, the analyses, and the conclusions generated from data obtained in collaboration with other persons, and that I have correctly marked my own contribution and the contributions of other persons (cf. declaration of contribution). I have correctly marked all texts or parts of texts that were generated in collaboration with other persons.

My contributions to any publications to this dissertation correspond to those stated in the below joint declaration made together with the supervisor. All publications created within the scope of the dissertation comply with the guidelines of the ICMJE (International Committee of Medical Journal Editors; <http://www.icmje.org>) on authorship. In addition, I declare that I shall comply with the regulations of Charité – Universitätsmedizin Berlin on ensuring good scientific practice.

I declare that I have not yet submitted this dissertation in identical or similar form to another Faculty.

The significance of this statutory declaration and the consequences of a false statutory declaration under criminal law (Sections 156, 161 of the German Criminal Code) are known to me.”

Date:

Signature

---

## Declaration of your own contribution to the publication

Rebecca Ingenhoff contributed the following to the below listed publication:

**Publication:** Ingenhoff, R., Munana, R., Weswa, I., Gaal, J., Sekitoleko, I., Mutabazi, H., Bodnar, B. E., Rabin, T. L., Siddharthan, T., Kalyesubula, R., Knauf, F., & Nalwadda, C. K, Principles for task shifting hypertension and diabetes screening and referral: A qualitative study exploring patient, community health worker and healthcare professional perceptions in rural Uganda, BMC Public Health, 2023

Contribution: Study conception and design, literature review, coordination of data collection, leading the data analysis, writing the first version of the manuscript, leading the critical manuscript revision, preparation of all figures and tables: Table 1 was developed based on the participant characteristics, Figure 1 was developed based on the results of my thematic analysis, Figure 2 was developed based on the discussion.

---

Signature, date and stamp of first supervising university professor / lecturer

---

Signature of doctoral candidate

## **Excerpt from Journal Summary List**

Journal Data Filtered By: **Selected JCR Year: 2021** Selected Editions: SCIE  
 Selected Categories: **“PUBLIC, ENVIRONMENTAL and OCCUPATIONAL HEALTH”** Selected Category Scheme: WoS  
**Gesamtanzahl: 210 Journale**

Rank	Full Journal Title	Total Cites	Journal Impact Factor	Eigenfaktor
1	Lancet Public Health	10,449	72.427	0.03326
2	JOURNAL OF TRAVEL MEDICINE	6,380	39.194	0.01202
3	Lancet Global Health	22,156	38.927	0.06056
4	MMWR Recommendations and Reports	4,013	36.286	0.00808
5	MMWR-MORBIDITY AND MORTALITY WEEKLY REPORT	40,949	35.301	0.11642
6	MMWR Surveillance Summaries	4,118	29.095	0.01013
7	Lancet Planetary Health	4,794	28.750	0.01283
8	Annual Review of Public Health	11,349	21.870	0.01332
9	Travel Medicine and Infectious Disease	5,860	20.441	0.00989
10	JMIR Public Health and Surveillance	4,323	14.557	0.00958
11	BULLETIN OF THE WORLD HEALTH ORGANIZATION	21,791	13.831	0.01573
12	EUROPEAN JOURNAL OF EPIDEMIOLOGY	14,232	12.434	0.02058
13	AMERICAN JOURNAL OF PUBLIC HEALTH	54,930	11.561	0.05040
14	ENVIRONMENTAL HEALTH PERSPECTIVES	51,752	11.035	0.02398
15	Globalization and Health	5,196	10.401	0.00928
16	INTERNATIONAL JOURNAL OF EPIDEMIOLOGY	35,233	9.685	0.04410
17	One Health	1,759	9.000	0.00274
18	JOURNAL OF HOSPITAL INFECTION	14,491	8.944	0.01578
19	International Journal of Transgenderism	1,744	8.606	0.00243
20	Lancet Regional Health-Western Pacific	528	8.559	0.00089

Rank	Full Journal Title	Total Cites	Journal Impact Factor	Eigenfaktor
21	ENVIRONMENTAL RESEARCH	45,789	8.431	0.04264
22	Current Pollution Reports	1,718	8.097	0.00178
23	JOURNAL OF TOXICOLOGY AND ENVIRONMENTAL HEALTH-PART B-CRITICAL REVIEWS	2,532	8.071	0.00139
24	BMJ Global Health	9,641	8.056	0.03240
25	JOURNAL OF ADOLESCENT HEALTH	23,158	7.830	0.02445
26	Journal of Global Health	4,452	7.664	0.01016
27	Journal of Infection and Public Health	6,717	7.537	0.01006
28	JOURNAL OF CLINICAL EPIDEMIOLOGY	44,451	7.407	0.03031
29	INTERNATIONAL JOURNAL OF HYGIENE AND ENVIRONMENTAL HEALTH	9,087	7.401	0.00829
30	Environmental Health	9,266	7.123	0.00832
31	ANNALS OF EPIDEMIOLOGY	9,797	6.996	0.01303
32	TOBACCO CONTROL	11,085	6.953	0.01327
33	AMERICAN JOURNAL OF PREVENTIVE MEDICINE	30,469	6.604	0.03417
34	INDOOR AIR	9,240	6.554	0.00745
35	Current Environmental Health Reports	2,722	6.521	0.00419
36	INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY	14,794	6.520	0.01612
37	Frontiers in Public Health	16,304	6.461	0.02847
38	Antimicrobial Resistance and Infection Control	5,465	6.454	0.00938
39	Journal of Exposure Science and Environmental Epidemiology	6,252	6.371	0.00447
40	GeoHealth	821	6.343	0.00195
41	JOURNAL OF EPIDEMIOLOGY AND COMMUNITY HEALTH	19,968	6.286	0.01537
42	Health Reports	1,837	6.094	0.00197

Rank	Full Journal Title	Total Cites	Journal Impact Factor	Eigenfaktor
43	Journal of Epidemiology and Global Health	1,484	5.959	0.00210
44	Epidemiology and Health	2,243	5.919	0.00365
45	NICOTINE & TOBACCO RESEARCH	12,690	5.825	0.01748
46	Clinical Epidemiology	5,599	5.814	0.01000
47	JOURNAL OF URBAN HEALTH-BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE	6,264	5.801	0.00735
48	PALLIATIVE MEDICINE	7,829	5.713	0.00815
49	JOURNAL OF RURAL HEALTH	3,217	5.667	0.00554
50	OCCUPATIONAL MEDICINE- OXFORD	5,695	5.629	0.00430
51	Disaster Medicine and Public Health Preparedness	4,517	5.556	0.00506
52	SCANDINAVIAN JOURNAL OF WORK ENVIRONMENT & HEALTH	6,743	5.492	0.00392
53	NEUROEPIDEMIOLOGY	4,955	5.393	0.00350
54	SOCIAL SCIENCE & MEDICINE	62,797	5.379	0.04952
55	AMERICAN JOURNAL OF EPIDEMIOLOGY	45,157	5.363	0.02764
56	International Journal of Health Geographics	3,317	5.310	0.00243
57	DRUG SAFETY	7,184	5.228	0.00592
58	Tobacco Induced Diseases	1,648	5.163	0.00301
59	LGBT Health	2,171	5.150	0.00507
60	Evolution Medicine and Public Health	831	5.143	0.00186
61	International Journal of Public Health	5,371	5.100	0.00713
62	JOURNAL OF PUBLIC HEALTH	6,362	5.058	0.00799
63	PUBLIC HEALTH	10,259	4.984	0.01449
64	OCCUPATIONAL AND ENVIRONMENTAL MEDICINE	11,519	4.948	0.00768

Rank	Full Journal Title	Total Cites	Journal Impact Factor	Eigenfaktor
65	HEALTH & PLACE	11,042	4.931	0.00989
66	ENVIRONMENTAL GEOCHEMISTRY AND HEALTH	8,659	4.898	0.00595
67	EPIDEMIOLOGY	17,133	4.860	0.01488
68	Digital Health	1,132	4.687	0.00256
69	PREVENTIVE MEDICINE	22,059	4.637	0.02490
70	Disability and Health Journal	3,046	4.615	0.00548
71	International Journal of Environmental Research and Public Health	123,104	4.614	0.16443
72	Conflict and Health	1,618	4.554	0.00336
73	PUBLIC HEALTH NUTRITION	21,998	4.539	0.01725
74	INTERNATIONAL JOURNAL OF ENVIRONMENTAL HEALTH RESEARCH	2,847	4.477	0.00195
74	EPIDEMIOLOGY AND INFECTION	13,279	4.434	0.01434
76	Transgender Health	1,203	4.427	0.00317
77	EUROPEAN JOURNAL OF PUBLIC HEALTH	10,292	4.424	0.01140
78	Environmental Health and Preventive Medicine	2,847	4.395	0.00259
79	Preventing Chronic Disease	6,865	4.354	0.00949
80	AMERICAN JOURNAL OF INFECTION CONTROL	14,187	4.303	0.01465
81	EPIDEMIOLOGIC REVIEWS	4,066	4.280	0.00267
82	PSYCHIATRIC SERVICES	14,005	4.157	0.01212
83	BMC PUBLIC HEALTH	69,134	4.135	0.08029
84	CANCER EPIDEMIOLOGY BIOMARKERS & PREVENTION	23,000	4.090	0.01963
85	SSM-Population Health	3,223	4.086	0.00948
86	Safety and Health at Work	1,982	4.045	0.00229





