Addressing the "weakest link" in Community Health Worker Programmes: A Community-Based Participatory Research Approach towards the design, implementation and evaluation of a mobile-facilitated blended supervision programme in Uganda.



Application for the degree of Doctor of Philosophy in Education

Michaelmas Term 2020

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Funding

1. Doctoral Training Programme (DTP) Grant, Economic and Social Research Council (ESRC) (Grant reference number ES/P000649/1).
2. The Clarendon Scholarship Fund, University of Oxford.
3. British Medical Association (BMA) Charitable Arm (Grant date: November 2018).
4. The Peter Hansell Scholarship, The Royal Photographic Society (Grant date: March 2019).

Word count (*excluding table of contents, abstract, references and appendices*): 91,125

Declaration

I declare, to the best of my knowledge and belief, that no parts of this thesis have been accepted or submitted for the award of any other degree. I also declare that, to the best of my knowledge and belief, this document contains no material published by another person, unless explicit reference is made within the text.

Parts of this thesis (*for example, my literature review*) have previously been submitted, either in part, or in whole, for my Transfer of Status examination in 2018, Confirmation of Status examination in 2020, and/or for publications in peer-reviewed journals where I was the lead author. These submissions were all made while I was registered as a DPhil student at The University of Oxford and are my own original work where I was the primary contributor, both in terms of development of the content and writing of the manuscript.

Signed…… **Date**…….....

Acknowledgements

Completing my DPhil would not have been possible without the support of a collective. I therefore wish to acknowledge and thank those who have supported me throughout this journey of personal and professional growth.

Firstly, I wish to thank the Community Health Workers of Seeta Nazigo Parish for allowing me to spend time with you; working with you has been a true honour and privilege. You have taught me important lessons in humility, patience, friendship, and hard work. These are lifelong lessons I will take forward with me both in my professional and personal life. To my dear friend Godfrey Byamukama (one of the Community Health Workers who sadly passed away in May 2020). May he rest in peace.

To my colleagues and friends in Uganda who shared their time with me – Ken Kabali, Isaac Ddumba, Hadji Kalunji, Edward Mwebe Mutimba, Elizabeth Nalweyiso, Henry Mugabe, Daisy and Wicliffe. To the people of Seeta Nazigo, thank you for welcoming me. My dear friends in Kampala and Mukono - Adi Lees, Federica Margini, Prajwal Gyawali, Emmy Dortant, Katie Taylor, MacKenzie MacRae. I also want to thank my close friend Hannah Behringer – thank you for all of the support you provided me throughout the year we spent in Makata together. To Missions of Africa, especially Brother Francis Dwaz, Fr Hans, Fr Peter Van Der Heuvel, Sister Prima, Fr Kato Otto; I will be forever indebted to you and the brothers and sisters at Lourdel House, Nsambya – a haven for prayer, reflection and tranquillity.

I also wish to specifically thank Rebecca Hamala and Allan Saul Namanda, my wonderful research partners, mentees and friends without whom the project would not have been possible. Their humility, tenacity, grit and willingness to explain complex issues with

patience, facilitated my own personal growth and I wish them both all the success they deserve.

To my academic supervisors, advisors and mentors – Professor Winters, Dr Paton, Professor Bhutta, Dr Chankseliani, Dr Musoke, Dr Mills, Professors Sonia and Jeffrey Sachs, Dr Fancourt and Dr Edward O'Neil Jr; thank you for your feedback, advice, guidance and mentorship. To my family and friends spread across different countries who were there for me over the last three years when I needed them most – Maclen and Ashleigh Stanley, The Sobeks Romy Conzade, Molly Ross, Harriet Morton, Mark Collier, Clinton Lowe, Yusuf Ikbal Oldaç, Reza Khanzadeh, Olivia, Charles and Niamh O'Donovan to name but a few.

To my beautiful dog Peanut. You kept me company during the dark nights and long days - truly a man's best friend. I still think of you every day and miss you so much. I hope to be reunited with you soon.

To my parents and grandparents for instilling the principles of hard work and compassion in me from an early age and for supporting me to take the less well trod route though my academic life – even if at times this has meant swimming against the current. Thank you for your encouragement and endless support in all I do.

Finally, I wish to thank Stephanie. For your patience, understanding, endless unwavering support and countless hours spent proofreading my work. You have acted as a critical sounding board for me over the course of my DPhil and kept me going, even when I felt unable. Your intelligence challenges and inspires me and I am so grateful for your kind heart. Despite our relationship now spanning four continents "You are my rock in times of trouble, the lighthouse in the dark, the anchor keeping me grounded" and for this I will be forever thankful.

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Acronyms and abbreviations

App – Mobile-application

ART – Anti-retroviral therapy

AusAID - Australian Aid

CBPR – Community-Based Participatory Research

CEO – Chief Executive Officer

CHW – Community Health Worker

CHEW – Community Health Extension Worker

CSOM – Chronic Suppurative Otitis Media

DREC – Departmental Research Ethics Committee

ENT – Ear, Nose and Throat

FGD – Focus Group Discussion

GBP – British Pounds

HIV - Human Immunodeficiency Virus

HMIS - Health Management Information System

ICT4D – Information Communication Technology for Development

IRB – Institutional Ethics Review Board

LMIC – Low- and middle-income country

MBBS – Bachelor of Medicine, Bachelor of Surgery

mHealth – Mobile Health

mLearning – Mobile learning

MoH – Ministry of Health

MRRH – Mbarara Regional Referral Hospital

MSD – Medical Sciences Division

NCD – Non-Communicable Disease

NHS – National Health Service

OSCE – Observed Structured Clinical Examination

OTT – “Over-the-Top” Tax

PAR – Participatory Action Research

PHC – Primary Health Care

PVM – Participatory Visual Method

RA – Research Assistant

RCT – Randomised Controlled Trial

SDG – Sustainable Development Goal

TB – Tuberculosis

UGX – Ugandan Shillings

UK – United Kingdom

UN – United Nations

UNCST - Ugandan National Council for Science and Technology

UNMHCP - Uganda National Minimum Health Care Package

US – United States

USAID - The United States Agency for International Development

VHT – Village Health Team

WHO – The World Health Organization

Abstract

By 2030 it is estimated there will be a global shortage of 18 million health workers, which will disproportionately affect "low- and middle-income countries" (LMICs). As a result, a cadre of lay-health workers, commonly referred to as Community Health Workers (CHWs), have been proposed to help address this gap in the global health workforce. Yet, despite the documented successes of existing CHW programmes, many programmatic challenges remain, one of which is supervision. This has resulted in supervision being termed "one of the weakest links in CHW programmes" to date.

As a result, given the widespread and increasing ownership of mobile phones in LMICs, the use of mobile technologies (also referred to as *mHealth*) has been suggested as one way to facilitate CHW supervision. However, although the potential benefits of mobile technologies to support CHW supervision have been explored from a technical perspective, there is a relative paucity of work evaluating the implications of such an approach from a pedagogical perspective.

Through this thesis, I therefore seek to answer two key research questions:

1. How do key stakeholders (*CHWs, NGO programme managers, health facility workers and government officials*) perceive CHW supervision, and specifically the role of mobile technologies in facilitating supervision?
2. What are the effects of using an mHealth intervention, as part of a blended supervision programme, on the nature of CHW supervision?

I address these questions by taking a three-phase Community-Based Participatory Research (CBPR) approach towards the design, delivery and evaluation of a blended supervision programme for CHWs. This work was conducted over a 10-month period in the context of Seeta Nazigo Parish, Mukono District, Uganda. It was done in partnership with CHWs, non-governmental organisation (NGO) partners, government health officials and workers from the formal health sector. I took a mixed-methods approach to my work, using methods including photovoice, individual interviews, focus group discussions and analysis of a mobile group-messaging data set in order to help to answer the research questions.

Through an exploratory phase of work undertaken at the beginning of the project, the CHWs identified ear and hearing disease as a neglected but important problem which they encountered in their daily practice. In keeping with the participatory nature of my work, the focus of supervision largely centred around this topic and was enabled through the use of a shared mobile messaging platform: WhatsApp. The findings from my work also reveal the tensions in how supervision is conceptualised and delivered in this setting and is framed against the complexities of the wider system in which the CHWs work. I analyse how the WhatsApp messaging platform was used to support supervision and explore the nature of supervisory exchanges and how these evolved over the duration of the project. Finally, I take the opportunity to discuss some of the ethical issues raised by taking a CBPR approach and reflect on my own position as a British researcher undertaking 'global health' work in a post-colonial space.

Foreword: A portrait of Seeta Nazigo

"Morning Ssebo![1] How's the day?" Proclaimed Luke*, a 45-year-old male Community Health Worker (CHW), from Seeta Nazigo Village, Mukono District, Uganda.

Luke has been a CHW since 2008 and, despite having only a primary school education, he serves over 100 households in his village, raising awareness amongst residents on the importance of handwashing, safe sanitation and the signs of common childhood illnesses, such as diarrhoea, malaria and pneumonia. In 2010, he was given a box of rapid diagnostic testing kits and co-artem tablets[2] to treat malaria by the Ugandan Ministry of Health (MoH) but, like the 'Village Health Team (VHT)[3]' sign on his ageing orange t-shirt, memories of the days when he received regular stock ups are quickly fading. He now uses the box to store a vast array of notes from various pilot projects that have been run by different non-governmental organisations (NGOs) and aid agencies over the past decade.

> *"Look – I am the most travelled man to have never left Uganda!"* He says gleefully as he pulls out ageing consent forms from different projects. "*America (USAID), Australia (AusAID) and Liverpool (Liverpool School of Tropical Medicine)! Now Oxford in the UK,"* he exclaims as he points in my direction, with a broad smile across his face.

It would be fair to say that Luke, like thousands of CHWs throughout Uganda, has mostly been forgotten by the MoH[4]. He does not receive a salary, yet is technically the first port of call for primary health services in his village. He is officially responsible for recognising and referring sick individuals to the nearest health centre, yet does not have a record book to

[1] "Now Sir!" is the direct Luganda-English translation. The word "Ssebo" translates as "Sir" and is commonly used to address men in a respectful manner.
[2] Co-artem is a medication (*a combination of artemether and lumefantrine*) which is a recognised treatment for malaria. Uganda has one of the highest incidences of malaria in sub-Saharan Africa, however, in recent years there have been significant improvements in the number of individuals sleeping under insecticide-treated nets, as well as an increase in the number of children under-5 seeking treatment for suspected malaria.
[3] 'Village Health Team' often abbreviated to its acronym 'VHT' is the official name for Community Health Workers in Uganda.
[4] https://pulitzercenter.org/reporting/how-effective-are-ugandas-poorly-funded-community-health-workers

make referrals, nor a designated supervisor should he encounter a challenging case. In fact, when I first met Luke in October 2018, he couldn't tell me who his supervisor was, let alone how often he received supervision. Sometimes he and his fellow CHWs would receive training and supervision from one of the many foreign NGOs that now support the Mukono District Health Office, but this would be piecemeal in nature and the type of supervision would vary depending on the size and budget of the NGO. Luke, despite being well known in the local area and committed to his role, isn't part of one of the bigger NGOs which provide CHWs with a small stipend and medications to sell in return for a share of the profits[5]. Instead he serves in a voluntary capacity.

> *"Me? Luke? Those organisations like Living Goods or Healthy Entrepreneurs – they will not even look at me because I left school at primary. I am not* '*educated'*!" He smiled, laughing at my apparent naivety.

***

Fast forward six months to July 2019 and Luke stood peering over the shoulder of his peer-supervisor, Edward*, who was inspecting the image of a patient's eardrum displayed on the screen of his smart-phone. Following a period of collaborative programme design in January 2019, Luke and his fellow CHWs had elected Edward (a respected and well-liked CHW) to be their peer-supervisor. The patient, a young girl called Mercy*, sat calmly on her mother's lap outside their home on a woven mat made out of banana leaves. Mercy's mother had found Luke on his way home from a tuberculosis (TB) screening programme at one of the local primary schools and mentioned that her four-year-old daughter had been pulling at her ear for several weeks. In the past few days she had also noticed a gooey, white liquid coming out of the ear. She knew Luke, who was her neighbour's son, was a CHW and had heard from the local church pastor that he been trained in recognising, treating and managing ear disease.

[5] These are often NGOs based in the Uganda but often founded in the USA or Europe, such as Living Goods (https://livinggoods.org/) and Healthy Entrepreneurs (https://www.healthyentrepreneurs.nl/), who receive large amounts of philanthropic and international development funding.

As Edward skilfully manoeuvred a video-otoscope in Mercy's ear with one hand, he used his other hand to capture the image of the eardrum on his phone. Meanwhile, I leant against the mud-brick walls of the house observing the consultation. It was late in the afternoon and although the sun was waning, I felt the heat that had been trapped during the day radiating on my back from the mud-bricks.

It was June 2019 and I was coming towards the end of my fieldwork in Uganda. I felt privileged that I was sitting there almost unnoticed, watching this encounter take place. The rich supervisory exchange that was occurring between Edward and Luke would not have taken place six-months earlier. I say *almost* unnoticed because there was a small group of children who had gathered to stare at me inquisitively. Every so often one of the bolder children would run over and quickly touch my arm before darting back to the group proclaiming with glee '*Mzungu! Mzungu!*'[6]. He acted like an orchestral conductor by setting off the childrens' harmonious chant of '*Oh-ma-zun-gu! Oh-ma-zun-gu!*'

> *"So, Luke, what do you think*?" asked Edward as he showed him the newly acquired image of Mercy's eardrum on the screen of his phone.
>
> *"Well, I think it is a hole in the eardrum with pus, so I would give her a washout with iodine, dry mop and give antibiotics. Is that the right way Ssebo?"* replied Luke in his typically inquisitive but jovial tone.

Edward smiled and nodded in agreement before calling me over.

> *"Doctor James –we think this one [Mercy] has a hole in the eardrum and pus coming out. So I am proposing to send the photo to the WhatsApp group to get the opinions of our fellow CHWs and Doctor Gloria*. Will that work?"*
>
> *"I think that is a good idea",* I replied.

[6] The term 'mzungu' is a Bantu language term, used across East Africa, to describe white people. When translated literally, it means "wanderer". The origins of the word come from the Kiswahili word 'zungu' which means "spinning around on the spot" and its use can be traced back to the colonial period when locals would comment that the European settlers often looked lost. The possessive of 'mzungu' is 'kizungu' which has been translated as "behaving rich".

I was happy knowing that this was the correct diagnosis and management plan, but happier still that they were seeking input from their fellow CHWs and Dr Gloria Nagasakka*, a Ugandan Ear Nose and Throat (ENT) surgeon based almost 300km away at Mbarara Regional Referral Hospital (MRRH), for a second opinion. This was the kind of local capacity building I had envisaged at the beginning of the project. The fact that I wasn't needed in this situation made me happy, since peer-supervision was now gaining traction.

Luke and Edward thanked the mother and explained what they had found. They gave her a copy of the examination findings written down on a standardised history sheet and showed her how to wash and dry Mercy's ear. They told her that they would wait to hear back from Dr Nagasakka later that day regarding confirmation of the diagnosis and management plan and would relay this to her as soon as possible. They also warned her that it might be necessary for Mercy to be prescribed some antibiotic ear drops to help treat her presumed infection. If this was necessary, Luke volunteered to bring the antibiotic drops the following day when he was conducting other household visits in the area, to save the mother the hour-long round trip by foot to the health centre.

***

As we strolled back to the local Health Centre there was a palpable energy in the air, generated from the buzz of the weekly Tuesday afternoon market held in the town's trading centre[7]. Vendors had laid out tarpaulin sheets displaying their wares, ranging from *mivumba*[8] to *matooke*[9].

[7] In rural regions trading centres are often located at a central location in-between several villages and contain small shops and act as a hub for various forms of public transport connecting the villages to larger towns and cities.
[8] Second-hand clothes often imported from the US or European countries. It is estimated that Uganda imports 1,500 tonnes of such clothing annually from the US alone (http://www.takepart.com/article/2015/12/30/secondhand-clothing).
[9] A starchy type of banana.

I stepped into Fred's* shop. Fred owned one of the many small shops at the trading centre which had everything from bags of posho, beans and rice, to *kaveras* of Waragi[10]. In the corner there, was a small fridge-freezer. The chugging of the diesel generator in the corner signalled that the mains electricity in the village was out (probably after a night of heavy rain). The warmth of the soda inside the bottles of *Rwenzori*[11] and *Stoney Tangawizi*[12] would be a good indicator of how long the power had been out. I picked up a luke-warm Stoney (*which indicated that the power had probably been out for at least the day*) and handed Fred 1000 shillings (UGX).