**Printing copy of the publication**

RESEARCH

Open Access



# Principles for task shifting hypertension and diabetes screening and referral: a qualitative study exploring patient, community health worker and healthcare professional perceptions in rural Uganda

Rebecca Ingenhoff<sup>1\*</sup>, Richard Munana<sup>2,3</sup>, Ivan Weswa<sup>3</sup>, Julia Gaal<sup>1</sup>, Isaac Sekitoleko<sup>4,5</sup>, Hillary Mutabazi<sup>3</sup>, Benjamin E. Bodnar<sup>6</sup>, Tracy L. Rabin<sup>7</sup>, Trishul Siddharthan<sup>8</sup>, Robert Kalyesubula<sup>3,7,9</sup>, Felix Knauf<sup>1,7</sup> and Christine K. Nalwadda<sup>2</sup>

## Abstract

**Background** A shortage of healthcare workers in low- and middle-income countries (LMICs) combined with a rising burden of non-communicable diseases (NCDs) like hypertension and diabetes mellitus has resulted in increasing gaps in care delivery for NCDs. As community health workers (CHWs) often play an established role in LMIC healthcare systems, these programs could be leveraged to strengthen healthcare access. The objective of this study was to explore perceptions of task shifting screening and referral for hypertension and diabetes to CHWs in rural Uganda.

**Methods** This qualitative, exploratory study was conducted in August 2021 among patients, CHWs and healthcare professionals. Through 24 in-depth interviews and ten focus group discussions, we investigated perceptions of task shifting to CHWs in the screening and referral of NCDs in Nakaseke, rural Uganda. This study employed a holistic approach targeting stakeholders involved in the implementation of task shifting programs. All interviews were audio-recorded, transcribed verbatim, and analyzed thematically guided by the framework method.

**Results** Analysis identified elements likely to be required for successful program implementation in this context. Fundamental drivers of CHW programs included structured supervision, patients' access to care through CHWs, community involvement, remuneration and facilitation, as well as building CHW knowledge and skills through training. Additional enablers comprised specific CHW characteristics such as confidence, commitment and motivation, as well as social relations and empathy. Lastly, socioemotional aspects such as trust, virtuous behavior, recognition in the community, and the presence of mutual respect were reported to be critical to the success of task shifting programs.

\*Correspondence:  
Rebecca Ingenhoff  
rebecca.ingenhoff@charite.de

Full list of author information is available at the end of the article



© The Author(s) 2023. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

**Conclusion** CHWs are perceived as a useful resource when task shifting NCD screening and referral for hypertension and diabetes from facility-based healthcare workers. Before implementation of a task shifting program, it is essential to consider the multiple layers of needs portrayed in this study. This ensures a successful program that overcomes community concerns and may serve as guidance to implement task shifting in similar settings.

**Keywords** Community health workers, Perceptions, Task shifting, Screening, Referral, Hypertension, Diabetes, Uganda

## Introduction

The Alma Ata Declaration on primary health care, established health as a human right while highlighting the significance of community health workers (CHWs) [1]. Over 40 years later, improving the access to healthcare by bridging the care gap between communities and health centers remains a major challenge for low- and middle-income countries (LMICs) like Uganda. Uganda is experiencing a shortage of health care workers, particularly in rural areas [2]. Simultaneously, the global rise of non-communicable diseases (NCDs) continues unabated. In Uganda, this dual burden puts a strain on the already fragile healthcare system [2]. On a global scale, NCDs such as hypertension and diabetes mellitus (diabetes) account for over 70% of yearly deaths worldwide. This is an alarming trend particularly in LMICs, where 80% of these deaths occur [3].

Currently 1.13 billion people suffer from hypertension worldwide, and the majority of these individuals live in LMICs [4]. Diabetes, a major driver of global mortality and morbidity, currently affects 8.5% of adults, with an increase in cases documented over the past two decades [3, 5]. The WHO estimates that 1.5 million deaths were directly caused by diabetes in 2019. Diabetes and hypertension are both major risk factors for heart attacks and strokes, and multi-morbidity is unfortunately common [5]. Uganda is severely burdened by NCDs, which account for more than 40% of yearly deaths [6]. Current numbers indicate that 26.4% of Ugandans suffer from hypertension while 1.4% of the Ugandan population are estimated to have diabetes [7, 8]. The majority of NCDs in Uganda remain underdiagnosed, generating a prevention and care gap that may be closed through the implementation of community-based disease management programs [8–11].

To overcome these challenges in workforce and access to healthcare, the Uganda Ministry of Health initiated the CHW program called the Village Health Teams (VHTs). VHTs typically are volunteers who provide a connection between the health sector and the communities in which they live [12, 13]. In the study region, CHWs are nominated by their respective communities often with at least seven years of education, along with proficiency in reading and writing in Luganda, the community's most commonly used local language. The Ugandan Ministry of Health provides foundational health training to CHWs prior to serving in local communities, where they may

aid in data collection, health education matters or disease surveillance. Despite working as volunteers, they often receive a small contribution to cover their travel expenses based on the activity conducted [12]. While CHWs are well utilized in the management of communicable diseases such as malaria, tuberculosis and HIV/AIDS, evidence on employing CHWs in the management of chronic diseases is limited [14, 15].

Task shifting, where tasks are delegated from physicians to nurses or lay health workers, has been successfully implemented and proven to enhance access, coverage and quality of care [15, 16]. Task shifting to non-physician health workers may be a feasible method to tackle the NCD burden in LMICs, where a shortage of health workers is experienced [15, 17, 18]. With the alarming rise of NCDs in Uganda, efforts are being made to scale-up task shifting to CHWs programs [12, 13]. In 2018, the Ministry of Health in Uganda introduced the nation-wide Community Health Extension Workers program to institutionalize the CHW role and ensure a balanced division of CHWs across the country [19]. However, challenges of acceptance and programmatic components persist [2, 12, 14, 20]. CHWs require professional management and supervision, available equipment and supplies, as well as continuous training. Recent evidence from rural Uganda suggests that the program currently faces several challenges related to CHWs' job motivation, satisfaction and inherently their performance. Additionally, CHWs often face difficulties with transportation due to a lack of financial resources, as well as a lack of recognition from higher levels of the healthcare system [21].

Reliable evidence is lacking regarding the design of task shifting to CHWs NCD programs, particularly in rural areas. Integrated multi-stakeholder studies investigating the acceptance of community-based NCD programs are scarce [20]. The purpose of this study was to explore patient, CHW and healthcare professional (HCPs) perceptions of a task shifting to CHWs intervention for the screening and referral of hypertension and diabetes in Nakaseke, rural Uganda before the introduction of such a program. During the planned intervention, trained CHWs perform hypertension and diabetes screening using blood pressure devices and glucometers at the household level. CHWs then direct patients matching the referral criteria to the nearest health center. Input from all stakeholders was expected to be vital to inform a holistic understanding of the complex care environment.

## Methods

### Study design

We carried out an exploratory, qualitative study using focus group discussions (FGDs) with patients and in-depth interviews (IDIs) with CHWs and HCPs. Participants were selected through a purposeful sampling approach to represent similar characteristics such as disease status or occupation in the three participant groups. A heterogeneous sample of patients featuring diversity in age, gender and disease status was selected from a prior community census [22]. This qualitative study is one component of a larger mixed-methods investigation on the impact of CHW-led community-based screening and referral for hypertension and diabetes in rural Uganda [23].

### Study site

Nakaseke is a rural district in Central Uganda approximately 66 km north of Kampala with an estimated population of 202,200 [24]. It consists of nine sub-counties including Semuto Town Council and Nakaseke Town Council. Nakaseke district is home to approximately 43,000 households, with a gender composition of 53.1% males and 46.9% females. There is a high rate of illiteracy, with 27% of individuals aged 18 years and above reported to be illiterate [25]. The study site was selected purposively due to a prior community census and the research infrastructure available [22]. The population profile of the study population is representative of rural populations in Uganda, yet the pre-established cohort presents a unique characteristic for the study's design.

### Participants

Patients who currently lived in Nakaseke district were recruited from two public hospitals in the district. CHWs were inhabitants of Nakaseke district and attached to a local non-governmental organization (NGO) the African Community Center for Social Sustainability Uganda (ACCESS). The HCPs were either from or worked in Nakaseke district local government, Nakaseke Hospital or in the capital city Kampala with expertise in national NCD or CHW programming.

### Data collection

The study was conducted in Nakaseke district, rural Uganda in August 2021. A small number of HCPs' interviews were conducted in Kampala, Uganda. Three distinct, interview guides were developed. Interview guide 1 was utilized for the patient FGDs, focusing on personal experiences and perceptions of CHWs. Interview guide 2 was designed for the IDIs with CHWs, focusing on their needs and experiences. Interview guide 3 was used for HCPs, encompassing structural and professional experiences with CHWs. Interview guides were initially written

in English and translated to Luganda by the Makerere University Multilingual Project to ensure validity. Data was collected by research assistants who were social scientists, fluent both in English and Luganda, the most commonly used dialect in the study area. The research assistants were trained to understand the study objectives, data collection tools and supervised by two project managers from ACCESS Uganda with prior experience in managing community-based research studies. Pilot interviews and pilot FGDs were conducted by the local project managers and research assistants after which the data collection tools were redesigned to fit the research needs and local context. Participants were either contacted by phone or in-person. Patient interviews were conducted in Luganda, HCP interviews were conducted in English, and CHW interviews were held in English or Luganda, based on participant preference. Interviews in Luganda were recorded and transcribed verbatim to English by research assistants. Interviews obtained in English were recorded and transcribed in English. The location for conducting the majority of patient FGDs was outdoors on the grounds of Nakaseke District Hospital or Semuto Health Centre IV, one FGD was performed within the community. IDIs with CHWs were conducted at ACCESS Uganda. The HCPs' IDIs were carried out at the participants' respective place of work such as the Ministry of Health, Nakaseke District Hospital, Semuto Health Centre IV, and ACCESS Uganda. Due to the ongoing COVID-19 pandemic at the time of data collection and inherent movement restrictions, some interviews were facilitated digitally via video software. IDIs typically lasted between 30 and 45 min, FGDs took approximately one hour.

### Analysis

We used an inductive approach to thematic analysis where the identified themes are strongly linked to the data [26, 27]. By re-reading transcripts individually to identify reoccurring topics and discrepancies, RI and RM collaborated to create the initial code book using independent line-by-line coding of a sample of transcripts with Microsoft Word. As the transcripts offer a large dataset, codes were used repeatedly. RI and RM agreed on a set of codes that were arranged in categories to capture emerging themes. At the next stage, the initial codebook was discussed and further refined collaboratively by RI, RM and CN, as well as based on the feedback from the research team. After agreeing on a final thematic framework, RI applied the codes to the remaining transcripts using MAXQDA qualitative analysis software. Data was analyzed using the framework method as a proven concept in multi-disciplinary health research, allowing for a thematic or qualitative content approach [28].

### Ethical approval and consent

Ethical approval for this study was granted by the Makerere University School of Biomedical Sciences (SBS-REC 874) and the Uganda National Council of Science and Technology (SS821ES). All participants were compensated for their time and effort, provided written informed consent to participate in the study and agreed to their interview data being published anonymized. The study was conducted in line with the required Covid-19 regulations such as wearing personal protective equipment, sanitizing and social distancing.

### Results

A total of 101 participants participated in the research, grouped into three categories: HCPs, CHWs and patients (Table 1). We conducted individual IDIs with twelve CHWs and twelve HCPs. Further, we conducted ten FGDs with 77 patients in total. Patients who were previously diagnosed with either hypertension, diabetes or both, and were currently seeking care at either Nakaseke District Hospital or Semuto Health Centre IV were selected purposeful from a previous census study on NCDs in Nakaseke [22]. The local research team identified these patients from clinical and research records. Patients that were willing to share their perceptions of the study's topic and available to participate in the FGD

at the respective study site were selected. Individual FGDs were created while ensuring a diversity and balance among the demographic factors such as gender and age that were selected in our initial sampling strategy. CHWs working at ACCESS Uganda that runs health and education programs in the local community participated in this study. The local research team contacted CHWs either in person or via telephone to find those who were interested in participating. Only CHWs that previously received basic training on NCDs as part of a prior community census, but were not yet employed in task shifting, were selected for the interviews [22]. HCPs were selected nurses, doctors, and project implementers from ACCESS Uganda, as well as individuals from local, regional and national authorities such as the District Health Office or the Uganda Ministry of Health. HCPs were identified by the local research team due to their reputable knowledge in the field of NCDs and CHW-led disease management programs. We ensured gender balance among the CHW and HCP participants.

Figure 1 provides an overview of the three categories and twelve themes that emerged from the thematic analysis of interviews regarding patient, CHW and HCP perceptions of task shifting for screening and referral. The categories and themes are presented here, along with representative quotes from each respondent group.

**Table 1** Characteristics of patients, CHWs and HCP that participated in the study

Characteristics	Patients (N = 77)	CHWs (N = 12)	HCPs (N = 12)
<b>Age group</b>			
18–30	7 (9,1%)	5 (41,7%)	0
31–40	6 (7,8%)	2 (16,7%)	4 (33,3%)
41–50	19 (24,7%)	5 (41,7%)	4 (33,3%)
51–60	22 (28,5%)	0	4 (33,3%)
61–70	13 (16,9%)	0	0
71–80	4 (5,2%)	0	0
Age unknown	6 (7,8%)	0	0
<b>Sex</b>			
Female	54 (70,1%)	5 (50%)	6 (50%)
Male	23 (29,9%)	5 (50%)	6 (50%)
<b>Diagnosis</b>			
Hypertension	15 (19,5%)		
Diabetes mellitus	18 (23,4%)		
Hypertension and Diabetes mellitus	30 (38,9%)		
Hypertension and/or Diabetes mellitus	14 (28,2%)		
<b>HCP Role</b>			
Nurse			4 (33,3%)
Doctor			1 (8,3%)
Project Implementer			4 (33,3%)
Government Employee			3 (25%)

### Fundamental drivers of successful task shifting

As demonstrated in the following quotations, there are a common set of fundamental drivers that all three respondent groups agreed would be important for a successful task shifting implementation.

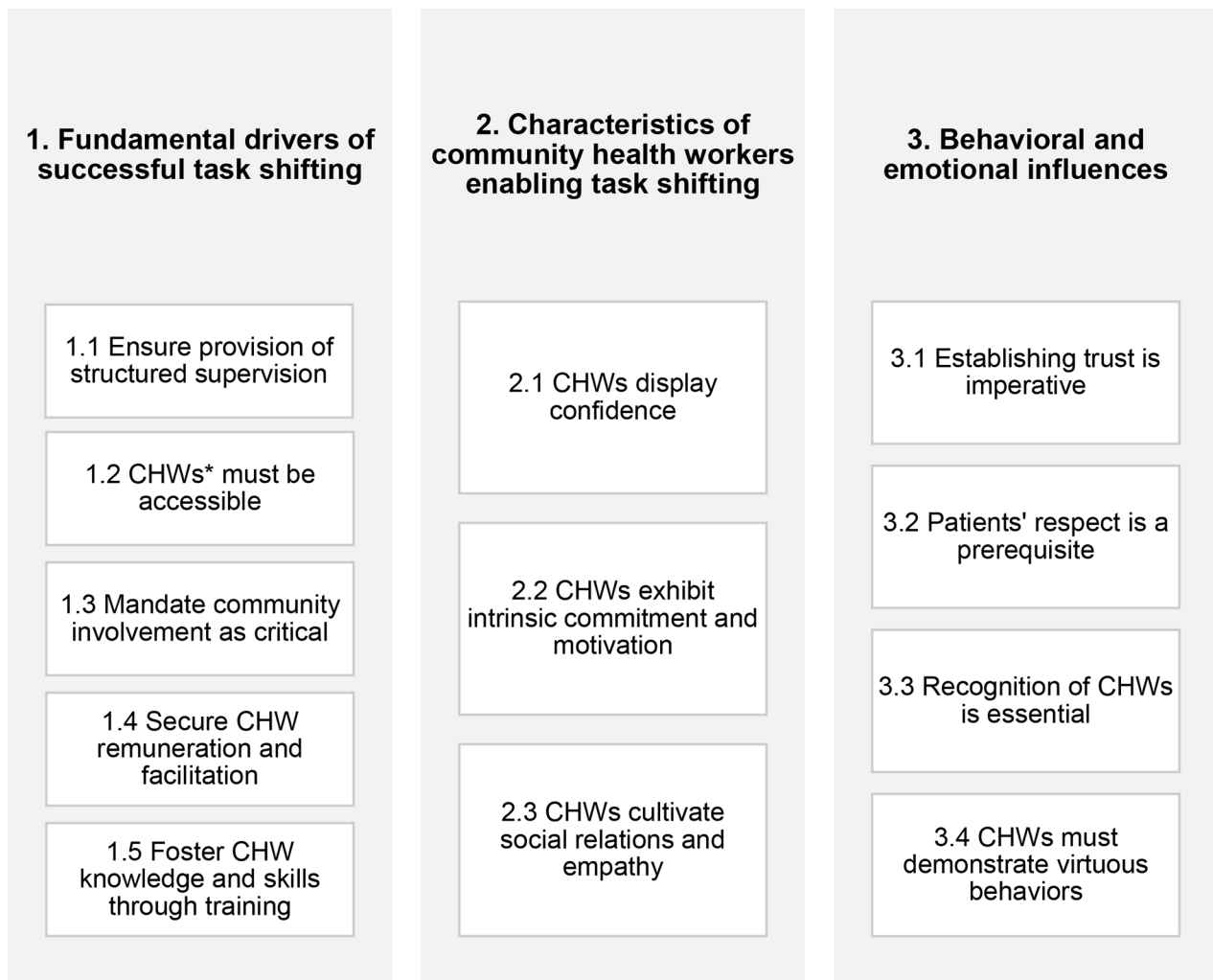
#### Ensure provision of structured supervision