> *"Make sure you bring me back the empty!"* Fred shouted after me, in reference to the empty bottle, for which he could reclaim 100 UGX.

A hawker[13] stood near the entrance to the Health Centre and carried a box of medicines. She was deep in conversation with another lady who was apparently unable to afford the full box of amoxicillin tablets for her child. The two women began to barter until they settled on a deal: a two-day supply of antibiotics for a fraction of the price of those in the pharmacies in Mukono Town.

As we arrived back at the health centre, located on the edge of the trading centre, we made our way into one of the buildings known as the "Anti-Retroviral Therapy clinic", or the "ART clinic"; a simple concrete building, with a corrugated iron roof used to treat HIV positive patients with anti-retroviral drugs. We sat down on the simple wooden benches. There was a silence only interrupted by the fizz of our carbonated drinks and the sound of

[10] Kaveras are small plastic pouches often filled with an alcoholic drink, such as Waragi. Waragi is a Ugandan Gin, produced by East African Breweries Limited. It is a favourite with locals and expats alike. Although the Ugandan government officially banned Kaveras in order to combat single-use plastic pollution, they remain popular, especially in the local district.
[11] A brand of bottled water popular throughout Uganda.
[12] Often referred to simply as '*Stoney*', Stoney Tangawizi is a brand of ginger beer popular throughout East Africa and bottled by the Coca-Cola company.
[13] "A person who travels about selling goods, typically advertising them by shouting."

children playing on the grassy verge outside. It was late afternoon and the clinic had been empty since midday - not due to a lack of patients, but because there were not enough permanent staff to hold morning and afternoon clinics.

The silence was broken by the buzz of Luke's phone on the wooden desk.

> *'Mmmm! The CHWs are finishing up their gardens[14]. They will have seen the image. Let's see what they are saying."*

Luke reached forward, picked up his phone and unlocked his screen with an expert flick of his finger.

> *"Eh! Doctor they agree…that one needs antibiotics! I knew I was right! Even Doctor Gloria agrees on that one"*, he announced gleefully. Almost instantaneously, however, a more serious look crossed his face.
>
> *"Now, it is time for me to go to a burial. I am sorry, but I can't stay… I am providing the food[15]. I forgot and Mrs Musa reminded me on the WhatsApp group not to be late!"*
>
> *"Don't forget about tomorrow! The follow-up visit for your patient!"* I reminded Luke as he jogged away from the Health Centre in his bright blue gumboots, which identified him as a CHW.
>
> *"I won't Doctor… but remind me on WhatsApp about that meeting time!*" He called back, eager not to be late to the burial ceremony.

***

I soon arrived back at the NGO A*[16] compound, which had become my home during my DPhil fieldwork period. I slipped off my previously brown leather shoes, now red from months of walking on the roads around Seeta Nazigo, and went to fill my jerry can with water from an on-site deep well for a cool and refreshing bucket shower. As I did this, four of

[14] Many of the CHWs were also small-hold farmers and tended to their land during the day.
[15] Alongside his role as a voluntary CHW, Luke was a fishmonger, builder, TB outreach coordinator and a caterer for communal events. Having multiple jobs was not uncommon and was both a reflection of the entrepreneurial spirit of many of the CHWs and the unstable economic climate of rural Uganda.
[16] NGO A are the local NGO in the area I was based for my fieldwork responsible for the training and maintenance of the CHWs. ***Please note, the original name of the NGO has been anonymised to "NGO A" throughout the thesis.***

the neighbour's children appeared, in the hope of a refill of their own cans, that would save them a three-mile round trip to the busy local borehole. Despite the initial difficulties I had readjusting from the affluent surroundings of Oxford to village life in Uganda, this served as a daily reminder of my privileged position.

***

This is where my work took place - in a rural and vibrant group of four villages in Seeta Nazigo Parish. The experience enriched my life immeasurably. I was able to share in the highs and lows of a close-knit community. I was welcomed into a group of 14 amazing CHWs. They brought me into their homes, shared their struggles, hopes, dreams, fears, moments of happiness and moments of sadness over cups of sugar-laden chai tea and handfuls of 'groundnuts'. Throughout my fieldwork, they, and others, taught me about the hardships of Ugandan graduate students, entrepreneurship and resilience, the ingrained *magenda* economy[17] (which defines the health system at almost every level) and their own personal struggles, as well as their hopes for the future. I left Uganda with a deeper appreciation of the importance of active listening, humility and a reciprocal relationship with the local community in shaping the research agenda.

It is therefore an honour and privilege to share this experience with you herein.

**N.B. All original names of individuals and of certain organisations have been changed to preserve confidentiality.*

Please note that written photo permissions were granted from all individuals whose photographs appears within this thesis. Hard copies of these consent forms are stored at NGO A Offices, in keeping with local ethics protocols

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[17] Magenda is a Kiswahili word used to describe the 'black-market'. It was used largely in the 1980's to describe the "magenda economy" synonymous with healthcare delivery across East Africa, where there was a culture of 'off-the-record payments' for health services, medications, or consultations.

A brief background note on my philosophical worldview

In order to understand the design and methodological decisions taken during my DPhil, it is important that I explain the philosophical worldview of constructivism which underpins and shapes my work. For the purpose of this thesis, I draw upon Guba and Lincoln's definitions of *constructivism* and *positivism* (Guba and Lincoln, 1994). Whereas a positivist ontology suggests that "reality is assumed to exist, driven by immutable natural laws and mechanisms" (*ibid*.:109), constructivist ontology is underpinned by a worldview where realities are "multiple, intangible mental constructions, socially and experientially based, local and specific in nature" (*ibid*.:110).

These alternative paradigms also mean that the epistemological and methodological stances differ. For example, whereas researchers who have a positivist worldview believe that "the investigator and "investigated object" are assumed to be independent entities, and the investigator to be capable of studying the object without influencing it" (*ibid*.:110), a researcher with a constructivist worldview, such as myself, would suggest that "the investigator and the object of investigation are…interactively linked so that the "findings" are literally created as the investigation proceeds" (*ibid*.:111). These opposing worldviews result in different methodological approaches to answer research questions. For example, whereas those taking a positivist stance might seek out experimental methodological approaches to verify propositional questions and aim to control for confounding variables to "prevent outcomes from being improperly influenced" (*ibid*.:110), those with a constructivist worldview look towards methodological approaches which are more iterative and dialectic in nature, where "insights and understanding emerge from the joint construction of inquirer and participant" (Costantino, 2008:117).

Importantly, my worldview has not always been that of constructivism - *a concept which I address in Chapter 3; Section 3.3* - and is constantly evolving through new experiences and my reflections on these experiences; however, I hope this brief philosophical background will help facilitate your understanding of my work herein.

Chapter 1 – Introduction

> *"Supervision is often among the weakest links in CHW programmes"* (The World Health Organization, 2007:20).

1.1 Chapter Overview

This thesis explores the role of mobile technologies in facilitating the supervision of Community Health Workers (CHWs) in Seeta Nazigo Parish, Mukono District, Uganda.

In this opening chapter, I explore the historical context underpinning modern-day CHW programmes and outline the CHWs' current roles in addressing the health workforce crisis in low- and middle-income countries (LMICs). I then document how CHW supervision is an underexplored but important area of study, before suggesting a role for mobile technologies to facilitate CHW supervision. I suggest that the use of mobile technologies to support CHW supervision is an exciting proposition, but highlight the paucity of existing literature exploring the potential benefits of such an approach from a pedagogical perspective. I give reasons as to why this is important and continue by arguing that CHW supervision should be framed as a 'complex intervention', and why this carries significant implications for my thesis. I conclude this chapter with the contributions my thesis makes towards advancing our understanding of mobile technology facilitated supervision for CHWs.

1.2 A historical background to CHW programmes

By 2030 it is estimated there will be a global shortage of 18 million health workers (Liu et al., 2017). This scarcity will disproportionally affect LMICs (Aluttis et al., 2014) and is likely to have a significant impact in achieving The United Nations (UN) Sustainable Development Goal (SDG) 3 – '*Good Health and Wellbeing for All'* (The United Nations, 2015).

To address the gap in human resources for health in LMICs, alternative healthcare delivery models have been proposed, which utilise 'lower-skilled' cadres of workers. Two different options have been put forward to tackle the problem: One approach is known as "task shifting", a process which involves [*the*] redistribution of certain healthcare related tasks away from highly qualified health professionals, such as doctors or nurses, to health workers with fewer qualifications and less training (The World Health Organization, 2008a). The other approach is referred to as "task sharing"; a planned process whereby healthcare professionals work together to deliver health services and lower cadres of health workers are 'upskilled' simultaneously (Anand et al., 2019). The "task sharing" approach has been suggested to be preferable to "task shifting" in areas which require high levels of technical skill (Bergström, 2015, Anand et al., 2019).

CHWs are one particular cadre of 'lower-skilled workers' which have been deployed in both task sharing and task shifting initiatives. Although there is not a fixed definition for a CHW, the term is generally used as an umbrella description for groups of:

> *"…paraprofessionals or lay individuals with an in-depth understanding of the community, culture and language, who have received standardised job-related training of a shorter duration than health professionals and whose primary goal is to provide culturally appropriate health services to the community"* (Olaniran et al., 2017:1).

A recent review by Olaniran et al. (2017), revealed significant contextual variation in the roles of CHWs, ranging from unsalaried lay health workers with little formal education, to paid paraprofessionals with extensive formal training (Olaniran et al., 2017). Indeed, the global landscape of CHW programmes is patchy, with multiple different providers ranging from centralised management of CHWs at a government level to a more informal network of CHWs who are primarily managed by NGOs. This has resulted in a variable landscape with

regards to the specific roles and responsibilities of CHWs, as well as inconsistencies around training, funding and ongoing support (Agarwal et al., 2019b).

The concept of deploying CHWs to increase access to Primary Health Care (PHC) services is not new. For example, China's 'Farmer Scholars' were introduced almost a century ago. Illiterate farmers in rural areas of China were trained to, "record births and deaths, vaccinate against smallpox and other diseases, give first aid and health education talks, and help communities keep their wells clean" (Perry et al., 2014:2). The 'Farmer Scholars' were the predecessors of China's now legendary barefoot doctor programme, of which there were almost 1 million at the programme's height in 1972, serving an estimated population of 800 million people (Sidel, 1972). The success of this model inspired the establishment of many CHW programmes in other parts of the world, including India, Tanzania and Venezuela (Perry, 2013, Kanté et al., 2019).

In the 1960s and 1970s, when many countries were failing to address the health needs of marginalised members of society through traditional hospital-based models of care, the requirement for alternative, community-based models, became increasingly apparent. It was at the 1978 International Conference on PHC that CHWs were recognised in the Alma-Ata declaration as being a key way of delivering care, "as close as possible to where people live and work" (The World Health Organization, 1978). Despite many countries rolling out CHW led PHC programmes, a culmination of factors in the 1980s and 1990s led to the demise of several such initiatives. Many CHW programmes were disjointed, lacked funding and were seen by some governments as 'second-class' models of care delivery (Perry et al., 2014). In addition, the global energy crisis of the 1970s resulted in a debt crisis which in turn affected many LMICs (The World Health Organization, 2007). Governments were forced to embrace

free-market reforms by international donors and to reduce public sector financing. As a result, many CHW programmes were abandoned (Perry et al., 2014).

The establishment of the Millennium Development Goals in the early 2000s led to renewed interest in CHWs, resulting in many countries re-establishing and re-investing in programmes, which in some cases led to positive outcomes. For example, following the implementation of a CHW programme in Liberia aimed at community management of childhood illness, 83.5% of children in the intervention area received care from a CHW for diarrhoea (Luckow et al., 2017). What is more, CHWs in this programme were able to help increase the rate of facility-based new-born deliveries from 55% to 84% (Jallah et al., 2019).

With this regeneration of CHW programmes, healthcare practitioners and policymakers are now keen to understand how they can best support these initiatives in order to minimise the chances of failure while maximising their potential impact (Cometto et al., 2018). As such, stakeholders have begun to explore factors necessary for the sustainability and success of CHW programmes, such as financing, education and ongoing training.

One particularly important, yet under-researched area is CHW supervision (O'Donovan et al., 2018b). As CHW programmes continue to grow globally, supervision must be better conceptualised and understood. This would help to ensure that CHWs can be adequately and consistently supported in the delivery of safe healthcare, and to also ensure they remain motivated and feel valued. Existing research has already demonstrated that CHWs are often prone to burn-out, leading to ongoing issues around retention of CHWs, especially unpaid volunteers such as those in Uganda where my research took place (Ludwick et al., 2014). Supervision, therefore, represents an important means by which to support CHWs in their roles. Furthermore, Kok et al. (2018) have suggested that supervision can increase community trust and provide a sense of legitimacy to CHWs work, which can in turn increase

CHW motivation (Kok et al., 2018). However, very little empirical work has been conducted with key stakeholders concerning the perceived purpose of supervision, how it is defined, delivered, evaluated and the challenges inherent to its delivery. My thesis, therefore, aims to address this critical gap in the literature.

1.3 An introduction to, and overview of, CHW supervision

The topic of CHW supervision is an important one. Despite there being an estimated 1.3 million CHWs worldwide (World Health Organization, 2011), the role of supervision for this growing cadre is poorly understood. In a 2007 report from the World Health Organization (WHO), supervision was described as one of the "weakest links in CHW program(me)s" due to a multitude of factors, including a shortage of trainers and poorly designed programmes (The World Health Organization, 2007:5). Several challenges exist regarding CHW supervision, which I address in Chapter 2 (*see Section 2.5 'Challenges surrounding the supervision of CHWs in LMICs':49-56*). However, here I will briefly outline some of the key issues that underpin my thesis.

First, from a conceptual standpoint, the term supervision is contested and ambiguous (Vasan et al., 2017, Avortri et al., 2019). On the one hand, it is used to define a process of accountability and managerial oversight, involving the monitoring of CHWs performance (Marquez and Kean, 2002). For example, a study from Botswana noted that supervision of CHWs entailed:

> *"…submission of mandatory statistical reports, passing on directives from the National Ministry of Health and crisis management when problems arose"* (Nkomazana et al., 2016:2-3).

Similarly, in a study from Uganda, Musoke et al. (2019), framed supervision through a technical lens as:

> *"…(supporting) the CHW coordinators with three motorcycles that were used to collect reports from CHWs as well as provide other supervisory support including distribution of medicines and other supplies"* (Musoke et al., 2019:2).

In these two examples, supervision is viewed as a way of keeping CHWs accountable for their work in a managerial fashion, or providing purely technical support. There are some historical reasons for this, which I discuss further in Chapter 2 (*see Section 2.2 'A History of Supervision in Healthcare':41-45*).

Conversely, there has been a recent shift towards approaching supervision in a more holistic sense, where its nurturing function (*vs. managerial control*) is prioritised. This style of supervision has been termed, 'supportive supervision' (Bailey et al., 2016, Hernández et al., 2014, Marquez and Kean, 2002). This definition typically encompasses more holistic purposes of supervision aligned with mentoring, mutual learning, problem solving, emotional support and skills development (Avortri et al., 2019). Maryse Kok, a leading researcher in the field of CHW supervision, suggests supportive supervision is a way through which to focus on:

> *"…problem solving; joint responsibilities and team work; cross learning and skill sharing;…facilitating and coaching…;… [and] empowerment and participation of supervisees in decision making"* (Kok, 2018:991).

I suggest that this diverging set of definitions has partly contributed to the different ways in which supervision is currently conceptualised and implemented, and has thus led to a contested field of empirical study. The term *supervision* is often used loosely within the existing literature. This lack of clarity has proved challenging since existing research has struggled to build upon previous studies due to the fragmented nature of the field. Furthermore, although recent work has focussed on trying to understand the *outcomes* of CHW supervision (Hill et al., 2014, Kok et al., 2015, Kok et al., 2017a, Musoke et al., 2019), much less work has focussed on the *processes* underpinning supervision, such as how it

occurs, the type and nature of supervisory interactions (framed through a pedagogical lens), and how supervision specifically impacts the motivation and performance of CHWs (Assegaai and Schneider, 2019b, Kok et al., 2018b). These are some of the issues that my thesis aims to address.