Participants agreed that a clear supervision structure needs to be in place to communicate challenges and successes. As HCPs argue, CHWs should have clear targets that are monitored while roles are clearly defined and documented. Patients emphasized that supervision is key in successful task shifting.

*'At community level, we also come to monitor and supervise and see that [CHWs] (...) are actually working within their defined roles.'* (HCP-12)

*'CHWs can ably do the screening, identification and referral of diabetic patients if there is close supervision and monitoring (...).'* (Patient, FGD-10)

Patients laid out that supervision should also include random supervision visits in the community. Moreover, following up with screened patients to leverage their experiences and recommendations towards improving the program.



**Fig. 1** Categories and themes as emerged from the qualitative data  
 \*Community health workers

*'I would arrange some field visits whereby spot checks will done; interaction with patients who have received CHWs' services as an evaluation exercise (...) from the community outlook.'* (Patient, FGD-05)

Regular performance reviews ensure CHWs adhere to guidelines. CHWs perceived supervision and feedback on screening targets as a mode of motivation. Field visits by the supervisors were displayed as positive by CHWs.

*'Telling us how everyone has performed or how many everyone has [referred] could (...) give us more encouragement and more morale (...).'* (CHW-02)

**CHWs must be accessible**

This theme was dominated by patients' voices. CHWs can provide care at the household level, making disease monitoring more accessible and flexible in remote

villages. As a patient demonstrated, this can save patients tremendous transport costs.

*'Our villages are very far away from health facilities, so having a CHW (...) will be extremely important because she will check on me and advise me to go to the health center earlier (...).'* (Patient, FGD-08)  
*'Transport is very hectic. So having got someone in our community who can do the job, it will save us the more [money].'* (Patient, FGD-05)

Nonetheless, this theme also featured negative aspects on accessibility as patients had high expectations towards the availability and reliability of CHWs. Patients raised the concern that they need to be able to follow their own work schedules and often find CHWs unavailable when services are needed.

*'They are not reliable in terms of their availability at their homes. In most cases they are occupied with other kinds of work.' (Patient, FGD-10)*

To overcome this challenge, a patient suggested that having a dedicated workplace that is separate from the CHWs' homes would also make it easier for the CHW to separate family and work and formalize the CHWs' work.

*'I [would] establish a special place where this CHW will be found within the community. I [would] not put this place at his / her home because this responsibility will interfere [with] her family affairs and privacy. This person [would] have defined days to do home visits and days to be at his / her office.' (Patient, FGD-08)*

#### **Mandate community involvement as critical**

The involvement of local leaders was identified as fundamental in task shifting. Local leaders are individuals who offer leadership to their respective communities. They are chosen from among their peers to represent the needs and interests of the community they serve. Local leaders can support CHWs in the program implementation by introducing them to the community. Introductions to the community leader before undertaking activities within a community builds trust between CHWs and community members and nourishes long-term program success. Moreover, local leaders can support CHWs in identifying remote patients.

*'Community leaders (...) are influential people, (...) including the religious leaders [and] cultural leaders (...). Someone might be in community without a title but (...) when he says something (...), people will follow him.' (HCP-02)*

Furthermore, patients appear to trust the local leaders in the selection of CHWs but also in the selection of community programs. As a patient described, community meetings provide a platform for discussing challenges.

*'There should be a village meeting about some of the complaints we have made. (...) On a Sunday, we seat with [the local chairman] in presence of the CHWs.' (Patient, FGD-01)*

#### **Secure CHW remuneration and facilitation**

HCPs argued that NCD screening is complex, therefore CHWs need to be formally compensated. An allowance can motivate CHWs in performing their roles, even

when they act as volunteers. The suggested amount was between USD 25 and USD 100 per month.

*'They need to be paid (...). [It] will influence someone to concentrate on this assignment other than giving it divided attention when looking for additional money to meet their financial demands.' (HCP-04)*  
*'Their work is very complicated because it is not easy to move door to door (...); they deserve to get some allowance.' (HCP-08)*

A patient demonstrated that CHWs need to support their own lives and families, while expected to prioritize their work and to present a certain level of NCD knowledge. This expected level of education in handling NCDs should be compensated adequately.

*'There should [be] a motivation (...) so that [CHWs] don't just work for free (...) So that they know that even if the shoe they are using to walk gets old, they can repair it, if the cloth gets dirty they can be able to buy some soap.' (Patient, FGD-09)*

Additionally, CHWs need to be given the required equipment to screen for NCDs. Patients acknowledged that other expenses such as transport and phone communication should also be covered to ensure they can fulfill their roles.

*'I would want them to get the [screening] machines. (...) To see [my] status on diabetes and hypertension.' (Patient, FGD-03)*  
*'This person [CHW] will need (...) access to easy transport means. Secondly; (...) a mobile phone for communication. Thirdly; (...) some monthly allowance that will motivate him / her to work.' (Patient, FGD-08)*

Working while not being able to fulfill basic needs such as eating due to financial constraints limits CHWs in performing their roles.

*'Being in field and you're worried on what to eat, we can't deliver to our maximum.' (CHW-05)*

Furthermore, CHWs described that at times the community expects them to support vulnerable patients by enabling transport to the nearest hospital, which reinforces the need for securing adequate facilitation and remuneration.

*'There is need to add on my transport that will enable me to transport some patients found in poor living conditions. Some patients especially the old*

*ones find a challenge of moving (...) to health centers for medication.’(CHW-04)*

#### **Foster CHW knowledge and skills through training**

Participants agreed that CHWs need to be intensively trained prior to task shifting assignment. Training was regarded as essential for ensuring adherence to medical standards. As a HCP emphasized, continuous training was identified as crucial, including to ensure that CHWs know how to properly use equipment in the field.

*‘They need to be trained well enough (...). Also give them [CHWs] refresher courses wherever gaps are identified.’ (HCP-12)*

In addition, CHWs and HCPs emphasized the need to strengthen patient communication and lifestyle counseling skills so CHWs can approach community members comfortably.

*‘[Train] how to approach someone because if the [CHW] does not know how to talk well with people, [some] may not allow [the CHWs] to talk to them.’ (HCP-03)*

Patients laid out that providing communication skills as part of training is important, even before knowing how to operate the equipment.

*‘I [would] train CHWs on how best to handle NCD patients. I [would] tell them to receive patients with happiness. Then I [would] train them on how to use those machines.’ (Patient, FGD-02)*

Patients’ negative views on CHWs’ current knowledge and skills augmented the requirement for training as they presented doubts whether CHWs have the necessary skills to screen for NCDs.

*‘They [CHWs] had no knowledge on NCDs and they couldn’t help NCD patients (...). These CHWs lack the required knowledge and skills to do this work.’ (Patient, FGD-02)*

#### **Characteristics of community health workers enabling task shifting**

This category was heavily influenced by CHW responses and supported by patients and HCPs, while the perspectives on confidence and intrinsic commitment and motivation were exclusively shaped by the responses of CHWs.

#### **CHWs display confidence**

CHWs portrayed a high level of confidence towards their abilities on patient communication and performing the outlined tasks of screening and referring hypertensive and diabetic patients. Being trained and appreciated by the community further underlines their confidence in performing their roles.

*‘Being with patients helped boost my confidence.’ (CHW-02)*

*‘I told you about the training I received, I am qualified I understand things and if it’s time to screen a diabetes patient there is nothing to stop me.’ (CHW-06)*

Beyond screening for diseases, CHWs acknowledged their good communication skills. One CHW stated they have the capacity to create a linkage between the patient and the health centers.

*‘We are informed. (...) we are like a linkage between patients and health workers.’ (CHW-12)*

*‘Through the training, (...) I have acquired good communication skills, which help me to convince the patients to seek for health attention.’ (CHW-09)*

#### **CHWs exhibit intrinsic commitment and motivation**

CHWs demonstrated a high degree of motivation, some even working unpaid. They thrive to empower patients to know their disease status.

*‘I am a CHW and all work is in the community. Personally, I feel motivated to help other people to live a healthy lifestyle.’ (CHW-05)*

The acquired knowledge from training further motivates CHWs to perform their work while being committed to helping patients.

*‘The salary and knowledge they give me, [I] am satisfied because brain [knowledge] is power.’ (CHW-06)*

The role of CHWs makes them feel needed by the community and provides a sense of self-worth, a position where their voices are heard. Also meeting new community members motivates CHWs to perform in their roles. They aim to be a role model for communities.

*‘I make sure that I happen to be the first example before telling others what to do.’ (CHW-09)*

CHWs perceived it as an honor to act as a health worker. The changes on people’s health is a major motivation.



*'I am happy that there are many people who received our services because of this program and without it; I think they would have been left out.'* (CHW-07)

In addition, the program influences CHWs and their own families to change their lifestyle habits and to act as a multiplier through the community.

*'I have become a doctor of my life. I have changed my healthy lifestyle. I cannot sleep without a mosquito net; I cannot treat my child without examination (...).'* (CHW-07)

### **CHWs cultivate social relations and empathy**

Being born in the areas they serve, CHWs are known members of the community. If CHWs are assigned to an area and the community is familiar with them, it will simplify entering the community and communication as a HCP describes.

*'CHWs are in the communities. They live with the subjects; they will understand them better (...).'* (HCP-12)

Patients perceived CHWs as equals, following the same occupation as community members while showing commitment and empathy towards their work.

*'They are not bad, they are like us, because they are farmers like us and you can't differentiate them from us.'* (Patient, FGD-04)

*'CHWs are so transparent and interested in the kind of work they do. This is because they show us love whenever we seek for their health advice (...). I think they behave this way because they come from our communities.'* (Patient, FGD-06)

HCPs and patients argued that CHWs need to be empathetic when for instance delivering bad news to not create worries among patients.

*'We need someone who is empathetic towards people's health.'* (HCP-04)

Several patients suggested that a CHW should also be a NCD patient as empathy towards the patients would be stronger.

*'There is need to recruit a CHW who is a patient of NCD. This person will greatly support us because he will know the magnitude of NCDs that his friends are fighting with.'* (Patient, FGD-02)

### **Behavioral aspects and emotional influences**

The following results were firmly shaped by patients, who raised needs and concerns that were partly supported by CHWs or HCPs responses.

#### **Establishing trust is imperative**

HCPs emphasized the need to engage local leaders to build trust. A CHW supported this notion by sharing her personal experience as a counsellor.

*'We engage local leaders and CHWs to recommend teams of people they trust.'* (HCP-04)

*'For the village where I come from, people appreciate me (...). Me, [I] am trusted because [I] am now the woman counsellor where I come from.'* (CHW-06)

CHWs and patients agreed that carrying medical equipment helps CHWs in building trustful relationships with patients.

*'Our gadgets and equipment created confidence in community members to accept the exercise.'* (CHW-07)

*'If the CHW is well equipped, I will send my children to call him (...).'* (Patient, FGD-02)

In addition, CHWs laid out that being affiliated to an institution and receiving the support of medical doctors will nurture trust.

*'We need to have effective communication with medical doctors to give referred patients special attention and in the process, our patients will have confidence in us as community health workers.'* (CHW-11)

In contrast, patients raised specific concerns about situations that may inhibit trust and the willingness to participate in the program, which underlines that establishing trust is essential. Patients presented doubts about the capability or qualification of CHWs in handling medical devices and the mode of supervision.

*'Those [screening] machines (...); she [the CHW] may not know how to convert and know if it is (...) in normal range. I will run away (...) because [the CHWS] don't know what they are doing.'* (Patient, FGD-03)

A negative experience or personal disagreement with CHWs may lose patients' trust and impact their health seeking behavior. To support this discussion, some patients even stated that they "despise" people from the community.

*'If I have personal conflict with that CHW, I cannot go there; I would rather die.' (Patient, FGD-05)*

Patients presented concerns that CHWs need to keep the health status of patients confidential and not expose it to the community. In addition, patients perceived CHWs' corrupted behaviors as challenging.

*'I cannot allow a CHW to measure my blood sugar if s/he is not ready to keep my results confidential. (...) S/he will expose my diabetic results [to] the entire village (...). But if the CHW is good at keeping secrets; then I will be ready to participate (...).'* (Patient, FGD-10)

*'It is very bad to hear that some CHW ask for money from patients.' (Patient, FGD-10)*

#### **Patients' respect is a prerequisite**

Respect was described as a major driver of a programs' success.

*'It takes a lot of understanding (...). That can only be extended to the community members by the people who live with them; whom they believe in; who actually they respect. So that is the vote for CHWs.' (HCP-12)*

Yet, (young) age was identified as a main barrier to respect by HCPs and CHWs, posing a potential challenge to program implementation.

*'And age, some look to be too young that some people may despise them.' (HCP-03)*

*'I think this [lack of respect] results from the mere fact that some of them are older than us, big, tall as opposed to us who are small bodied.' (CHW-01)*

Underlining this argument, a patient presents that being familiar with a CHW and their upbringing as a barrier to respect. Similarly, a patient stated that knowing a CHWs main occupation such as farming reduces respect.

*'It is very hard for people to respect someone who comes from within.' (Patient, FGD-02)*

*'Even when he brings out a certificate that I am from training, you who was there digging beans [farming]? I cannot.' (Patient, FGD-04)*

To address this challenge, patients recommended to assign CHWs to villages where they were not brought up.

*'Now during fieldwork, I will use CHWs of village A to work in village B and vice versa. This will help all*

*teams to be respected in those areas because they will be new to them.' (Patient, FGD-02)*

#### **Recognition of CHWs is essential**

HCPs reported that being recognized can drive task shifting success through motivation. Being known in and appreciated by the community empowers CHWs and influences their sense of belonging.

*'[Providing] a sense of belonging and empowerment in the community. (...) They become [a] point of reference in the community (...) that come[s] with prestige.' (HCP-10)*

A CHW describes that the recognition from the community increased the responsibility towards their work.

*'I became responsible with this job and got honor in this job because people call me a health worker (...).'* (CHW-10)

#### **CHWs must demonstrate virtuous behaviors**

For successful task shifting, patients stated that CHWs need to be proactive, honest and act as role models. Portraying acceptable social behaviors for instance towards alcohol consumption was identified as important by patients.

*'Emphasizing them to portray good behaviors within their communities by avoiding getting involved in bad activities like overdrinking which will influence them to misbehave.' (Patient, FGD-10)*

To further highlight the need for virtuous behaviors, participants described potential misbehaviors of and negative experiences with CHWs that may inhibit the success of a task shifting program. One patient described that a CHW took advantage of a vulnerable situation by asking for physical favors.

*'Vibing [Pursuing a romantic relationship with] patients, (...) they ask for love and say if you do like this and that, it will be easy for you. Have you gotten it?' (Patient, FGD-09)*

Underscoring this narrative, patients emphasized that virtuosity encompasses that CHWs focus on providing care rather than prioritizing their income.

*'In some communities, people lost hope in their CHWs because they are negligent and they are unsupportive.' (Patient, FGD-06)*

*'There are [CHWs] who (...) came to make money not to care about the sick.' (Patient, FGD-01)*

In line to this, patients criticized nepotism and misbehaviors, especially in the dispersion of medication, which as patients argue, CHWs give at times first to relatives and friends.

*'There is need to select a well behaved and honest person who will not steal the public medicine.' (Patient, FGD-08)*

## Discussion

The study investigated the principles for introducing task shifting to CHWs. We thereby focused on task shifting screening and referral for hypertension and diabetes in rural Uganda, exploring the perceptions of patients, CHWs and HCPs. Based on these findings, we argue that the success of a task shifting program builds on a set fundamental programmatic structures, while certain CHW characteristics as well as behavioral and socioemotional influences are not to be neglected. Hence, moving beyond paying attention to only programmatic structures to a holistic approach that considers CHW characteristics as well as patients' concerns through the construction of longitudinal relationships is critical.