1.4 An overview of mobile technologies in CHW supervision

Aligned with the interest in CHW supervision is the growing use of mobile technologies to support its delivery (Winters et al., 2019, Braun et al., 2013). This is in part due to the widespread and increasing ownership of mobile phones across LMICs. One particular area with a high ownership of mobile phones is sub-Saharan Africa, where it is estimated that by 2025 over half of the total population of the region will have a mobile phone subscription (Global System for Mobile Communications, 2019). Coupled with increasing coverage of 3G, 4G, and 5G cellular networks, mobile technologies are increasingly being thought of as one way to address the challenges in supporting CHW supervision. The use of mobile technologies as a way to facilitate the supervision of CHWs falls under the umbrella term "mHealth", which has been defined as the "use of mobile and wireless technologies to support the achievement of health objectives" (The World Health Organization, 2011:1). Throughout this thesis, the terms 'mHealth' and 'mobile technologies' will be used interchangeably.

In January 2018, a $100 million (USD) investment fund was launched at the World Economic Forum in Davos to support digitally enabled supervision of 50,000 CHWs across sub-Saharan Africa (Winters et al., 2018b). Yet, despite the promise and potential attached to mHealth as a way of facilitating CHW learning, much of the hype surrounding mobile technologies has been portrayed through a technocentric lens (Winters et al., 2017). Little work has been conducted from a pedagogical perspective to understand the potential barriers

(*and indeed pitfalls*) that the use of mobile technologies might have specific to CHWs. In a 2019 evidence map published in BMJ Global Health, which I co-authored, we documented just 13 studies which explored the role of mobile technologies to support CHW supervision (Winters et al., 2019). This is in contrast to 47 studies which documented the use of mobile technologies as 'on-the-job-aides' and 44 studies exploring their use as workforce planning tools. This is important because "information dissemination models of education" (Winters et al., 2018a:2) often fail to account for the cultural and social aspects of learning, which are important in the field of healthcare (Bleakley, 2006). Similarly, these information transmission models of mobile learning have been critiqued in the wider educational literature, because their pedagogically limited nature fails to develop skills of genuine comprehension, critical thinking, and learner agency (Hoppe et al., 2003).

These critiques are underpinned by constructivist notions of learning, which suggest that learning should be viewed as a process involving communication between learners, rather than the transmission of knowledge (Pask, 1976). This concept has been applied to the field of education more broadly, where multiple different theories of learning have been applied to understand the role of mobile technologies to facilitate learning (Keskin and Metcalf, 2011). For example, conversational theories of learning (Laurillard, 2013) which stress the importance of understanding the context in which learning takes place (Sharples et al., 2005) and the importance of dialogue as part of the learning process are particularly relevant to mobile-based learning, which has the potential to be highly social in nature given the technical capabilities of mobile phones to connect multiple learners in one online space. This theoretical concept underpins the design of a blended supervisory model incorporating mobile technologies, which I describe in Chapter 7 and evaluate in Chapter 9.

While literature from the broader field of medical education (concerning doctors and nurses) has developed sophisticated models of learning based around constructivist theories, such as situated and inquiry-based learning (Williams, 1998, Taylor and Hamdy, 2013), these have not been applied to the context of CHW supervision. This is evidenced by a recent systematic review by Winters et al. (2018), focussing on mHealth initiatives for CHW training and education (Winters et al., 2018a). Of the 24 studies classified as supporting CHW learning or supervision through mHealth, only four studies were underpinned by educational theories around work-place based learning or mobile learning (Winters et al., 2018a). The rest emphasised scalable interventions such as unidirectional information dissemination models of supervision (e.g. sending SMS messages to ensure CHWs adhere to guidelines). The danger with such models is that simple exposure to information is prioritised over more sophisticated models of learning. This in turn could result in CHW de-professionalisation and a lack of deep understanding about topics of importance in relation to community health, representing a long-term threat to the strengthening of community health systems (Winters et al., 2018a).

Furthermore, an emerging body of more critical literature has attempted to document the complex and important challenges posed by the use of mobile technologies to support healthcare workers in the context of LMIC settings. This literature ranges from critiques of programme design to lack of interoperability (Shuchman Miriam, 2014, Thondoo et al., 2015). The literature also critiques programmes that implement one-off, unsustainable projects rather than adopting a health systems strengthening approach; a phenomenon that has been termed, “pilotitis” (Huang et al., 2017). A small body of literature has also begun to highlight the challenges of evaluating mHealth facilitated training (Winters et al., 2017). My work aims to build on this emerging literature by undertaking an exploration and evaluation of supervision facilitated by mobile technologies, framed through a pedagogical lens, with a small group of CHWs in the setting of Uganda.

1.5 Framing mHealth facilitated CHW supervision as a complex intervention

I explore the role of mobile technologies in facilitating CHW supervision by framing it as a 'complex intervention'.

Complexity has been defined as:

> *"a concept underpinned by a set of theories used to understand the dynamic nature of interventions and systems"* (Petticrew et al., 2019:1).

Within the health sector, researchers are increasingly drawing upon complexity theory to explore how interventions, comprised of multiple interacting components, work and give rise to behaviours characterised by fluidity and non-linearity (Rickles et al., 2007, Matheson et al., 2018).

The Medical Research Council has suggested that there are three core characteristics of a complex intervention (Craig et al., 2008). These include that it has, or is:

(1) Multiple components;

(2) Non-linear;

(3) Context dependant.

I suggest that CHW supervision can be considered a 'complex intervention' for the following reasons:

(1) There are multiple components which characterise and enable supervision. These components include the actors within the system ranging from CHWs to supervisors to

government officials - all of whom interact with each other in a variety of ways, depending on their positions, relationships and past experiences, the funding streams that enable supervision to take place and the mechanisms through which supervision is supported and delivered.

(2) Supervision is non-linear. In a recent social network analysis of CHW relationships within a supervisory system in South Africa by Assegaai and Schneider (2019) it was suggested that CHW supervision should move away from the traditional conceptualisation of point-to-point interactions between supervisor-and-supervisee, to a series of multidirectional exchanges operating in both a horizontal and vertical fashion viewed through a health systems lens (Assegaai and Schneider, 2019b).

(3) The context in which supervision takes place is vitally important (Booth et al., 2019). For example, the geographical context will influence the prevalence and burden of certain disease groups, which will in turn influence the content of supervision. Similarly, the socio-cultural context will influence the pedagogical underpinnings of how CHWs learn and thus will impact the design of supervisory programmes.

It has also been suggested that conducting evaluations of complex interventions is challenging, given that they can produce diverse and wide-reaching effects at a system level (Shiell et al., 2008). As such, they require non-traditional, innovative forms of evaluation (Minary et al., 2019); a concept which I have applied to my own work. Traditional experimental designs, such as Randomised Controlled Trials (RCTs), which seek to draw causal inference through a controlled evaluation of an intervention and its effects, are often ill-suited to research studies concerning complex interventions (Marchal et al., 2013). Furthermore, given that many complex interventions take place within real-world settings (where the context has an important role in the uptake, acceptability, use, and perception of

the intervention), controlling for environmental factors may not be desirable. Instead, alternative approaches, which are "methodologically pluralistic, flexible and ecologically focused" (Greenhalgh and Papoutsi, 2018:4), should be explored in order to evaluate complex interventions.

Given that complex interventions often produce effects on multiple levels (e.g. at an individual, community and organisational level) (Petticrew et al., 2019), in this project I am concerned with asking both *how* and *why* the mHealth facilitated supervisory intervention I implemented worked i.e. exploring the mechanisms underpinning it. It is for these reasons that I pursue a mixed-methods approach to evaluation in my thesis.

1.6 Thesis contributions

At a macro-level, my thesis aims to understand better the role mobile technologies play in CHW supervision from a pedagogical perspective. I chose to analyse this in the context of the Ugandan CHW Programme, using an action research study design. I discuss action research in significant detail in Chapter 3; however, as way of introduction and to help frame my work, action research has been defined as a research methodology concerned with:

> *"…the systematic study of attempts to change and improve practice by groups of participants by means of their own practical actions and by means of their own reflection upon the effects of those actions"* (Ebbutt, 1985:156).

My thesis tells the story of a Community-Based Participatory Action Research (CBPR) project (*a particular form of action research*) undertaken in partnership with multiple stakeholders involved in CHW programming in a rural region of Uganda. In this thesis, I present the findings from three interlinked phases of study undertaken between October 2018 and July 2019. I describe the background and process of action research and CBPR in

relation to my project in more detail in Chapter 3, however here I present a brief overview of the three phases of the study in order to help situate you, the reader.

Phase One was a reconnaissance phase, undertaken between October and December 2018, to familiarise me with the context in which I was working and to better understand the views of the key stakeholders who would be involved in the project; especially the CHWs who were the primary focus of the project. This initial phase of research helped me to understand better the challenges of supervision concerning the wider context in which I was working. This was an important phase as it helped me discover that ear and hearing disease (*which was the subsequent focus of supervision*) was an important but neglected disease burden in the area where my project took place. Furthermore, it helped me understand how different stakeholders involved in CHW programming conceptualised supervision and the underlying tensions and challenges that existed. These were important concepts for me to understand at the beginning of the project and helped to inform the subsequent phases of my research. I describe the methodology of Phase One in Chapter 4, and the subsequent findings in Chapters 5 and 6.

Phase Two was undertaken in January 2019. It involved the participatory design and implementation of an initial training and ongoing supervisory programme for a group of 14 CHWs. Importantly, this phase built upon the findings from Phase One, which was in keeping with the overall action research approach towards my work. A training course for the CHWs was designed in a participatory manner and focussed on the recognition, diagnosis and management of ear and hearing disease. This phase also involved the participatory design and modification of an mHealth facilitated ongoing supervision programme. This resulted in the mobile application (App) 'WhatsApp' being selected to facilitate supervision. I describe Phase Two in detail in Chapter 7.

Phase Three, undertaken between February and July 2019, involved the evaluation of the mHealth component of the supervisory programme. The evaluation of this phase specifically focussed on how the use of WhatsApp impacted on the nature of supervision and CHWs perceptions of this. I describe the methodology of Phase Three in Chapter 8 and the subsequent findings in Chapter 9.

As a result, my thesis makes three core contributions to the existing literature.

Contribution One

First, it addresses the current gap in the literature regarding how supervision for CHWs is currently conceptualised and defined. This gap was identified through an extensive review of the literature (Chapter 2). By drawing upon the wider body of research from the field of education and healthcare more generally, I have been able to identify features of *good supervision*. I suggest that supervision for health workers in LMICs has often failed to encompass these features, in part due to its historical positioning as a mechanism for accountability and control. I evidence the lack of clarity regarding how supervision is currently framed, specifically with regard to CHWs. Maryse Kok et al. (2018) have identified that there are multiple and contested definitions of what supervision means across different contexts (Kok et al., 2018b) —a reality that hasn't always been taken into consideration by previous researchers.

Through a photovoice study and findings from in-depth interviews with multiple key stakeholders involved in CHW supervision in Mukono District, my thesis contributes towards addressing the gap in the literature by first highlighting the challenges of supervision in relation to the wider context (Chapter 5) and secondly taking an in-depth exploration of how supervision is currently perceived and understood in this setting (Chapter 6).

Contribution Two

Secondly, although supervision has been cited as an important area of CHW programming and mobile technologies have been heralded as a promising means by which to facilitate this, there is a gap in the empirical literature on CHW supervisory interventions and the use of mobile technologies within this (Winters et al., 2018a, O'Donovan et al., 2018b).

My thesis directly addresses this gap by describing the design of an mHealth assisted supervisory programme, which took a participatory approach towards design (Chapter 7). This rich description of the real-life challenges encountered through a participatory design process provides an alternative narrative to the overly simplistic descriptions in the existing literature, which rarely outline the complexities of selecting and co-creating a supervisory programme. It also places emphasis on co-creating an mHealth-facilitated supervisory programme based upon pedagogical principles, rather than the technical factors strongly emphasised in the current literature (Thondoo et al., 2015).

Contribution Three

Thirdly, having positioned technology-mediated CHW supervision as a 'complex intervention', I describe the mixed-methods approach to evaluating the mHealth component of a blended supervisory programme (Chapter 8), with a specific focus placed on better understanding the effect mobile technologies have on the nature of CHW supervision (Chapter 9). Not only does this address the paucity of empirical studies evaluating the role of mobile technologies to facilitate CHW supervision, but it also directly addresses Winters et al.'s call to "measure better" in the context of mHealth evaluations (Winters et al., 2017).

Through an analysis of over 2000 WhatsApp messages exchanged between CHWs and their supervisors, I explore the specific nature of supervisory exchanges, and how these evolved over a six-month period. This is an approach that has not yet been covered in the literature.

Existing analyses of WhatsApp exchanges between CHWs, of which there are two, have focused on measures such as the number of messages exchanged and the content of messages (Pimmer et al., 2017, Vu Henry et al., 2016). I supplement these descriptive statistical measures with a parallel qualitative analysis of focus group discussions (FGDs) and individual interviews, as well as my own observations to explain observed phenomena. This mixed-methods approach also allowed me to better understand the perceptions and experiences of CHWs in using a technology-mediated supervision platform; something which is lacking in the existing literature.

Chapter 2 – Literature Review

> *"The reality is that most of the time in CHW programs, supervision is virtually non-existent or of questionable value even when it does occur"* (Crigler L et al., 2014:2).

2.1 Chapter Overview

In this chapter, I review the literature relating to the supervision of CHWs in a narrative fashion. I begin by providing a historical overview of supervision in healthcare more generally, before focussing on how the supervision of CHWs is currently framed and delivered. I conclude the chapter by reviewing how mobile phones have played a role in CHW supervision and identify key gaps in the literature, that will be addressed in the body of this thesis. This review builds upon a 2018 systematic scoping review I published in BMJ Open, concerning supervision and ongoing training for CHWs in LMICs (O'Donovan et al., 2018b).

2.2 A history of supervision in healthcare

Formal supervision in healthcare has its roots in organisational and management processes and can be traced back to the early 1900s (Hill et al., 2014). In 1903, Jeffrey Bracket outlined the role of supervision in social work in his book '*Supervision and Education in Charity*' (Bracket, 1903). According to Kadushin and Harkness who analysed the text almost a century later, Bracket suggested that the original purpose of supervision was to:

> *"help the social worker develop practice, knowledge and skills, and provide emotional support to the person in the social work role"* (Kadushin and Harkness, 2002:2).

Yet, as Bernard and Goodyear (2004) later note, the interpretation of what supervision should entail changed over time, so that by the end of the 1900s supervision in the field of healthcare appeared to prioritise administrative functions over supportive ones (Bernard and Goodyear, 2004). They suggest that more emphasis was placed on the function of supervision as a tool

for accountability rather than emotional support, with hierarchy and evaluation deeply intertwined within this (Bernard and Goodyear, 2004, Schriver et al., 2018). This style of supervision, which is inherently more controlling in nature, often places emphasis on fault-finding and has been found to be common in African settings (Blaise and Kegels, 2004, The World Health Organization, 2008b, Bradley et al., 2013). There is often a unidirectional flow of information, where the supervisor assumes the role of the "expert", whose job is to transmit the knowledge they possess to the supervisee. This style of supervision has been suggested to be "unhelpful" by CHWs and has also been criticised because supervisors fail to understand CHWs roles and the contexts in which they work (Crigler et al., 2014).

Recognising that this style of supervision fails to motivate health workers (Crigler L et al., 2014), efforts have been made over the past decade to shift towards a more holistic model of supervision which places greater emphasis on the needs of health workers as both professionals and individuals. The ideals of this model are to promote collaborative problem solving, where the exchange of ideas and information is more reciprocal in nature (Clements et al., 2007b, Hernández et al., 2014, Hill et al., 2014b, Tavrow et al., 2002). This style of supervision has been termed 'supportive supervision' which the WHO defines as:

> *"A process of helping staff to improve their own work performance continuously. It is carried out in a respectful and non-authoritarian way with a focus on using supervisory visits as an opportunity to improve knowledge and skills of health staff. Supportive supervision encourages open two-way communication, and building team approaches that facilitate problem-solving. It focuses on monitoring performance towards goals, and using data for decision-making, and depends upon regular follow-up with staff to ensure that new tasks are being implemented correctly"* (The World Health Organization, 2008b:1).

However, the concept of what supportive supervision *actually* means to front line health workers such as CHWs and how it should be delivered and evaluated in practice remains underexplored (Bosch-Capblanch and Garner, 2008, Hernández et al., 2014, Kok et al.,

2017a, Martin et al., 2017b, Avortri et al., 2019). As such, attempts have been made to try and conceptualise what supervision should entail.

Proctor's model suggests three core purposes of supervision, which are, "normative (administrative), formative (educational) and restorative (supportive)"(Winstanley and White, 2003:13). The normative functions of supervision are aimed at ensuring supervisees' work conforms to organisational objectives, for example adhering to policies (Bowles and Young, 1999). Formative functions are aimed at skill acquisition, development of understanding and honing ability. Restorative functions are aimed at providing emotional support to the supervisee; for example by allowing them to share a difficult or challenging experience with the supervisor, who should encourage them to reflect on it (Bowles and Young, 1999). In practice, there is often significant overlap between these three functions, and the emphasis on each component will vary depending on the needs of the supervisee across time and place (Martin et al., 2017b).

Specific to the field of CHW supervision, authors such as Crigler et al. (2013) have outlined key areas in keeping with the normative, formative and restorative functions described by Proctor (Crigler et al., 2013). These include:

1. **Quality assurance.** This should typically involve continuous monitoring of CHW performance and assessing their ability to follow guidelines.
2. **Information and communication.** This involves "communicating, gathering and sharing information related to CHW activities" (Vu Henry et al., 2016:312).
3. **Creating a supportive environment.** This would include things such as coaching, mentoring, teamwork and providing emotional support.

As I have already suggested, the first area of quality assurance, which mirrors the normative function described by Proctor, has seemingly dominated the literature. Several studies on CHW supervision emphasise the importance of accountability and monitoring (Kok et al., 2017a, Ndima et al., 2015, Roberton et al., 2015, Zurovac et al., 2011). This could be due to the strong influence from the field of medical sciences in which "instructional techniques, instructional designs, and competency-focused assessment methods" are commonplace (Stevens and Goulbourne, 2012:685). For example, in a study by Ndima et al. (2015), CHW supervisors' duties were largely centred on the use of checklists to assess, "whether APEs [CHWs] have particular commodities available, have the tools they are expected to have and if they are completing and recording their duties correctly" (Ndima et al., 2015:2). This style of technical assessment is unlikely to provide insights into how a more holistic, supportive environment was created and facilitated, or CHWs perceptions on how it supported their learning.

Significantly, in a landmark study by Roberton et al. (2015), a call was made to redefine how supervision was conceptualised, by focusing less on, "report checking and more on problem solving and skills development" (Roberton et al., 2015:11). At this point, it is important to note that considering CHWs as an extension of the formal medical system runs the risk of not fully understanding or appreciating their unique position within society. For example, unlike other cadres of professional health workers, one of the key attributes of CHWs is that they are often selected from their own communities (Ballard et al., 2018). Second, the expectations community members have of CHWs are different to formal professionals. While they are expected to play a role in healthcare delivery, they are also likely to play a greater role in community advocacy and emotional support (Scott et al., 2018, Malcarney et al., 2017). Thus, by taking an approach to supervision which prioritises knowledge and skills acquisition over other important aspects of their job, such as trust and respect (Smith and Blumenthal,

2012), there is a danger that current supervisory practices fail to acknowledge and support the holistic role CHWs play within their communities. Supervisory programmes should therefore be designed and delivered in a contextually and culturally appropriate manner, so that they contribute to the supportive environment necessary for CHW programmes to flourish (Kok et al., 2017a).

2.3 What are key aspects of 'good' supervision?

Across the field of medical education, attempts have been made to try and conceptualise *effective supervision*. In an article by Kilminster et al. (2007), seven features were identified for effective supervision of healthcare professionals (Kilminster et al., 2007). These principles state that supervision should be:

1. Offered in context.

2. Direct and respectful, including positive exchanges between supervisors and supervisees.

3. Provide frequent constructive and focused feedback; *self-supervision is not sufficient*.

4. Structured and offered regularly. Content, duration and number of supervisory meetings should be agreed in advance to set realistic expectations.

5. Holistic and encompass, "clinical management; teaching and research; management and administration; pastoral care; interpersonal skills; personal development; reflection" (Kilminster et al., 2007:2).

6. Led by the needs of the supervisee. Kilminster suggests that, "supervision is only effective when this is the case" (Kilminster et al., 2007:2), and that it should involve reflection from both the supervisor and supervisee.

7. **Ensure supervisors receive training** on, "understanding teaching; assessment; counselling skills; appraisal; feedback; careers advice; interpersonal skills" (Kilminster et al., 2007:8).

In addition to these seven features, it was also deemed important that those in charge of supervision should be able to demonstrate an element of clinical competence (Kilminster et al., 2007). This is because one of the core priorities in healthcare is that of "patient safety [and] good quality clinical care" (Tomlinson, 2015:1).

Specific to CHWs, Duthie et al. (2012) outlined key features of effective supervision, including advocating for CHWs, thoughtful recruitment of supervisors, developing field sensitivity, respecting and trusting the CHW, clarifying boundaries and scope of practice, developing a flexible structure, and encouraging continuous learning (Duthie et al., 2012). Crucially, although there are many parallels between the two sets of recommendations, there are also some key differences. For example, the recommendations put forward by Duthie et al. (2012), place greater emphasis on respecting the cultural contexts in which CHWs operate (Duthie et al., 2012). In addition, they recognise how CHWs have different needs and responsibilities to other healthcare professionals since they need to "be able to relate to community members in a way that is often not possible for health professionals who have different cultural or socioeconomic background(s)" (Duthie et al., 2012:63).

Yet, despite these attempts to try to define and conceptualise effective supervision, little empirical work explores how these features can be achieved in practice with frontline health workers (Hernández et al., 2014). The next section of my literature review will therefore outline the existing research landscape relating to CHW supervision and the unique challenges this presents.

2.4 Supervision of CHWs in LMICs

In 2018, a comprehensive report was published by six leading international NGOs responsible for developing high-impact CHW programmes (Ballard and Schwarz, 2019). Eight features were outlined in the report describing the "minimum viable elements needed for CHW programmes to succeed" (Ballard and Schwarz, 2019:4). These included the need for CHWs to be accredited, accessible, proactive, continuously trained, supported by a dedicated supervisor, financially remunerated, a member of the formal health system and part of continuous data feedback loops (Ballard and Schwarz, 2019:25). The importance placed on supervision in this report mirrors the findings of other studies, which conclude that supervision is one of the key features of CHW programmes, and can help improve CHW performance, motivation, retention and job satisfaction (Ndima et al., 2015, Ngugi et al., 2018, Rabbani et al., 2016, Greenspan et al., 2013, Ludwick et al., 2018, Nxumalo et al., 2013, Scott et al., 2018).

Yet, despite the claims surrounding the effectiveness and importance of CHW supervision, supervision remains one of the most under-researched areas of CHW programming to date (Crigler et al., 2013, Mathauer and Imhoff, 2006, O'Donovan et al., 2018b). For example, Leslie et al. (2016), described the quality of evidence regarding the effects of supervision as "weak", and that "the magnitude and longevity of the effect on provider quality has not been definitively established" (Leslie et al., 2016:1717). Furthermore, several existing studies point towards fragmented and inadequate existing supervisory programmes for CHWs in countries such as India and South Africa (Besada et al., 2020, Paul et al., 2011).

The first issue is that the existing empirical literature often fails to define what is meant by supervision (Avortri et al., 2019). This means the current landscape of research on CHW supervision lacks clarity and coherence. As such, leading scholars in the field such as Hill et

al. (2014), have called for work to better define and frame the field of CHW supervision (Hill et al., 2014). This includes the need for clear descriptions of the type of supervision that takes place, including programme components and processes.

Second, despite the claims made around the benefits of supervision, most emphasis has been placed on the managerial aspects of supervision. The earliest comprehensive systematic review regarding supervision for primary health workers (including, but not exclusive to CHWs) in LMIC settings was published over a decade ago (Bosch-Capblanch and Garner, 2008). The authors of this study noted that the purpose and focus of supervision was largely centred around the administrative aspects of supervision, rather than a focus on "problem solving, feedback and clinical supervision, training and consultation with the community" (Bosch-Capblanch and Garner, 2008:369). From a participatory standpoint, this positioning of supervision is problematic, since by overemphasising the administrative purposes of supervision, other more holistic aspects of supervision are in danger of being overlooked.

More recently, a study focusing specifically on the supervision of CHWs was published in 2014 (Hill et al., 2014). In this review Hill et al. (2014) noted that between the early 2000s and late 2010s there was a shift in focus away from viewing supervision as a management tool, towards one where supervision was regarded as a way to address the needs of CHWs as learners (Hill et al., 2014). The review also highlighted that despite showing promise, the evaluations of supportive supervision strategies encouraging community engagement were of poor quality.

Hill et al. (2014) also noted that CHWs and CHW supervisors are not "blank pages" (Hill et al., 2014:7). Their perceptions of supervision will inevitably be influenced by existing values and previous experiences (Rowe et al., 2005). Working alongside CHWs is therefore of paramount importance so that these values can be appropriately understood and incorporated

in the development of supervisory programmes. This calls for a participatory approach to research with CHWs, which has been suggested in recent literature (Coulter et al., 2020) and underpins how I undertook my study, which I describe in greater detail in Chapter 3 (*see Section 3.2 'Action Research as an Orientation to Enquiry':70*).

Since the publication of this seminal review by Hill et al. (2014) greater attention has been paid to supervision of CHWs, and a range of empirical studies have been conducted. In the following section of my literature review I provide a synopsis of the challenges identified in these studies.

2.5 Challenges surrounding the supervision of CHWs in LMICs

In order for supervision to occur, an enabling environment has to be in place. However, this is often difficult in LMICs due to several barriers and challenges. These include, but are not limited to:

Challenges related to the nature of supervision

A recent study by Ludwick et al. (2018) found that high CHW satisfaction in Uganda was associated with frequent contact with supervisors, positive relationships, the opportunity for feedback and the demonstration of mutual respect (Ludwick et al., 2018). However, the supervision of health workers in LMICs has traditionally been carried out in a technocratic and controlling fashion, emphasising the importance of inspection (Thakral, 2015). Supervision, in which "values, beliefs, motivations…and identities" (Scribner and Crow, 2012:243) are emphasised has been prohibited from occurring due to "the entrenched authoritarian supervisory paradigm" (Nkomazana et al., 2016:2). This has led to a call from researchers such as Couper et al. (2018) for supervision for health workers in Africa to focus more on clinical mentorship than administration (Couper et al., 2018). Similarly, scholars such as Avortri et al. (2019) have suggested the need to "transform the traditional form of

supervision that comprise top-down authoritarian approaches, to new methods that are more liberal and collaborative" (Avortri et al., 2019:2). However, given the managerial nature of so many existing approaches to supervision in LMICs, facilitating genuinely supportive supervision will require a drastic paradigm shift (Clements et al., 2007b).

Human-resource shortages

A lack of human resources for health has resulted in a shortage of trained supervisors in many LMICs (Crigler et al., 2014). This means that supervisee to supervisor ratios are often unacceptably high, which has been suggested to affect the overall quality of supervision (Rosales et al., 2015). Supervisors face several competing pressures, including high workloads and multiple responsibilities (Okyere et al., 2017, Manongi et al., 2006). This is illustrated by the following quote from a CHW supervisor in Ghana, who stated:

> "*…the workload is too much for me here. I am the administrator, accountant, and consultant and I also supervise the other staff so you can imagine what I am going through. There is no motivation for doing all these tasks…"* (Okyere et al., 2017:16).

Lack of supervisor training

Another critical issue is that many supervisors lack formal training in good supervisory practices and techniques. Often CHW supervisors can be poorly organised and unaware of the needs of their supervisees (van Ginneken et al., 2010). One such example was highlighted in a study by Crispin et al. (2012), which found that CHWs supervisors often lack the skills required to carry out their role effectively (Crispin et al., 2012). Similarly, a study by Ndima et al. (2015) found that several CHW supervisors in Mozambique had never received training in good supervisory practices. One was quoted as saying:

> *"I am supervisor since the APE (CHW) programme was revitalized here, but I have never been trained"* (Ndima et al., 2015:6).

This study also found that CHWs felt their supervisors largely focused on fault-finding, which in turn was demotivating (Ndima et al., 2015). This finding was mirrored in similar studies from Kenya and Ethiopia, in which CHWs reported that their supervisors focussed largely on highlighting mistakes they had made, rather than supporting the CHWs to solve the problems they had identified (Karuga et al., 2019, Kane et al., 2016). This issue is illustrated well in a quote from a CHW from Ethiopia who stated:

> "*What makes us not work hard is, when the higher health office comes for supervision, they leave our strong parts and take very minor things and discourage us …. "* (Kane et al., 2016:31).

Such concerns highlight the need to provide supervisor training. A study by Nkomazana et al. (2016) who conducted co-operative inquiry groups with supervisors of a PHC programme in rural Botswana, found that when supervisor training did take place there was a distinctive change in the way supervisors thought of, and approached, supervision (Nkomazana et al., 2016). This investigation revealed that after a period of reflection, supervisors felt they needed to change their supervisory style to incorporate values such as "teamwork, information sharing, transparency, affirmation, caring, staff health, and collaboration" (Nkomazana et al., 2016:5). There is, therefore, a need to respond to the call by Winters et al. (2018) for greater interdisciplinary collaboration between the field of health sciences and education (Winters et al., 2018a), given that the extensive research already conducted on good mentorship in the field of education could prove a valuable point of reference for the design and implementation of CHW supervisor training. As highlighted by Bush et al. (1996), qualities of a good mentor - such as active listening, good interpersonal skills, commitment to their role and regular feedback - were those most appreciated by mentees (Bush et al., 1996). Bush et al. (1996) also noted: "formal hierarchical relationships were alien to an effective mentoring relationship" (Bush et al., 1996:132). Similarly, Crow

suggests a socio-constructivist approach to mentorship in education, which places emphasis on learning in which "inquiry, sense making and reflection are foundational" (Crow, 2012:233). Importantly, Barnett and O'Mahony (2006) suggest that a good mentor should encourage reflection (Barnett and O'Mahony, 2006). This involves reflection on exemplary models of practice and reflection on their own practice. Such qualities and features should be emphasised, encouraged and evaluated during supervisor training programmes.

Supervisor selection

Another challenge relating to the supervision of CHWs is the way in which supervisors are selected. This is important since it has been suggested that the professional background of supervisors might influence their supervisory style. For example, supervisors in South Africa who previously worked in clerical positions took an administrative approach towards their role, whereas those with a background in counselling focused more on providing emotional support (Daniels et al., 2010). It is therefore important to consider the ability of the supervisor to relate to the needs of the CHW when undertaking selection (Duthie et al., 2012). The importance of this was demonstrated in a study by Kok and Muula (2013), where CHWs in Malawi felt the supervision process was hindered by a lack of recognition and respect from supervisors (Kok and Muula, 2013). One of the CHWs interviewed as part of this study stated:

> *"We are voiceless in this health system"* (Kok and Muula, 2013:8).

In other settings selection of supervisors has prioritised technical knowledge of clinical topics (Roberton et al., 2015). Whilst this is important, it does not necessarily mean that the supervisors who are selected possess other qualities known to be important for supportive supervision, such as good interpersonal skills (Duthie et al., 2012). Indeed, the wider literature on CHW supervisor selection is relatively sparse and requires further investigation.

Disjointed providers and supervisory frameworks

Where supervision programmes do exist, they are commonly unstructured and lack a framework for delivery (Karuga et al., 2019). The patchwork landscape of CHW providers, ranging from NGOs to governments, compounds this issue and makes it challenging to navigate the field (Fabricant et al., 2014). Different providers have different ways of conducting supervisory practice and are often not accountable to anyone.

Several studies have demonstrated the gap between expectations (in terms of how often CHWs expected to be supervised) and realities (in terms of actual supervisory habits). For example, in a study from South Africa, CHWs anticipated that they would meet their supervisor at least once a week and conduct joint home visits once a month (Austin-Evelyn et al., 2017). In reality this was the case for less than 50% of CHWs surveyed. Similarly, in Malawi Kok and Muula (2013) noted that there was no framework in place for giving feedback to CHWs (Kok and Muula, 2013). A lack of feedback from supervisors and low frequency of supervision was also associated with greater rates of attrition amongst volunteer CHWs in Kenya (Ngugi et al., 2018). Similarly, a study by De Neve et al. (2017) revealed that due to the disjointed provider networks in Swaziland, CHW programmes focussing on the delivery of supportive supervision for HIV care were piecemeal and often took vertical approaches to delivery (De Neve et al., 2017). Giving more consideration to how CHW supervision is embedded within the broader health system is therefore important.