Firstly, fundamental underpinnings as outlined and confirmed by all participant groups surround training, supervision, remuneration, community involvement and ease communities' access to care through CHWs. Roles and tasks need to be clearly defined and monitored by an institution or health center as the World Health Organization guideline on health policy and system support to optimize CHW programs underlines [29]. These programmatic themes were investigated in previous studies in a diverse set of contexts. They were presented as vital to ensure continuity and adherence to standards while including training on patient communication and proper referral, which is consistent with a study performed in the United States [30]. Our results match previous findings that indicate, anchoring the programs in the community by working with trusted leaders will enable community trust and limit patient concerns as access to care advances [11, 29, 31]. Transport facilitation was repeatedly described as a crucial component of remuneration and was perceived as a burden when having to come out of CHWs pockets, as also a former study conducted in Uganda describes [20]. A previous study conducted in the same rural Ugandan community displays the concerns of patients and HCPs towards CHWs' capability in managing NCDs [32]. Complementing these previous findings, patients in our study voiced their concerns of current limited CHW knowledge and skills in screening

and referring for NCDs. However, participants in our study stated trust and support of a task shifting program if training and supervision structures are in place. In addition, the previous study emphasizes the need of introducing salaries for CHWs' motivation [32]. HCPs and patients underlined this finding by arguing for monetary compensation of CHWs in task shifting. While we argue, emphasized by our study results, that CHWs need to be formally compensated, facilitated and supervised to perform their roles, the introduction of management structures, supervision and regular trainings throughout CHW programs faces major challenges, as two Ugandan studies acknowledge [2, 19]. Limited funding for Primary Health Care programs in Uganda and uncertainty regarding the cost of CHW programs may inhibit the potentials of continuous facilitation [33]. For the successful introduction of task shifting to CHWs and to address participant concerns, our study emphasizes the need to develop sustainable policy mechanisms that ensure the ongoing training and financial compensation of CHWs. Our findings indicate that these structures will establish the essential community trust.

Secondly, all participant groups presented similar individual characteristics of CHWs that may act as program enablers, while CHWs themselves manifested the findings through personal experiences. Consistent with other findings from Uganda, CHWs presented a high degree of intrinsic commitment and motivation that was nurtured by being recognized in the community and seeing a direct impact of their activities [20, 34]. Confidence of CHWs was identified as a key enabler in providing services, which is in line with discoveries from Mozambique and Indonesia [35, 36]. Social relations with community members or the close-ties to the community were perceived as an enabler but also as a potential barrier by participants. On the one hand, being well known by community members creates a gateway where patients trust CHWs from their own community and feel comfortable in accepting offered services. In contrast, participants described the restrictions and barriers such close ties create. CHWs of a younger age than patients, who are well known within a village since their upbringing, may nurture doubts. Patients often questioned whether younger CHWs are able to fulfill their medical roles. These barriers match a study conducted in Indonesia, where CHWs below an age of 30 were perceived as less trusted and as lacking skills [36]. Hence the closeness to a community may be perceived as a driver but could also be a barrier to CHW-led programs. To mitigate this concern, we recommend undertaking formative research that explores community perceptions prior to program implementation. By taking into account the community's needs and concerns, CHWs may be stationed in their own home villages or

assigned to areas where households have less familiarity with their personal backgrounds.

Thirdly, emotions and behaviors were identified as soft facts, driving or halting a task shifting programs' success. These findings were mostly derived from patients' interviews, which portrayed high expectations towards CHWs' performance and behavior beyond working hours, matching findings from a former Ugandan study [31]. A recent article presents the communities' expectation of professionalizing the CHW role, training and continuous education [37]. How a CHW is perceived and respected within a community appears as a major indicator of program acceptance. Patients in our study anticipate CHWs to be readily available, empathetic, and competent to serve their health needs while acting as role models in the community. Empathetic health care interventions have proven to create better patient experiences and enhance clinical outcomes [38]. Finally, several patients raised the concern of keeping medical information confidential and therefore distrusting CHWs. Similar results were found in a qualitative study conducted in Western Kenya, where the authors suggest that poor confidentiality may hinder the effectiveness of a chronic disease management program [39].

In Fig. 2 findings are presented in accordance to their level of categorization. It displays the principles when building a CHW-led task shifting program. As outlined above, interventions are built on programmatic, fundamental drivers, further nurtured by CHWs characteristics and finally influenced by socioemotional and behavioral aspects. While the last are strongly dominated by patients' voices and concerns, CHWs and HCPs appeared less aware of these emotional and behavioral influences that may halt a program's success. We therefore argue that all stakeholders, namely patients, CHWs, as well as HCPs, need to collaborate and listen to patients' needs to integrate task shifting successfully within a healthcare system.

In our framework (Fig. 2), we move beyond programmatic components and argue that the establishment of trust-based relationships and communication is a key component of task shifting to CHWs. Trust is built through long-term relationships that do not only focus on household visits carried out by CHWs, but reflect their holistic standing within a community. Several patients reported negative experiences with or observations of CHWs, which may inhibit trust. However, patients appeared open to CHWs services when supervision and training structures are in place and transparently managed. This indicates that these layers are linked and need to be addressed holistically throughout the task shifting program design and implementation. Program implementers and policymakers need to look beyond the structural outlines of an intervention and investigate the

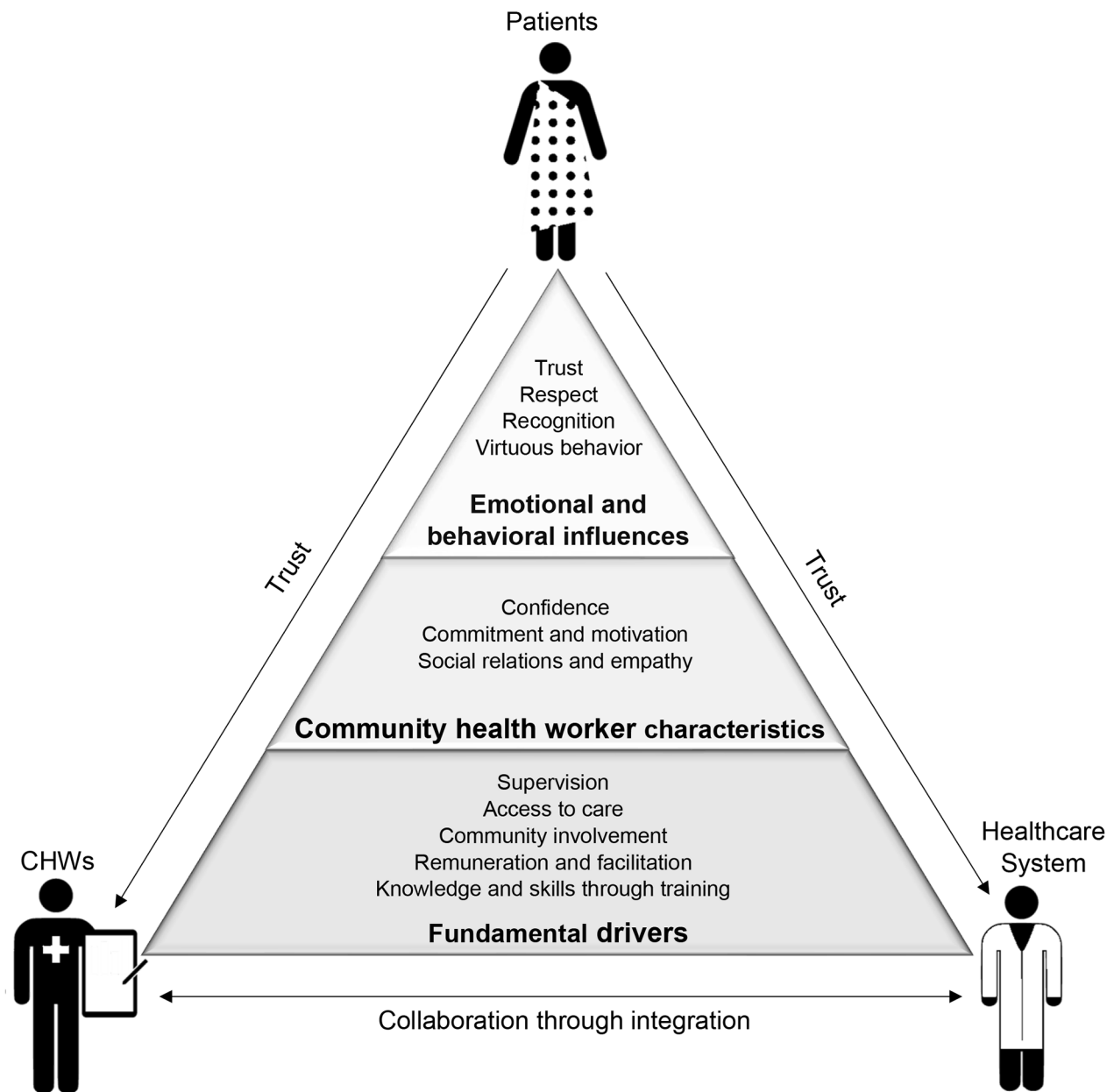
social spheres that may challenge community perceptions of trust and the acceptance of such services. A study from South Africa argues that trust can be enhanced through the integration of CHWs in the existing health system such as clinics [40]. As trustful relationships between patients and HCPs were identified in our study, this patient trust may be transferred to CHWs.