Infrastructure barriers in LMICs

There are also logistical barriers that hinder supervision, such as poor transport access in rural areas during the rainy season (Kok and Muula, 2013). This can mean CHWs are unable to travel to ‘in-person’ supervisory sessions if roads become unfit for travel. Furthermore,

CHWs often have to travel long distances in order to receive supervision. One Tanzanian CHW in a study by Greenspan et al. (2013) highlighted the difficulties in distance by stating:

> *"I know they [health workers] have more expertise than me, but since we are located very far [from a health centre], for me it is very important to be supervised during the [service] delivery process"* (Greenspan et al., 2013:9).

Competing interests

The ability of CHWs to attend supervision sessions is also impacted by CHWs' busy personal and professional lives. For example, volunteer CHWs have other competing interests to balance alongside their roles as health providers, such as their regular jobs. This was highlighted in the study by Greenspan et al. (2013), where CHWs struggled to fit supervision into their daily routine:

> "*As you know, this is a volunteer position. Therefore, we need time to do our personal work"* (Greenspan et al., 2013:10).

Funding

Despite recent studies suggesting that investment in supervision could yield important improvements in health outcomes for communities served by CHWs (George et al., 2020), real monetary contributions towards supervision programmes remain low.

There are several reasons for this. Firstly, supervisory costs are high, ranging from initial recruitment and training of supervisors to the costs attached to holding supervisory sessions. For example, a recent study that evaluated the financial impacts of adding a supervisory package to a CHW initiative that encouraged exclusive breastfeeding in South Africa found that supervision constituted 64% of the trial costs (George et al., 2020). Although this figure is particularly high, in other settings such as Malawi, costs associated with supervision have constituted up to 17% of programme costs (Besada et al., 2020), suggesting that such

activities have significant budget implications. Secondly, given that the effects of supervision are not always immediately apparent, other areas such as drug procurement or initial training are often prioritised by programme managers (O'Donovan, 2018). Finally, ear-marked funding for CHW supervision often does not exist.

This is especially true in Uganda, where the government does not financially support the national CHW programme; thus it is underfunded and poorly supported (Lee, 2015). This issue is reflected across many LMICs, where funding for comprehensive CHW programmes is often lacking (Taylor et al., 2017). CHWs are often at the mercy of the programmes managing them – be this government or NGO organisations. Issues with remuneration have been widely documented in the literature, ranging from delayed payments (Chevalier et al., 1993), to no pay at all – such as in Uganda, where the current CHW programme is premised on a voluntary model. This can result in a feeling of neglect amongst the CHWs, which is illustrated well through a quote from a CHW in Mozambique:

> *"When I was chosen as APE [CHW] they spoke about the monthly allowance and I hoped that allowance was monthly … this is my 4th month and I have not received … is just not enough for anything …*" (Kane et al., 2016:31).

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In light of the numerous challenges outlined above, alternative strategies are needed to help support the delivery of supervision for CHWs. Given the high ownership of mobile phones in many LMIC settings (including Uganda where mobile phone ownership stands at 55% of the total population) (The World Bank, 2018), the use of mobile technologies (such as mobile phones) has been suggested as one way to address some of the challenges relating to the provision of supervision for CHWs (O'Donovan et al., 2018b). Their use could help to improve access, remove infrastructural barriers and help to develop the structure and

educational quality of supervision (DeRenzi et al., 2011, Istepanian et al., 2004, Labrique et al., 2013, Mwendwa, 2018).

2.6 The use of mobile technologies to assist CHW supervision

mHealth can be broadly defined as "mobile computing, medical sensor, and communications technologies for healthcare" (O'Donovan et al., 2015:34). As noted earlier in this thesis, I use the terms 'mobile technologies' and 'mHealth' interchangeably. Labrique et al. (2013) suggest that mobile technologies have several roles in assisting health systems strengthening, one of which is to support the education and training of health professionals (Labrique et al., 2013). To date, much of the literature on the role of mobile technologies to assist in the training and education of CHWs has focused on a technocentric approach towards evaluation (Winters et al., 2017). As a result, the popularity of mobile phones as a supervisory adjunct is largely driven by the promise of improved data collection and the ability to deliver supervision at scale (Tomlinson et al., 2009, Feroz et al., 2020). This is in keeping with the broader field of literature pertaining to the use of mobile technologies to facilitate learning (*mLearning*), where the features such as the cost, portability of devices and mobility of learners is emphasised (Kearney et al., 2012). Whilst these suggested benefits are undoubtedly promising, there is almost a complete absence of research regarding how the use of mobile technologies might facilitate CHW training and learning from a pedagogical perspective (Laurillard, 2009).

The role of mobile technologies to facilitate education and training for CHWs was evaluated in a recent systematic review by Winters et al. (Winters et al., 2018a). Significantly, of the 24 studies in which mobile technologies were used to support CHWs training and education, only four referred to formal theories of learning from educational research. In this article, the authors suggest that much of the existing literature suffers from a, "reductionist view of

learning that underestimates the complexities of the relationship between pedagogy and technology" (Winters et al., 2018a:1). Many of the studies included in the review used measures of information exposure as a proxy for learning, for example the number of "simplified guidelines on protocols sent via text messages" (Winters et al., 2018a:7). Winters et al. (2017) caution against these simplistic approaches towards training and education, since it is unclear as to how they might empower CHWs. Similarly, they do not contribute to a broader understanding of *how* learning takes place (Winters et al., 2017).

One such example of a simplistic mHealth supervisory intervention was a study in Zambia (Biemba et al., 2017). Here, CHWs used mobile phones to send weekly reports to their supervisors. In return they received SMS messages to invite them for mentorship sessions. In this example, mobile technologies were used as an administrative tool; i.e. to facilitate the planning of meetings and exchange of logistical information. Furthermore, although significant emphasis was placed on data collection and reporting, less emphasis was placed on capacity building and the nature of CHW learning.

As I suggested in a 2018 systematic scoping review of the literature published in BMJ Open, supervision is a particular area of CHW education and training that could be supported by mobile technologies in line with formal theories of learning (O'Donovan et al., 2018b). For example, mobile technologies could be used to support reflective and interactive learning through real time feedback by a remote supervisor, or peer-to-peer support via instant messaging services. This idea builds upon Lev Vygotsky's socio-cultural theory, which "emphasises the interdependence of social and individual processes in the co-construction of knowledge" (John-Steiner and Mahn, 1996:191). The idea that mobile technologies can facilitate learning is premised by the idea that "learning is a situated, social endeavour, facilitated and developed through social interactions and conversations between people"

(Kearney et al., 2012:1). This has led to the development of a pedagogical framework by Kearney et al. (2012) for mobile-facilitated learning, which draws upon the perspective of socio-cultural theory and cites three essential components for mobile facilitated learning: "*personalisation, authenticity and collaboration*" (Figure 1) (Kearney et al., 2012:8).

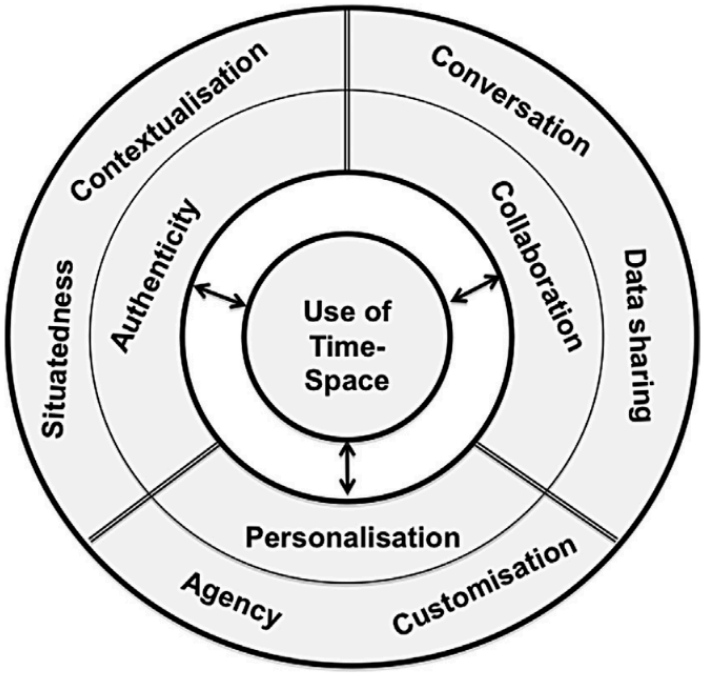


Figure 1 - Kearney et al's (2012) framework for mLearning underpinned by socio-constructivist theories of learning.

Personalisation gives learners control over where, when and what they learn (i.e. agency and autonomy) and allows them to engage with material on their own terms (Kearney et al., 2012). It should also encapsulate customisation of the learning experience (McLoughlin and Lee, 2008) and allow learners to set their own learning goals and objectives.

Authenticity in this context can broadly be defined as the extent to which learning is "realistic and addresses problems encountered by real world practitioners" (Kearney et al., 2012:9). It has been suggested that mobile-facilitated learning can help generate authentic learning opportunities through contextualised, data capture opportunities (Brown, 2010).

Collaboration can be thought of as "creating connections to other people and resources mediated by a mobile device" (Kearney et al., 2012:10). Underpinned by Vygotsky's socio-cultural theory this can mean sharing of information, obtaining feedback through rich dialogues and peer-to-peer exchanges.

Such uses of mobile technologies have been documented in literature pertaining to the field of education (Leinonen et al., 2016, Montrieux et al., 2015), however they have been under researched with regards to CHW supervision (O'Donovan et al., 2018b). In a systematic scoping review, I identified just seven studies that evaluated the use of mobile technologies to facilitate CHW supervision in LMIC settings (O'Donovan et al., 2018b). Of these, three used simplistic one-way SMS messages, with only one study from Kenya by Vu Henry et al. (2016) focussing on how mobile technologies might facilitate a more dialogical form of learning, through peer-to-peer interaction via an instant messaging mobile-app - WhatsApp (Vu Henry et al., 2016). There was a lack of attention given to providing a clear definition of supervision, and many researchers failed to position their work in relation to the existing literature on digital learning. This has led to calls for greater collaboration between members of the health and education research communities to understand how the capabilities of mobile technologies can be leveraged for the benefit of health workers from a pedagogical perspective (Winters et al., 2018a).

More recently, a study by Pimmer et al. (2017) explored the use of WhatsApp amongst a group of CHWs in rural Malawi (Pimmer et al., 2017). The study was less focussed on the role of WhatsApp in the supervision of CHWs, but rather on understanding how CHWs used WhatsApp to support their daily work. It also explored the perceived benefits and constraints regarding this approach. In total, 32 CHWs took part in the study and were supervised by six senior CHWs and three programme facilitators. In order to understand the nature of

WhatsApp exchanges, the study team thematically analysed five months of chat logs. They found two main uses of WhatsApp; instrumental and participatory.

The instrumental uses of WhatsApp were message exchanges aimed at achieving, "health-service and project-related goals" (Pimmer et al., 2017:4). Three sub-themes emerged from this category, which were (i) Mobilising Resources (e.g. arranging meetings); (ii) Information sharing and problem solving (e.g. sharing clinical information or finding solutions to a lack of medicine in one village); and (iii) Acknowledging performance (e.g. messages of congratulations from supervisors to CHWs) *(ibid)*.

The participatory uses of WhatsApp identified by Pimmer et al. (2017) encompassed message exchanges that helped to create a professional community for the CHWs and included strengthening supportive communal ties (e.g. sending greetings and wishing each other well), "disclosing and accumulating claims" (e.g. CHWs might send messages highlighting the need for financial support), and "engaging in cross-boundary debates" (e.g. debates around culture, religion and politics) (*ibid.:5*). The in-depth interviews exploring the benefits and constraints of the WhatsApp platform suggested that CHWs found it to be user friendly and the group nature of the exchanges meant that information could be shared easily – in contrast to traditional one-to-one SMS messaging. The CHWs also suggested that the process of information exchange and group feedback helped to facilitate learning, as well as helping to convey a strength of connectedness with their fellow CHWs, despite being geographically dispersed (*ibid*).

Pimmer et al. (2017) also noted challenges, such as striking a balance between instrumental and social conversations. Although 12 CHWs stated that the aspect they disliked most about mobile-instant-messaging was receiving non-work-related messages, a conscious decision was made by the facilitators to allow such messages to be sent, since banning them totally

may have risked diminishing the use of the platform altogether, which they stated was "inherently social" (*ibid.:6*). Another challenge was the linear way in which messages were sent. If a CHW did not read and respond to messages in the order they were sent, then several parallel conversations could emerge, rather than one conversation around one theme. The study suggested that this limited the ability for in-depth discussion. Finally, there were a small number of technical challenges, relating to the ability of CHWs to type messages or to charge their phones.

Given the potential and promise attached to the use of mobile technologies, it is also important to note the growing body of literature which highlights the challenges surrounding the use of mobile technologies for CHW training and supervision. In a study by Mwendwa (2016), it was found that although a SMS[18] supervisory system helped programme managers keep track of CHWs activities and allowed for data to be quickly sent to the MoH, CHWs expressed several areas of dissatisfaction. For example, in one focus group discussion, CHWs stated:

> *"We need to have more supervision when using RapidSMS. We have not used a technology before so it takes long to learn how to send the messages"* (Mwendwa, 2016:44).

Other issues included dissatisfaction with the automated messaging service, difficulties in contacting supervisors and feedback being in English rather than the local language (Mwendwa, 2016). For example, one CHW expressed their frustration with the automated messaging service, since they felt it did not adequately answer areas of concern or fully address their needs as learners:

> *"The system should point out where we make mistakes; I am tired of sending messages without success"* (Mwendwa, 2016:46).

[18] SMS (also known as Short Messaging Service or 'Text messaging')

Pimmer et al. (2017) also cautioned against viewing WhatsApp as a panacea for the delivery of supervision, given the un-focused nature of exchanges within a group discussion. They state that:

> *"…it could never supersede the focused learning and teaching of on-site training or the concentrated attention of face-to-face supervision, but should be conceived as an additional layer"* (Pimmer et al., 2017:8).

Similarly, several challenges were highlighted after an mHealth project in Nepal involving rural CHWs (Meyers et al., 2017). The authors of this study emphasised the importance of ensuring the suitability of technology to the local context, and bringing together key stakeholders to decide on the goals of the programme prior to commencement. Indeed previous research has noted that many mobile-assisted education and training programmes for CHWs fail to consider the contextual and cultural factors which are crucial to their overall acceptance and long term use (Tariq and Durrani, 2018). Tariq and Durrani (2018) suggest the need for a paradigm shift away from the, "techno-deterministic design focus" on mobile based interventions, towards one informed by context (Tariq and Durrani, 2018:10). This is an important concept which I built upon during the design of the supervisory intervention which I describe in Chapter 7.

Finally, it is important to note that the challenges of a mobile-assisted approach to CHW training and supervision are not restricted to individuals. In 2011, the government of Uganda issued a moratorium on all mHealth projects within the country due to a concern about the large number of pilot-projects that failed to scale and integrate with government systems (Huang et al., 2017). It is therefore important that those responsible for establishing mHealth based interventions work with key stakeholders at every level, from the community through

to government policymakers, to help maximise chances of large-scale and long-term adoption.

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In summary, there is a significant gap in the literature around CHW supervision, both in terms of how it is conceptualised, delivered and evaluated. I suggest this is due to a myriad of factors and underlying tensions, including how supervision has been positioned historically as a mechanism for accountability and control, to logistical factors such as a lack of human resources to facilitate supervision, through to financial barriers secondary to underfunding of CHW programmes. I suggest that one potential way to address the supervisory challenges I have identified is through the use of mobile technologies; a concept which has been explored before, but has often failed to be situated contextually and has often failed to be underpinned by established theories of learning. In the following sub-section of this Chapter, I outline my research questions in light of these gaps identified in the literature which motivates the need for my work.

2.7 Research Questions

With the current emphasis placed on evaluating the success of mHealth programmes through a technocentric lens, I build on Winters et al.'s (2017) proposition to focus on understanding how supervision (facilitated through the use of mobile technologies) can be understood from a pedagogical perspective (Winters et al., 2017).

Given the gaps identified in the literature, I aim to address the following research questions in my thesis:

1. How do key stakeholders (*CHWs, NGO programme managers, health facility workers, and government officials*) perceive CHW supervision, and specifically the role of mobile technologies in facilitating supervision?

This question is important given the tensions in the existing literature regarding how CHW supervision is defined and conceptualised, as well as the relative lack of research assessing the role of mobile technologies to assist in supervision. In the existing literature, only one study has conducted an in-depth exploration of CHW's perceptions relating to the ways in which mobile technologies could play a role in supporting supervision (Mwendwa, 2016). Although Mwenda's (2016) paper is significant in attempting to document challenges faced by CHWs, emphasis was largely centred around the technical barriers to supervision, rather than the pedagogical and socio-cultural challenges (Mwendwa, 2016).

Through in-depth engagement with key stakeholders on the ground, the project team was well placed to respond to the call from Tariq and Durrani (2018) to design a mobile-assisted supervision programme that is informed by context (Tariq and Durrani, 2018). Designing a supervisory programme around the needs of CHWs also provided me with a strong foundation from which to develop the rest of my work. This process also allowed me to explore any potential tensions that underlined the way in which supervision was perceived by different stakeholders. For example, in a 2018 study by Schriver et al. (2018) from Rwanda, "learning was rarely discussed as a supervision purpose among (managerial) providers," in a primary health setting (Schriver et al., 2018:7).

Chapters 5 and 6 of my thesis describe the key findings which helped me to address this research question.

2. What are the effects of using an mHealth intervention, as part of a blended supervision programme, on the nature of CHW supervision?

I answer this question in Chapter 9 by evaluating the impact of a blended supervisory intervention which used a mobile-based group messaging platform (WhatsApp) to support

CHW supervision. This evaluation consists of analysing the supervisory categories of messages exchange on the WhatsApp platform, as well as the supervisory nature of the interactions. I combine a descriptive analysis of the messages, with a qualitative thematic analysis of FGDs and in-depth interviews with the CHWs involved in the study. I also use key vignettes extracted from the message exchanges to illustrate the nature of mHealth-facilitated supervisory interactions over the six-month implementation period.

This analysis builds upon work already undertaken by Vu Henry et al. (2016), and Pimmer et al. (2017), who have both used WhatsApp to explore supervision of CHWs (Pimmer et al., 2017, Vu Henry et al., 2016). While their work has primarily focussed on a descriptive analysis of the types of messages sent, I go beyond this, exploring the precise nature of supervision that occurs through the exchanges, and conduct a more detailed analysis, drawing upon my deep understanding of the context in which this intervention took place.

Similarly, recent work by Assegaai and Schneider (2019) has begun to explore who is involved in CHW supervision through the use of social network analysis modelling (Assegaai and Schneider, 2019b). By using self-reporting questionnaires to explore who is involved in CHW supervisory interactions, the authors were able to better understand the roles of different actors involved in CHW supervision in a South African setting. However, unlike this previous work, which did not focus on the use of technology to facilitate supervision, I use real-world logs of WhatsApp message exchanges between CHWs and their supervisors to explore not only who is involved in supervision, but also the content and nature of interactions between these individuals.

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Throughout my thesis, I will provide summary tables, such as the one below (Table 1), highlighting how my understanding of CHW supervision evolved at different stages throughout the project, and how this understanding helped to shape the project design and evaluation.

Phase of research	**Core concepts of supervision**	**Ways in which it informed the design/evaluation of the subsequent intervention**
Background framing - *Literature review*	**Positioning and framing of supervision** • Historically supervision of health workers has been positioned to prioritise administrative functions over supportive ones. • There is often a failure to define what is meant by the term 'supervision' in much of the existing literature pertaining to CHW supervision.	• Understanding this background was important to ground myself in the reality that change in supervisory practice may be difficult to achieve. • I should carry out a period of work understanding how supervision was conceptualised in this setting (see Chapter 6). • I should take into consideration the viewpoints of different stakeholders (see Chapter 6). • I should understand how supervision is currently delivered in this setting – including challenges and ways in which it could be improved (see Chapters 5 and 6).
	Reconceptualising supervision • There is a need to shift towards 'supportive supervision' which promotes collaboration, problem solving and open communication. • There has been some theoretical work towards understanding what 'good supervision' entails (see Kilminster et al. (2007)); however this has rarely been instantiated in practice. • These features include that supervision should be: 1. Offered in context; 2. Respectful; 3. Provide frequent feedback; 4. Structured and regular;	• Thought needs to be given as to how a supervisory intervention can be designed in a way which encapsulates principles of 'good supportive supervision'. • It is important to consider a supervisory design which addresses local challenges in a contextually appropriate manner. This was part of the reason why I undertook a participatory approach towards my work. • The supervisory intervention needs to allow for regular feedback. This was part of the reason for selecting WhatsApp as the supervisory platform (see Chapter 7).

	5. Holistic; 6. Led by the needs of the supervisee; 7. Ensure supervisors receive training in assessment, counselling and interpersonal skills • An element of clinical competence is important for CHW supervision given the nature of their job roles.	• The intervention needs to be purposefully designed and structured (vs. piecemeal in nature). • Taking an approach which places CHWs at the centre of the design and implementation process is important. • Training of supervisors should be done prior to deployment. • Ensuring supervisors have clinical expertise is important – this was part of the reason for having a network of supervisors (see Chapter 7).
	Challenges facing CHW supervision • There are multiple challenges facing CHW training including: - Human resource shortages - Lack of supervisor training - Selection of supervisors - Disjointed frameworks for supervision - Overburdened CHWs - Funding issues	• Depending on the context and recognising potential local constraints on human resources, a supervisory intervention should be able to function without the need for a large number of supervisors. For example, where a shortage of health personnel exist, strong supervisory structures should not be dependant a low ratio of supervisors to supervisees. • Selection of supervisors should be informed by the needs and wishes of the participants where possible – this was facilitated in my project by taking a participatory based approach to the study. • Supervisory frameworks should contribute to an overall health systems strengthening approach and key stakeholders should be involved at each stage of the process, including District Health Officials and programme managers. • Supervision should be flexible in nature and provide CHWs with a level of autonomy. • The supervisory programme should be co-developed with key in-country stakeholders and be designed in a manner to promote sustainability.

	A potential role for mobile technologies to support supervision • mHealth could have an important role in supporting CHW supervision. • The current literature emphasises the technical benefits of mHealth supported supervision, but places less importance on the pedagogical aspects.	• A supervisory programme could be designed to incorporate mHealth. • The design and evaluation of any mHealth facilitated supervisory programme should be framed through a pedagogical lens, since there is a currently paucity of evidence in the literature regarding this. • The use of socio-cultural learning theory could be helpful in the design and evaluation of an mHealth facilitated supervisory programme.

Table 1 – My evolving understanding of supervision – Summary Table A. Here I highlight core concepts regarding my understanding of supervision developed through the process of the literature review and how this informed the design and evaluation of the subsequent mHealth facilitated supervisory intervention.

Chapter 3 - Methodology - Methodological underpinnings and setting the scene

3.1 Chapter Overview

My first methodology chapter begins by outlining the approach of Action Research (Koshy, 2010), which constitutes the methodological framework for my thesis. Action research takes many different forms and is not without its critics; however, I suggest that the underlying principles of CBPR - *which is one particular form of action research that involves the collaboration of a community in the pursuit of addressing a topic of societal importance* - are well suited to addressing some of the complex and deeply rooted challenges facing mHealth facilitated CHW supervision, which I outlined in my literature review (see Chapter 2). I also posit that the emancipatory goals of CBPR are well aligned to research concerning CHWs since they can be considered as a marginalised cadre of health workers.

I next describe the setting where my research took place – Seeta Nazigo Parish, in Mukono District, central Uganda. Rich descriptions of contexts are rarely, "recorded, analysed, or included in research reports" (Tomoaia-Cotisel et al., 2013:s115); however understanding context is vital for understanding phenomena in health research. I therefore address this gap by outlining the geo-socio-political context of Uganda and introducing the key stakeholders I worked with over the duration of my fieldwork. Despite context being cited as important in healthcare research, it is often poorly defined (McCormack et al., 2002). I therefore use Rogers et al.'s (2020) definition of context to refer to "a multi-dimensional construct encompassing micro-, meso- and macro-level determinants that are pre-existing, dynamic and emergent throughout the implementation process. These factors are inextricably intertwined, incorporating multi-level concepts such as culture, leadership and the availability of resources" (Rogers et al., 2020:18). This therefore involves me providing a detailed

description of the health infrastructure in Seeta Nazigo Parish, both in terms of individuals, organisations and the external environment in which my study took place. Finally, I outline the ethics procedures I followed for my study.

3.2 Action Research as an Orientation to Enquiry

3.2.1 Definition of Action Research

At the broadest level, action research has been defined as:

> *"a participatory, democratic process concerned with developing practical knowledge in the pursuit of worthwhile human purposes . . . It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities"* (Reason and Bradbury, 2001:1).

In essence, action research should begin with an issue of concern that is poorly understood, with an underlying principle that taking action to address the issue would be considered desirable (Cohen and Manion, 1989, McTaggart, 1991).

The topic of CHW supervision is well suited to an action research approach for a number of reasons. As highlighted in Chapter 2, the current field of mobile-facilitated CHW supervision is poorly understood from a pedagogical perspective. This is despite the interest and potential that currently surrounds mHealth initiatives for CHW training and supervision, which are often framed through a techno-centric lens (Winters et al., 2018b). There is also a need to understand how mobile technologies impact the nature of CHW supervision and learning. This is in order to avoid an overly simplistic instrumental view of mobile technologies, which reduces their potential benefits to technical issues, without addressing the pedagogical potential they also have to support supervision (Winters et al., 2017). The problem-solving nature of action research also means that the supervisory challenges identified as part of an action research cycle can also be addressed in an iterative manner.

3.2.2 Background to Action Research

The intellectual roots of action research are often credited to John Dewey and his seminal 1916 work, "*Democracy and Education: An Introduction to the Philosophy of Education*" (Dewey, 1916). Dewey's original work was further developed by Kurt Lewin (Adelman, 1993) and John Collier (Neilsen, 2006) - two pioneers in the field of action research.
John Collier appears to have first used the term '*action research*' in his 1945 publication, "*United States Indian Administration as a Laboratory of Ethnic Relations*" (Collier, 1945). In this article, Collier highlighted the exploitation of Native Indian communities in North America throughout the 19th and 20th centuries. He also outlined the United States Indian Administration's work to address these issues, and in doing so articulated a central tenet of action research, which is the process of taking action through the process of research, with the view that change is considered desirable (Cohen and Manion, 1989).

Lewin went on to develop Collier's work further, by exploring in greater detail the scientific understanding and theorisation behind such an approach (Neilsen, 2006). Importantly, he suggested it was integral that action research involved the individuals whose lives were under study in the research process. His early work highlighted the importance of collaborative group work in identifying an issue of societal importance, suggesting solutions, testing these solutions, and subsequently modifying them through a process of collaborative reflection. This raises the concept of *participation* in the action research process. Lewin also stressed that action research should be viewed through a critical lens (Newton and Burgess, 2008) and outlined eight core principles to guide action researchers. These are set out in Table 2.

Principle Number	Principle
1	"Action research combines a systematic study, sometimes experimental, of a social problem, as well as the endeavours to solve it."

2	"Action research includes a spiral process of data collection to determine goals, action to implement goals and assessment of the result of the intervention."
3	"Action research demands feedback of the results of the intervention to all parties involved in the research."
4	"Action research implies continuous cooperation between researchers and practitioners."
5	"Action research relies on the principles of group dynamics and is anchored in its change phases. The phases are: unfreezing, moving and refreezing. Decision-making is mutual and is carried out in a public way."
6	"Action research takes into account issues of values, objectives, and power needs of parties involved."
7	"Action research serves to create knowledge, to formulate principles of intervention and also to develop instruments for selection, intervention, and training."
8	"Within the framework for action research there is much emphasis on recruitment, training and support of the change agents."

Table 2- Principles of Action Research. Lewin's Principles of Action Research, as articulated by Bargal (Bargal, 2006).

3.2.3 How are action research studies conducted?

Action Research studies are conducted in various ways, but they are commonly based on multi-stage, cyclical models (Kemmis and McTaggart, 1988), where each phase (or stage) of the cycle influences the subsequent phase (Figure 2). This aligns with the 'spiral' process articulated in *Principle 2* in Table 2 above.

McNiff suggests the following stages for action research projects (McNiff, 2013) (2013: 8-9):

- Reflect on the situation at hand;
- Identify a challenge or concern;
- Identify a possible route forward, e.g. a plan of action;
- Test this out;
- Observe and evaluate the action taken;
- Modify the intervention based on observation and evaluation.

The following illustration is a diagrammatic representation of an action research cycle:

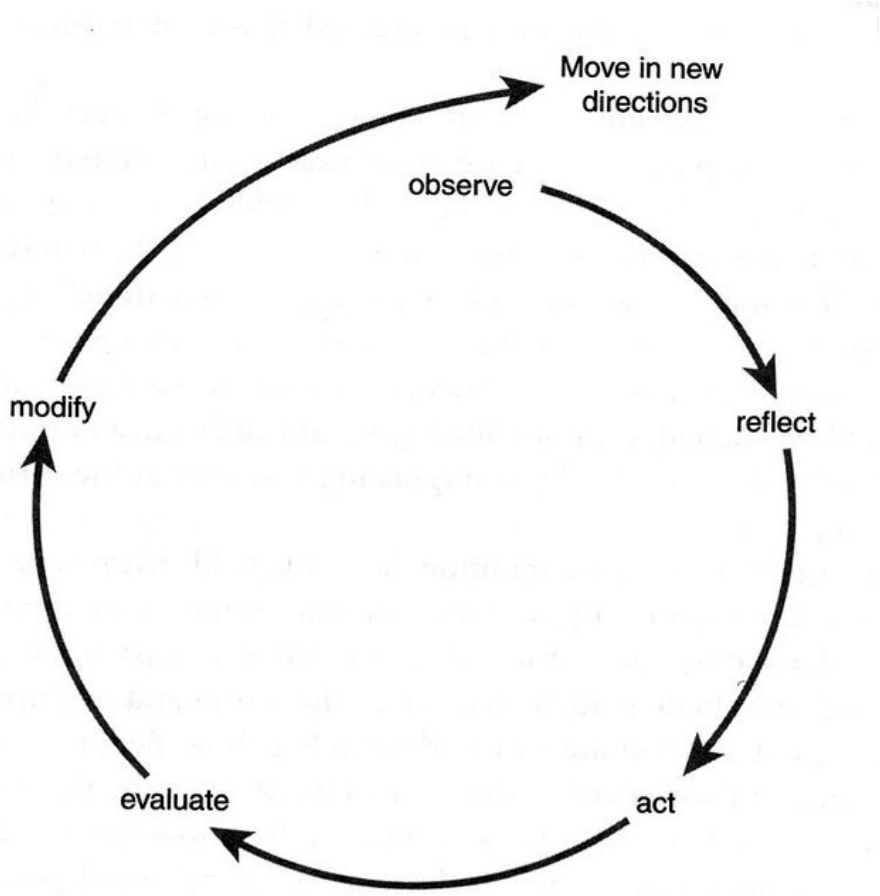


Figure 2 - An Action Research Cycle. An action research cycle, as proposed by McNiff (McNiff, 2013) (2013:9).

In my work, I completed one full action research cycle, where each stage of the cycle built upon the one before. I outline the methodology for each of these stages in Chapters 4 (Phase One); 7 (Phase Two); and 8 (Phase Three).

In the following section of this chapter, I outline the particular form of Action Research which underpinned my work; Community Based Participatory Research (CBPR).

3.2.4 CBPR as a Form of Action Research

'Action Research' can be thought of as an umbrella term for many different communities of thought underpinned by the general notion of, "creat(ing) change and improv(ing) the

situation (action) in which a practice takes place" (Jacobs, 2018:36); however, there is debate over what exactly constitutes the various different but overlapping 'strands' of Action Research (Robinson, 1993).

One form of Action Research is Participatory Action Research (PAR) which places particular emphasis on the active involvement of participants as part of the research process (Savin-Baden and Wimpenny, 2007). This is in contrast to other forms of Action Research, such as 'technical' or 'practical' action research which are primarily researcher driven (Jacobs, 2018) and where the commitments to participation vary (Bergold and Thomas, 2012).