This study has a few limitations that are worth noting. Firstly, the research site is unique as it has several years of experience in running community-based screening and education programs. As a qualitative study, this unique experience may make it difficult but not impossible to translate these findings to other rural or urban areas in Uganda or Sub-Saharan Africa. CHWs interviewed presented a unique sample as they were all attached to ACCESS Uganda and previously received training on NCDs. The inclusion of only one medical doctor may have influenced the production of knowledge. As the CHWs are well-known community members, patients' answers may have been shaped by interpersonal relationships. However, the participants were ensured of confidentiality and encouraged to express their views freely.

The heterogeneous international research team featured "insiders" that share similar attributes with the participants of the study as well as "outsiders" that do not belong to the participating group [41]. Data collection may have been influenced through the research assistants "insider" role as participants may have experienced a heightened sense of ease in the articulation of specific subject matter as a result of common traits and languages with interviewers. Acknowledging research reflexivity, the study outcome of a qualitative study is depending on the researchers' educational background, profession and even the coding method, which may have concentrated on certain areas of emphasis [42]. Through the collaboration of "insiders" and "outsiders" in the data analysis and interpretation we aimed to achieve a balance in gender, professions and countries of origins. Data analysis and interpretation were driven with the support of "insider" researchers from Uganda; there was no further attempt to validate themes with participants, which poses a limitation of the study.

## Conclusion

CHWs are viewed as a useful resource when task shifting NCD screening and referral for hypertension and diabetes in rural Uganda. The participants in this study – patients, CHWs and HCPs – laid out needs and prerequisites that increase understanding of what drives successful task shifting implementation. In addition, aspects that may serve as barriers for task shifting were identified. The study implies that it is necessary to move beyond the sole hard facts of task shifting to CHWs regarding program design and management. As the



**Fig. 2** Principles for designing task shifting to community health workers

established framework presents, building long-term relationships based on trust and collaboration is imperative when establishing community-based task shifting interventions. By addressing fundamental drivers, beneficial perceived CHW characteristics and creating virtuous behavioral influences and positive emotions, CHW programs can flourish and act as a driver against the global health workforce shortage. Further research and policy support is necessary to develop sustainable financing mechanisms for the implementation and scaling-up of such interventions.

**Abbreviations**

ACCESS	African Community Center for Social Sustainability
CHW	Community Health Worker
Diabetes	Diabetes Mellitus
FGD	Focus Group Discussion
HCP	Healthcare Professional
HIV	Human Immunodeficiency Virus
IDI	In-depth Interview
LMIC	Low- and Middle-Income Country
NCD	Non-Communicable Disease
VHT	Village Health Teams
WHO	World Health Organization

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-023-15704-w>.

Supplementary Material 1

### Acknowledgements

The data collection was supported by Reveal Research Centre Ltd, Kampala, Uganda. We thank the research assistants for contributing their time and expertise to our study.

### Authors' contributions

RI, RM, IW, FK, BEB, TS, RK and CKN conceived and designed the study. RI, RM, IW, HM, IS, JG, FK, TS, RK and CKN conducted the study. RI, RM and CKN analyzed the data. RI wrote the first draft of the manuscript and prepared all figures and tables. RI, RM, TS, TLR, BEB, JG, FK, RK and CKN critical revised the manuscript. All authors reviewed the manuscript.

### Funding

This study was funded by the Else Kröner-Fresenius-Stiftung (2019\_HA178) and the Makerere University Research Innovation Fund (MAKRIF/DVCF/026/20). The funding agencies had no role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript. Open Access funding enabled and organized by Projekt DEAL.

### Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

All methods were carried out in accordance with relevant guidelines and regulations. Ethical approval for this study was granted by the Makerere University School of Biomedical Sciences Research and Ethics Committee (SBS-REC 874) and the Uganda National Council of Science and Technology (SS821ES). All participants provided written informed consent to participate in the study and agreed to their interview data being published anonymized.

#### Consent for publication

This manuscript does not contain any individual person's data in any form.

#### Competing interests

The Authors declare that there is no conflict of interest.

#### Author details

<sup>1</sup>Department of Nephrology and Medical Intensive Care, Charité - Universitätsmedizin Berlin, Berlin, Germany

<sup>2</sup>Department of Community Health and Behavioural Sciences, School of Public Health, Makerere University College of Health Sciences, Makerere University, Kampala, Uganda

<sup>3</sup>African Community Center for Social Sustainability, Nakaseke, Uganda

<sup>4</sup>MRC/UVRI and LSHTM Uganda Research Unit, Kampala, Uganda

<sup>5</sup>London School of Hygiene and Tropical Medicine, London, UK

<sup>6</sup>Department of Medicine, Johns Hopkins University School of Medicine, Baltimore, MD, USA

<sup>7</sup>Department of Internal Medicine, Yale School of Medicine, New Haven, CT, USA

<sup>8</sup>Department of Pulmonary, Critical Care and Sleep Medicine, University of Miami, Coral Gables, USA

<sup>9</sup>Department of Physiology, Department of Internal Medicine, Makerere University College of Health Sciences, Kampala, Uganda

Received: 6 September 2022 / Accepted: 18 April 2023

Published online: 12 May 2023

## References

- Rifkin SB. Alma Ata after 40 years: Primary Health Care and Health for All-from consensus to complexity. *BMJ Glob Health* 2018, 3(Suppl 3).
- Baine SO, Arabat K. A scoping study on task shifting; the case of Uganda. *BMC Health Serv Res* 2014, 14(184).
- World Health Organization. : Global Health Observatory (GHO) Data NCD mortality and morbidity. In.; n.d.
- World Health Organization. :Hypertension Fact Sheet. In.; 2021.
- World Health Organization. :Diabetes. In.; 2021.
- Schwartz JI, Guwatudde D, Nugent R, Kiiza CM. Looking at non-communicable diseases in Uganda through a local lens: an analysis using locally derived data. *Global Health*. 2014;10:77.
- Guwatudde D, Mutungi G, Wesonga R, Kajjura R, Kasule H, Muwonge J, Ssenono V, Bahendeka SK. The Epidemiology of Hypertension in Uganda: Findings from the National Non-Communicable Diseases Risk Factor Survey. *PLoS ONE* 2015, 10(9).
- Bahendeka S, Wesonga R, Mutungi G, Muwonge J, Neema S, Guwatudde D. Prevalence and correlates of diabetes mellitus in Uganda: a population-based national survey. *Trop Med Int Health*. 2016;21(3):405–16.
- Jeet G, Thakur JS, Prinja S, Singh M. Community health workers for non-communicable diseases prevention and control in developing countries: evidence and implications. *PLoS ONE*. 2017;12(7):e0180640.
- Chiwanga FS, Njelekela MA, Diamond MB, Bajunirwe F, Guwatudde D, Nankya-Mutyoba J, Kalyesubula R, Adebamowo C, Ajayi I, Reid TG et al. Urban and rural prevalence of diabetes and pre-diabetes and risk factors associated with diabetes in Tanzania and Uganda. *Glob Health Action* 2016, 9.
- O'Neil DS, Lam WC, Nyirangirimana P, Burton WB, Baganizi M, Musominani S, Bareke D, Paccione GA. Evaluation of care access and hypertension control in a community health worker driven non-communicable disease programme in rural Uganda: the chronic disease in the community project. *Health Policy Plan*. 2016;31(7):878–83.
- O'Donovan J, Stiles CE, Sekimpi D, Ddumba I, Winters N, O'Neil E Jr. Potential challenges of implementing the Community Health Extension Worker programme in Uganda. *BMJ Glob Health* 2018, 3(4).
- Ministry of Health Uganda. Village Health Team Strategy and operational guidelines. Ministry of Health Uganda; 2010.
- Joshi R, Thrift AG, Smith C, Praveen D, Vedanthan R, Gyamfi J, Schwalm JD, Limbani F, Rubinstein A, Parker G et al. Task-shifting for cardiovascular risk factor management: lessons from the Global Alliance for Chronic Diseases. *BMJ Glob Health* 2018, 3(Suppl 3).
- Joshi R, Alim M, Kengne AP, Jan S, Maulik PK, Peiris D, Patel AA. Task shifting for non-communicable disease management in low and middle income countries—a systematic review. *PLoS ONE* 2014, 9(8).
- Lehmann U, Van Damme W, Barten F, Sanders D. Task shifting: the answer to the human resources crisis in Africa? *Hum Resour Health*. 2009;7:49.
- Jafar TH, Gandhi M, de Silva HA, Jehan I, Naheed A, Finkelstein EA, Turner EL, Morisky D, Kasturiratne A, Khan AH, et al. A community-based intervention for managing hypertension in Rural South Asia. *N Engl J Med*. 2020;382(8):717–26.
- Musoke D, Atusingwize E, Ikhile D, Nalinya S, Ssemugabo C, Lubega GB, Omodara D, Ndejo R, Gibson L. Community health workers' involvement in the prevention and control of non-communicable diseases in Wakiso District, Uganda. *Global Health*. 2021;17(1):7.
- Musoke D, Ndejo R, Atusingwize E, Ssemugabo C, Ottosson A, Gibson L, Waiswa P. Panacea or pitfall? The introduction of community health extension workers in Uganda. *BMJ Glob Health* 2020, 5(8).
- Ndejo R, Musinguzi G, Nuwaha F, Wanyenze RK, Bastiaens H. Acceptability of a community cardiovascular disease prevention programme in Mukono and Buikwe districts in Uganda: a qualitative study. *BMC Public Health*. 2020;20(1):75.
- Pandya S, Hamal M, Abuya T, Kintu R, Mwanga D, Warren CE, Agarwal S. Understanding Factors That Support Community Health Worker Motivation, Job Satisfaction, and Performance in Three Ugandan Districts: Opportunities for Strengthening Uganda's Community Health Worker Program. *Int J Health Policy* 2022.
- Siddharthan T, Kalyesubula R, Morgan B, Ermer T, Rabin TL, Kayongo A, Munana R, Anton N, Kast K, Schaeffner E et al. The rural Uganda non-communicable disease (RUNCD) study: prevalence and risk factors of self-reported NCDs from a cross sectional survey. *BMC Public Health* 2021, 21(1).
- Ingenhoff R, Nandawula J, Siddharthan T, Ssekitooleko I, Munana R, Bodnar BE, Weswa I, Kirenga BJ, Mutungi G, van der Giet M, et al. Effectiveness of a community health worker-delivered care intervention for hypertension control