The form of PAR which underpins my thesis is CBPR (Hall, 1992). CBPR has three key elements which are: participation, research, and action (Hall, 1992) and focuses on exploring issues of importance to a community. CBPR is unique in that it is situated within a community and recognises the unique perspectives that each member of the community can bring to understanding and addressing a problem of concern. It also aims to take a holistic approach to research by focusing on human emancipation (Minkler and Wallerstein, 2008). In particular, CBPR approaches have been suggested to be important in reducing inequities in health, especially with research projects that concern marginalised or underserved populations (Jagosh et al., 2012, Minkler and Wallerstein, 2008).

The existing literature on CBPR in the context of research involving CHWs has suggested that there are two important 'pillars' underpinning CBPR - ethics and empowerment (Smith and Blumenthal, 2012). It is important to caveat that the terms 'ethics' and 'empowerment' are loaded and heavily debated concepts, particularly within the wider development literature, each with extensive bodies of thought behind them (Lincoln et al., 2002, Sumner, 2007). An extensive critique of the terms is beyond the scope of my thesis, however with regards to ethics, CBPR has been suggested as one way to help ensure communities are better protected

from exploitation by external researchers through their integral involvement in the research process. The second pillar of empowerment is more controversial. CBPR has been suggested to, "offer a transfer of power from institutions that historically hold it (academia and public agencies) to those who have been denied it (low-income and minority communities)" (Smith and Blumenthal, 2012:2). From my own experience of taking a CBPR approach in the context of my thesis, I suggest the concept of 'shifting power' is overly simplistic and in reality is fraught with challenges which I discuss in more detail throughout the thesis in reflective vignettes.

3.2.5 How does CBPR Align with my Work?

Holkup et al. (2004) have suggested that traditional methods of enquiry, which are usually led by external 'experts', are often poorly aligned to exploring the complexities of community health challenges because they tend to take a positivist approach to research and attempt to separate phenomena from their context (Holkup et al., 2004). They argue that a deep understanding of context is imperative for understanding how and why a phenomenon occurs, and therefore suggest that researchers take a constructivist approach towards their work. As such, my research agenda and methodological approach (underpinned by a constructivist worldview) allowed me to explore the lived experiences of the participants and the influence of the context and my own role on my research findings. This, combined with a desire from the communities where research projects take place to have a say and genuine stake in the research, has led other researchers to suggest CBPR as an alternative paradigm for research concerning community health issues, especially involving marginalised populations (Green and Mercer, 2001, Minkler, 2005).

CBPR is therefore well suited to research regarding CHWs, who are often considered to be a marginalised and oppressed group of health workers (Kane et al., 2016). For example, CHWs

play an essential role in initiatives that are aimed at strengthening health systems in LMICs; however, they are rarely included in the decision making that relates to their job roles (Otiso and Hawkins, 2016). For example, during the Ebola crisis of 2015-2016, CHWs were the front-line health workers, taking on significant personal risk. Many CHWs remained in their communities providing services, yet were disadvantaged by a lack of supplies and equipment due to inadequately managed supply chains (over which they had no control) (Miller et al., 2018). In this case, the CHWs were let down by those in positions who controlled the supplies needed for them to carry out their jobs. Similarly, in the context of my study, despite being the official foundation stone of primary health in Uganda, CHWs are unpaid volunteers with no formal workers' rights (O'Donovan et al., 2018c). Furthermore, CHWs are often the subjects of research studies and implementation projects, yet have rarely been part of the teams directing the enquiry (Maleka et al., 2019, Otiso and Hawkins, 2016). Given that CHWs face the same challenges and issues as those they serve, (since they often live in the same communities) they offer valuable and unique insights that are lost if they are not included in the research process. Furthermore, a recent study by Coulter et al. (2020) which explored the roles of CHWs on research teams found that studies which took a CBPR approach were more likely to involve CHWs at more stages of the research process (compared to those which took a non-CBPR approach) (Coulter et al., 2020). For example, studies which took a CBPR approach were more likely to involve CHWs in identifying the topic of proposed study and in the dissemination of research findings. The authors suggest this approach can help to ensure relevance to communities where the research takes place (*ibid*).

In addition, the vast majority of research projects focus on reporting the outputs of CHW programmes, concentrating on metrics relating to improved health outcomes (Nkonki et al., 2011). These projects rarely focus on the perceptions and lived experiences of CHWs (Kane

et al., 2016). My thesis suggests that such explorations are vital to understanding the enormous challenges faced by CHWs and why they operate the way they do, which in turn may affect the delivery of care and thus health outcomes (Sivaram and Celentano, 2003, Ewoigbokhan and Brieger, 1994, Chevalier et al., 1993).

It is essential, therefore, for policy planners to understand the needs of CHWs, who play a vital role in strengthening health systems in LMICs. Thus, a body of work exploring the use of CBPR with CHWs has begun to emerge (Coulter et al., 2020). This research approach aims to address issues of concern in a collaborative manner with the CHWs themselves. It has also been found that, through this collaborative process, "CBPR can uncover lay knowledge critical to enhancing understanding of sensitive health problems" (Minkler, 2005:ii6) and that that this insider knowledge can help strengthen subsequent interventions.

For example, in a study from Botswana, a co-operative inquiry group was used to explore the process of change resulting from a supportive supervision intervention with CHWs (Nkomazana et al., 2016). The study followed a CBPR approach and, through a process of collaborative planning, action, observation, and reflection, found that a cultural shift was required to improve CHWs' perceptions of supervision. Findings suggested that managers should recognise the need to shift their style of supervision from managerial and authoritative, to supportive, as well as conducting outreach visits to CHWs.

My research therefore aims to build upon this emerging body of evidence. Using a CBPR approach, this study will explore the conceptualisation of supervision in a particular context and in collaboration with CHWs, will seek to understand how any subsequent supervisory intervention employing an mHealth approach, can be most responsive to the needs of CHWs.

3.2.6 Challenges and Criticisms of Action Research

Despite the potential merits of action research, there are also challenges and criticisms of this methodological approach. For instance, many projects that are defined as action research have strayed from Lewin's original vision in that they "might very well serve to reinforce a dominant discourse" in education (Newton and Burgess, 2008:21). Masschelein and Quaghebeur support this notion in the context of technology projects in the field of international development, by suggesting that notions of 'participation and involvement' can often be lost in action research projects (Masschelein and Quaghebeur, 2005), because the individual participant or technology-user can at times be expected to conform to pre-determined concepts of what it means to be a 'productive participant' (Zheng et al., 2018, Selwyn, 2012).

It has also been suggested that practitioners may be opposed to conducting action research, because it demands that they critically assess dominant societal structures that perpetuate injustices, which they themselves serve to reinforce. This conflict of interest has been suggested as a reason why some teachers, for example, are opposed to action research approaches in educational research (Pajak and Green, 2003, Brown and Jones, 2001). Other scholars have claimed that some of the central aims of action research are to:

> "*collaboratively develop research knowledge, mutual trust, culturally centred research methods, sustainable interventions, and community capacity and change power relations among academics, policy makers, community members, and other stakeholders*" (Oetzel et al., 2018:2).

However, action research approaches do not necessarily consider potentially complex relationships between a research team and participants (Colombo, 2003, Cooke and Kothari, 2001, Hawkins, 2015). In a study by Pinto et al. (2014) it was found that community participants with lower levels of education who were involved in participatory research studies were more tolerant of research approaches led by the external professional researcher,

than members of their own community, with higher levels of education (Pinto et al., 2014). This adds to the discourse that there is a danger of reinforcing "traditional researcher-driven investigations" (Spears Johnson et al., 2016:578) and masking them as participatory research. I grappled with this issue during my research in Uganda, where I played a key role in the project. The historical legacy of colonialism at times made forming genuine, equal relationships between a diverse research team, consisting of myself (a British researcher) and Ugandan CHWs, challenging and I reflect on this issue in the subsequent chapters of my thesis (*see Chapter 5:157-160 and Chapter 10:317-336*).

Other scholars have noted that deciding who takes part in participatory research can present challenges (Hakimi, 2015). For example, just because an individual identifies as a CHW, this does not necessarily mean they share the concerns and challenges faced by other CHWs. The danger, therefore, is that individuals selected for action research studies are assumed to be representative of the community as a whole – whereas in reality there is a complex web of interests, relationships, goals and aims; some of which are aligned and others which are divergent (van de Ruit, 2019). This has become known as the "myth of community" (Cornwall, 2003). On a similar note, there is a danger that those selected to be part of the research process are part of the dominant sector of society and therefore their views are reinforced through the research process. This could well be the case in participatory studies involving CHWs, given the selection criteria for their positions, which at times place emphasis on respect and position within the community. In such instances, there is a danger that the voices of the more marginalised individuals in the community are lost.

Throughout my thesis, I reflect and discuss these challenges by drawing upon specific examples encountered during my fieldwork; however, I also suggest that whilst these

challenges are real and should be made transparent, action research remains a useful and important methodological approach to inform my work.

3.3 How do I situate myself within the study?

One of the central tenants of action research is 'reflexivity' (Robertson, 2000) which is understood to be both the conscious practice of self-awareness and self-examination from the researcher of how their own position and experiences influence the research study, and also how the research affects them as an individual (Gilgun, 2008, Le Gallais, 2008). The 'reflexive researcher' has been described as an individual who is, "gazing in two directions at the same time. As they attend to what is taking place in the field of study, they become aware of their own projections, attachments, assumptions, agendas, and biases" (Probst, 2015:38). Reflexivity is important in action research because the decisions being made by the action researcher and the ways in which data are interpreted are constantly changing and being influenced by their own perceptions and views (Robertson, 2000). This can have important implications for subsequent phases of research. Being aware of these views and beliefs and critically assessing how these shape the action research process is important, since it allows the researcher to consider how these might have shaped the project findings (Hammersley and Atkinson, 1983:236).

At various points throughout my thesis I add reflexive statements in order to help the reader better understand the position from which I am approaching my research and the "conceptual baggage" I bring to this study (Hsiung, 2008). This has not, however, been an easy process for me. I commenced the DPhil in Education with no formal training in the social sciences having transitioned from the field of medical science, which, from my experience, placed little to no emphasis on reflexive practice (Closser and Finley, 2016). I also have struggled with the extent to which I should document my own personal experiences and reflections,

given that the primary focus of my research is the CHWs. Such quandaries have been documented in the past by individuals undertaking ethnographic research, who have grappled with the challenge of being seen to prioritise their own voice over that of the study partners and participants (Finlay, 2002). This dilemma has been termed as the "muddy" or "messy" nature of reflexive research (Pillow, 2003, Valandra, 2012). Some of these reflections have also forced me to be (*necessarily*) self-critical, which at times has been a challenging and uncomfortable experience.

McAteer notes that action research should be both contextualised and personalised (McAteer, 2013a). It is therefore essential that I situate myself within the wider study. Here I articulate my academic and professional background and how this has shaped my current, constantly evolving, worldview.

My research sits at the nexus of three broad areas: Education, Technology and Healthcare, and I have a specific interest in exploring how mobile technologies can facilitate CHW training and supervision. Of these three broad fields, I identify closest with the field of healthcare given that I entered the DPhil programme with a background as a medical doctor. During my undergraduate medical studies I developed an interest in better understanding health disparities and took time out of medical school to study for an intercalated Masters in Research and to complete a *Global Health*[19] fellowship in the United States. What is important to note is that up to the point of commencing the DPhil at the Department of Education, I had never been exposed to the concept of research philosophies, which perhaps is a reflection of the wider culture of medical training and research that is dominated by a

[19] Global Health, I argue, is a problematic term and one which I reflect deeply on in the Afterword of my thesis (*see Chapter 10*). Up until this particular critique I adopt Beaglehole and Bonita's widely accepted definition of 'Global Health' which is "*collaborative trans-national research and action for promoting health for all*" BEAGLEHOLE, R. & BONITA, R. 2010. What is global health? *Global health action,* 3**,** 10.3402/gha.v3i0.5142.

positivist paradigm (Dornan and Spencer, 2008, Kuper et al., 2017, Bunniss and Kelly, 2010). This meant that my past experiences and work, especially as a medical researcher, were largely grounded in experimental study designs, underpinned by a positivist philosophy.

However, as I will document at different points throughout my thesis, this approach did not enable me to ask more exploratory questions, such as why and how certain things happen. I also began to explore the work of influential medical anthropologists, who have offered critiques of the "empirical tyranny" that shapes global health research (Adams, 2010). These combined experiences, along with others which I will describe in subsequent chapters, led to a shift in my position as a researcher and resulted in me exploring an alternative approach to research, underpinned by a constructivist paradigm, which I take in this current study.

3.4 Research setting

My research took place in Mukono District, Central Uganda, approximately 25 kilometres east of the nation's capital Kampala. The district is made up of 12 sub-counties, further divided into 72 parishes and 721 villages (Figure 3).

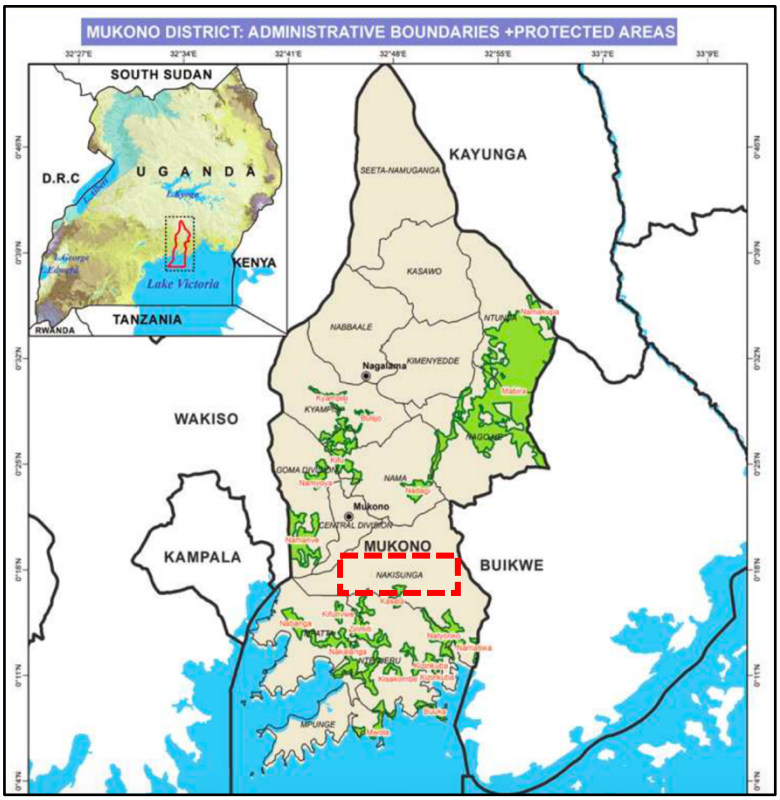


Figure 3 - Map of Mukono District. A map of Mukono District taken from "Mukono District Hazard, Risk and Vulnerability Profile Document" (Page 3). Nakisunga sub-county is highlighted by the red dashed box.

Specifically, my research took place in four villages; Makata (where I was resident for 10-months), Kirujja Butoke, Kavule, and Seeta Nazigo. These villages are located in Seeta Nazigo Parish, Nakisunga sub-county (highlighted by a red box in Figure 3).

Although Seeta Nazigo Parish is only 10 miles from the town of Mukono, the area is extremely rural, thus presenting a myriad of challenges. Branching off from the Jinja highway (which connects Kampala to the port town of Jinja), there is only a single track murram dirt road[20] between Mukono town and Seeta Nazigo, which is poorly maintained and interspersed with rocks and potholes (Figure 4).

[20] A form of laterite (clay material) used for road surfaces in East Africa. The laying of such surfaces facilitates passing on rural dirt roads, especially during the rainy season.



Figure 4 - The road to Seeta Nazigo. The murram dirt road connecting Mukono town to Seeta Nazigo.

In the dry season, the thick orange dust coats the surroundings, including cars, people, livestock and the trees and greenery lining the roadside. In the rainy season, the road disintegrates into a clay-like mud bath, coating tyres of cars and rendering any previous traction void. These conditions have real impacts on CHWs' delivery of healthcare services. During my time in Seeta Nazigo, I found the rainy season to be particularly problematic when it came to timely emergency care referrals from the local health centre to the large health centre in Mukono town because of the difficult road conditions.