- in Uganda: study protocol for a stepped wedge, cluster randomized control trial. *Trials*. 2022;23(1):440.
24. Uganda Bureau of Statistics. :National Population and Housing Census. In.; 2022.
  25. Uganda Bureau of Statistics: National Population and Housing Census. 2014, Area Specific Profiles Series - Nakaseke District. In. Kampala, Uganda; 2017.
  26. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Res Psychol*. 2006;3(2):77–101.
  27. Patton MQ. *Qualitative evaluation and research methods*, vol. 2nd edition: Sage Publications; 1990.
  28. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol* 2013, 13(117).
  29. World Health Organization. : WHO guideline on health policy and system support to optimise community health worker programmes. In.: World Health Organization; 2018.
  30. Lewis CM, Gamboa-Maldonado T, Carlos Belliard J, Nelson A, Montgomery S. Patient and community health worker perceptions of Community Health Worker Clinical Integration. *J Community Health*. 2019;44(1):159–68.
  31. Singh D, Cumming R, Negin J. Acceptability and trust of community health workers offering maternal and newborn health education in rural Uganda. *Health Educ Res*. 2015;30(6):947–58.
  32. Chang H, Hawley NL, Kalyesubula R, Siddharthan T, Checkley W, Knauf F, Rabin TL. Challenges to hypertension and diabetes management in rural Uganda: a qualitative study with patients, village health team members, and health care professionals. *Int J Equity Health*. 2019;18(1):38.
  33. Masis L, Gichaga A, Zerayacob T, Lu C, Perry HB. Community health workers at the dawn of a new era: 4. Programme financing. *Health Res Policy Syst* 2021, 19(Suppl 3).
  34. Brunie A, Wamala-Mucheri P, C CO, Akol A, M MC, Bufumbo L, Weaver M. Keeping community health workers in Uganda motivated: key challenges, facilitators, and preferred program inputs. *Global health science and practice*. 2014;2(1):103–16.
  35. Mabunda D, Oliveira D, Sidat M, Cournos F, Wainberg M, Mari JJ. Perceptions of Community Health Workers (CHW) on barriers and enablers to care for people with psychosis in rural Mozambique: findings of a focus group discussion study using the capability, opportunity, motivation and Behaviour framework (COM-B framework). *Hum Resour Health*. 2022;20(1):44.
  36. Surjaningrum ER, Jorm AF, Minas H, Kakuma R. Personal attributes and competencies required by community health workers for a role in integrated mental health care for perinatal depression: voices of primary health care stakeholders from Surabaya, Indonesia. *Int J Ment Health Syst*. 2018;12:46.
  37. Schleiff MJ, Aitken I, Alam MA, Damtew ZA, Perry HB. Community health workers at the dawn of a new era: 6. Recruitment, training, and continuing education. *Health Res Policy Syst*. 2021;19(Suppl 3):113.
  38. Nembhard IM, David G, Ezzeddine I, Betts D, Radin J. A systematic review of research on empathy in health care. *Health Serv Res* 2022.
  39. Rachlis B, Naanyu V, Wachira J, Genberg B, Koech B, Kamene R, Akinyi J, Braitstein P. Community Perceptions of Community Health Workers (CHWs) and Their Roles in Management for HIV, Tuberculosis and Hypertension in Western Kenya. *PLoS ONE* 2016, 11(2).
  40. Tseng YH, Griffiths F, de Kadt J, Nxumalo N, Rwafa T, Malatji H, Goudge J. Integrating community health workers into the formal health system to improve performance: a qualitative study on the role of on-site supervision in the South African programme. *BMJ Open* 2019, 9(2).
  41. Braun V, Clarke V. *Successful qualitative research: a practical guide for beginners*. 1 ed. London: SAGE; Los Angeles; 2013.
  42. Saldana J. *The Coding Manual for qualitative researchers*. Los Angeles, CA: Sage Publications; 2009.

#### Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## **Curriculum Vitae**

Mein Lebenslauf wird aus datenschutzrechtlichen Gründen in der elektronischen Version meiner Arbeit nicht veröffentlicht.





## Publication list

**Ingenhoff, R.**, Munana, R., Weswa, I., Gaal, J., Sekitoleko, I., Mutabazi, H., Bodnar, B. E., Rabin, T. L., Siddharthan, T., Kalyesubula, R., Knauf, F., & Nalwadda, C. K. (2023). Principles for task shifting hypertension and diabetes screening and referral: a qualitative study exploring patient, community health worker and healthcare professional perceptions in rural Uganda. *BMC Public Health*, 23(1), 881. [doi:10.1186/s12889-023-15704-w](https://doi.org/10.1186/s12889-023-15704-w) (IF 4.545)

**Ingenhoff, R.**, Nandawula, J., Siddharthan, T., Sekitoleko, I., Munana, R., Bodnar, B. E., Weswa, I., Kirenga, B. J., Mutungi, G., van der Giet, M., Kalyesubula, R., & Knauf, F. (2022). Effectiveness of a community health worker-delivered care intervention for hypertension control in Uganda: study protocol for a stepped wedge, cluster randomized control trial. *Trials*, 23(1), 440. [doi:10.1186/s13063-022-06403-9](https://doi.org/10.1186/s13063-022-06403-9) (IF 2.754)

**Ingenhoff, R.**, Brewster, U., Rastegar, R., Kalyesubula, R., Knauf, F. (2021). Global Health Education in Nephrology: The Time has Come. *Journal of the American Society of Nephrology*. [doi:10.1681/ASN.2021060731](https://doi.org/10.1681/ASN.2021060731) (IF 10.121)

**R. Ingenhoff**, D. Ganten und F. Knauf (2021). Nephrology and Global Health? An interim report on the development of patient care in rural Uganda. *Journal. Nieren- und Hochdruckkrankheiten* 5, pp.194-199. [doi:10.5414/NHX02177](https://doi.org/10.5414/NHX02177) (IF nicht verfügbar)

## Acknowledgments

I want to express my deep gratitude to all the research participants who openly shared their thoughts and opinions, without whom this dissertation would not have been possible.

I am thankful to my supervisor, Prof. Dr. Felix Knauf, for his supportive guidance throughout the research and writing process, for providing me outstanding opportunities as well as his continuous attentiveness for my career development.

My heartfelt appreciation goes out to our Ugandan colleagues, including Dr. Richard Munana, who was always available to discuss research methods and data analysis, Ivan Weswa, who facilitated our research on the ground, and Dr. Christine Nalwadda, who provided invaluable guidance in qualitative analysis and community health.

I am also most thankful to all the exceptional researchers and partners in our international consortium from Makerere University, Johns Hopkins University, Yale University, University of Miami, and ACCESS Uganda who provided constant support and shaped my journey towards becoming a global health researcher.

I extend my sincerest thanks to the Else Kröner-Fresenius-Foundation for their support of our project, which served as the foundation of my doctoral research.

Lastly, I am grateful to my loving family and exceptional friends who have been a continuous source of support during both the triumphs and challenges throughout this journey. Djihed, your genuine interest in my work, steadfast presence and goal-focused mindset were instrumental to me, particularly during the difficult moments.