According to the national 2014 census, the total population of Mukono was just under 600,000 people (Land Conflict Mapping Tool Uganda, 2017), the majority of whom belong to the Baganda ethnic group - the largest tribe in Uganda, comprising 16.9% of the population. The Baganda place significant importance on their traditional king, known as 'Kabaka', and are therefore also referred to as 'The Kings Men'. The dominant language of

the region is Luganda and the majority of individuals in the region identify with either Christianity or Islam. This is reflective of Uganda more generally, where 84.5% of the population identify as Christian and 13.7% as Muslim (Ugandan Bureau of Statistics, 2016).

The population of Seeta Nazigo Parish was estimated to be 15,300 in 2016, with almost half of the residents (48%) being under the age of 15. The majority of residents are subsistence farmers, growing crops such as maize, beans, matoke, bananas, avocadoes and rice. Some own a small number of chickens, pigs or goats. Other residents in this area are small-scale retail traders, or work in the informal sector (for example, driving boda-bodas[21]). The majority of people live in dried mud-brick houses with no access to running water or mains electricity. As a result, it is the role of children and women to fetch water in jerry cans from protected water sources. Similarly, to charge electrical items, people largely gather at a local shop at the trading centre in Seeta Nazigo and pay 500 shillings for the opportunity to charge their device. Even when houses or small businesses have access to mains electricity, it is notoriously unreliable and, at times, residents can be without power for two to three days. During my time living in Makata, I experienced power cuts on almost a daily basis. This reflects the wider challenge of mains electricity supply in Uganda, where it is estimated that only 18% of households have an electricity connection, with a rural-urban gap in supply of 85% (Gillwald et al., 2019). These infrastructural challenges had important implications for the decisions taken during the design phase of the project, which I outline in Chapter 7.

[21] A basic 125cc motorcycle common to East Africa. Typically, boda-boda drivers are young men who work either independently, or as part of a collective, to offer short trips as a taxi service. They are particularly popular in the densely populated urban hub of Kampala and will often weave in and out of the traffic congestion.

3.5 Ugandan Health System

3.5.1 Overview

Healthcare services in Uganda are delivered through both the public and private sector (Kwesiga et al., 2015). Although the Ugandan MoH oversees the national public health system and directs the overall vision for the national health plan, the majority of resources and authority are governed and administered at a district level by 'District Health Offices' due to Uganda's decentralisation laws. This means that health services across the country vary significantly from district to district and the availability of health services often depends on the specific areas prioritised by the District Health Office.

The public health system is organised in a tiered manner, meaning that individuals are typically referred upwards in a chain from a non-specialist based at the village level, to a specialist practitioner based in the regional, or national referral hospitals, which are found in major cities throughout the country (Figure 5).

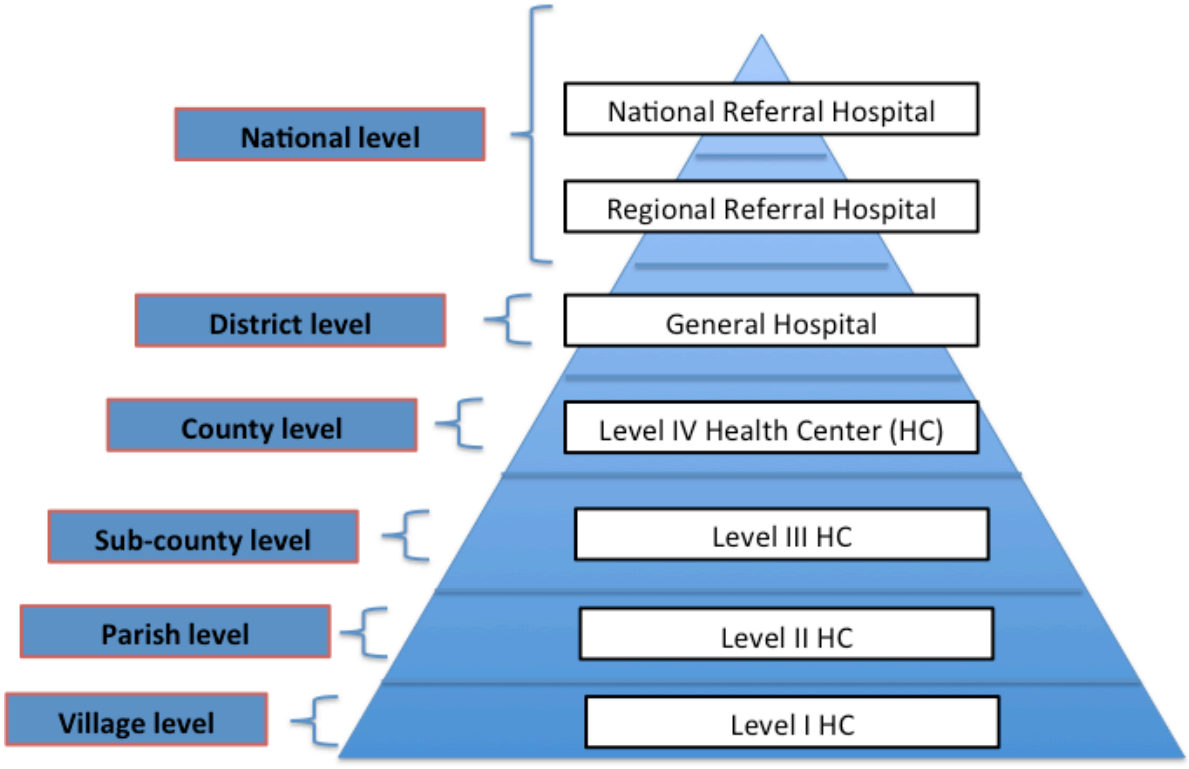


Figure 5 - The Ugandan Health System. The organisational structure of Uganda's Health System (Adapted from Acup et al. 2016)

3.5.2 CHWs in Uganda

The most basic unit of healthcare providers in Uganda are CHWs (also known as Village Health Teams [*VHTs*]), who are defined as the 'Level 1 Health Centre'. The CHW programme in Uganda was established in 2001 in line with the Uganda National Minimum Health Care Package (UNMHCP) (Musoke et al., 2019). The underlying goal of the UNMHCP was to ensure that all households in Uganda had access to basic health services (Ugandan Ministry of Health, 2001). Therefore, although the exact remit of CHWs differs across Uganda depending on the specific region in which they work, the MoH suggests that CHW responsibilities should broadly include, "recording demographic and health data, educating on health and hygiene topics, mobilizing families to engage in health programs such as vaccination campaigns, monitoring for illness, making referrals, and providing post-discharge follow up" (Mays et al., 2017:2).

Although the majority of CHWs have been trained in the delivery of child and maternal health services, their role has evolved in recent years in order to reflect the increasing dual epidemiological burden of disease facing Uganda. This reflects the increasing prevalence of non-communicable diseases (NCDs) such as diabetes and hypertension, alongside the burden of infectious disease such as TB and malaria (Schwartz et al., 2015). In particular, CHWs play an important role in providing health services in rural and remote areas of Uganda, where staffing levels at formal health centres are estimated to be less than 50% of that of urban areas (Baine et al., 2018). In some areas, CHWs are the only trained health professionals available to the community.

3.5.3 Challenges facing the CHW programme in Uganda and proposed reforms

Despite being the official, first-line health providers at the village level, significant challenges face the CHW programme in Uganda (Kimbugwe et al., 2014, Lee, 2015). One of

the biggest challenges is severe underfunding of the programme. CHWs are not officially paid; rather they act in a voluntary capacity. Recognising that this resulted in a low retention rate of CHWs in the programme, District Health Offices have turned to NGOs to help bridge the gap in financial resources. This means that various international NGOs are now largely responsible for the training and maintenance of CHWs across Uganda, which has resulted in a patchwork landscape of providers. For example, in the Mukono district alone there are four different NGOs involved in the training and support of CHWs. This has resulted in a disjointed approach to community health care across the country, since each NGO often takes a different approach to training CHWs, as well as monitoring their work-related tasks and reporting on outcomes. One of the main NGOs in the Mukono District responsible for training and supporting CHWs is NGO A. I worked alongside this organisation during this study, and will discuss this further later on in this chapter (*see Section 3.6.2 'NGO A':90-94*).

Communication and referral pathways between the CHWs and different levels of the health system are also poorly integrated. For example, CHWs at the Level 1 Health Centre should in theory be in contact with health professionals such as a nurse or doctor based at the Level 2 or 3 Health Centre; however, in reality this is not always the case. As a result many healthcare policymakers in Uganda are opposed to 'task-shifting' responsibilities to CHWs, citing factors such as, "inappropriate medicine use, overwork, and inadequate supportive supervision" as reasons for their opposition (Baine et al., 2018).

To try and address some of these issues, the Ugandan MoH announced in 2016 that they would be recruiting, training and deploying a new cadre of health workers known as Community Health Extension Workers (CHEWs) (Musoke et al., 2020). This programme is based upon the Ethiopian model of community healthcare delivery and aims to formalise, unify and regulate the community health sector. CHEWs will be salaried health workers

employed by the MoH in a full-time capacity. They will receive MoH approved training and report directly to the District Health Office. Although this investment and attempt to strengthen community-based healthcare is welcome, this initiative will not be without challenges. In 2018, I published a commentary in BMJ Global Health with my Ugandan colleagues outlining some of the potential issues raised by this model of healthcare delivery, including problems with how existing CHWs would fit into this new system and the tensions that may arise if this is not done in a sensitive manner (O'Donovan et al., 2018c). The MoH has issued assurances, stating that the existing cadre of volunteer CHWs will not be disbanded, or replaced by CHEWs as was initially feared. Rather, the MoH's intention is that the new CHEWs will act in a supervisory role, helping to better link the CHWs with the formal health system since their job will be based in both the community and at local health centres.

Despite being approved in 2017, this policy is yet to be implemented, illustrating the arduous process of reforming primary healthcare in a system characterised by increasingly complex and burdensome levels of bureaucracy.

3.6 Community Health Stakeholders in Seeta Nazigo

Although I played a central role within the study, especially with regard to its initiation, coordination, and evaluation, in keeping with the participatory approach to my work there were multiple other key actors integral to the design, implementation and evaluation phases. In the following sub-sections I will describe the key groups of stakeholders and how they were identified and selected for my study.

3.6.1 Mukono District Health Office

The Mukono District Health Office is led by a senior medical doctor with a background in Public Health. He oversees a team consisting of a Deputy District Health Officer, District

Health Educator, District Health Inspector, District Health Statistician, and several administrative staff.

The responsibilities of the Mukono District Health Office are to oversee the overall delivery of health projects across Mukono district, and to liaise directly with the MoH. The District Health Office gathers and compiles reports from the individual health facilities within the region, which are then logged onto the national Health Management Information System (HMIS). The District Health Office is also responsible for coordinating the supply of medicines based on report data submitted at the health facility level, managing the district health budget, coordinating human resources for health and inspecting health facilities (Gladwin et al., 2003). In addition, they partner with non-governmental and foreign government organisations to implement various healthcare projects across the district. These partners can range from small independent NGOs on a limited budget, to major international organisations, such as the Makerere University Walter Reed Project funded by the United States President's Emergency Plan for AIDS Relief (PEPFAR)[22]. The most recent flagship project that had just been completed during the time I was conducting my fieldwork was a brand new, state-of-the-art HIV clinic at Mukono Health Centre IV at the cost of $500,000 (USD)[23,24]. With a patchwork landscape of multiple NGOs and foreign government agencies vying for the attention and time of the District Health Office, it soon became apparent why working towards an overall strategic objective is challenging for the MoH.

3.6.2 NGO A

The primary NGO in the Seeta Nazigo Parish tasked by the Mukono District Health Office with helping to train and maintain CHWs is NGO A. NGO A was established in 1998 by an

[22] https://www.muwrp.org/pepfar/
[23] https://ug.usembassy.gov/u-s-officials-visit-participants-dreams-program/
[24] https://www.newvision.co.ug/new_vision/news/1415025/mukono-acquire-referral-hospital

American physician in response to his personal experiences in Uganda during his time as a medical student.

NGO A now supports approximately 1250 volunteer CHWs. Initially, when NGO A started its work in 2008, its aim was to provide external donor funding to support the CHW programme until the District Health Office took full ownership. However, as the MoH's commitment to the CHW programme waned, NGO A continued funding and supporting the CHWs. It has five members of staff who work full time managing and maintaining the CHW programme (e.g. conducting training sessions, carrying out outreach work, liaising with the CHWs across the district) and three staff members who are employed in domestic roles on NGO A's compound.

Given the small staff and restricted budget, supervision of CHWs has not formally been implemented or evaluated by NGO A and it is therefore unclear how supervision occurs in this context. This was therefore a good opportunity to not only explore how supervision is perceived by key stakeholders involved in the community health programme, but also an opportunity to explore how supervision in this context could be designed and enacted.

My relationship with Uganda and NGO A

My earliest experience in Uganda was in 2011 as a fourth-year undergraduate medical student undertaking a six-week medical elective at a mission run paediatric hospital in Mbarara, South-West Uganda. I spent the weekdays based at the hospital, observing intern doctors, nurses and clinical officers attend to dozens of sick children in the outpatient department and helped to conduct basic regular observations (such as temperature and oxygen saturations) on the children. I distinctly remember being shocked at common medical practices in the local region which were alien to me as a naïve and young medical student from the UK. Such practices have been well documented in the wider literature and include:

> *"a self-styled traditional practitioner in the area treat(ing) diahorrea in young children by extracting incipient incisor teeth. This old woman's treatment has seen many babies die from sepsis and bleeding after the crude operation"* (Kironde, 1985:66)

Despite my initial reaction being one of shock and confusion, it fuelled a desire to learn more about why such practices occurred. However, the brief nature of my trip, language barriers, strict safety policies from my home institution, and the uncertainty about how to broach such topics, meant that I never had the opportunity to travel to local communities to find out more.

Following a period of study in 'global health' at Harvard, I was invited to Kenya in 2013 as a researcher exploring the role of 'low-cost frugal technologies' to train medical students in clinical skills at a new medical school. At this point I had no formal mentorship or guidance and I was based in the country for less than a month. In recent years I have reflected on this experience and the problematic nature of this trip, including the lack of thought given to how this project would be sustained and the lack of genuine partnership between myself and local researchers. This whole experience left me feeling dissatisfied and guilty that I was becoming yet another 'parachute researcher'[25] and potentially causing more harm than good. This led me to take a break from global health research whilst I completed my medical studies.

I first met the founder of NGO A at a well-known global health conference, Consortium of Universities for Global Health, in Boston in 2015. He asked whether I might be interested in partnering with his organisation to help train some of their CHWs. Although at the time this seemed like an excellent opportunity, I did not have any funding to facilitate this work. Nonetheless, we remained in contact over the next few years while I undertook rotations as a junior doctor in the UK.

[25] A critical term used to describe foreign researchers, often from high-income countries, who visit a country (often an LMIC) to conduct research, carry out their study and then leave and disseminate the results with no acknowledgement to local contributors or efforts to disseminate findings or sustain the project (https://www.npr.org/sections/goatsandsoda/2016/04/02/472686809/scientists-say-its-time-to-end-parachute-research)

At the end of 2016 I successfully applied for grant funding from the British Medical Association to undertake an RCT exploring the training of CHWs on the recognition, treatment and prevention of childhood pneumonia using locally made videos loaded onto Android tablets. I subsequently established an informal research partnership with NGO A, since I wanted to ensure that any projects I was involved in were done in partnership with a local community organisation for sustainability purposes. I flew out to Uganda for a period of 12 days to oversee and guide the research project, which was to be primarily led by the NGO A staff (O'Donovan et al., 2018a). Although I still remained a 'transitory researcher' due to my commitments as a clinician in the UK, I remained engaged with the team on the ground through regular web-based video calls and emails long after I departed.

Overall, although this experience was generally positive, my prior assumptions and worldviews were challenged. For example, the evaluation of this project was focussed on the 'effectiveness' of improving clinical knowledge and skills. As such, I took a purely quantitative approach towards evaluation, using 'pre-' and 'post-test' standardised marking schemes. However, through the regular contact I had with the team in Uganda, I became aware that many of the more quantitative data collection tools used as part of the RCT failed to capture CHWs perceptions of the study, as well as some of the more nuanced issues that arose from the project, such as the ways in which the ownership of the tablets caused some tensions in the community between CHWs and their peers. This led me to consider alternative methods of evaluation which have shaped the mixed-methods approach taken during my DPhil.

Following this project, I was recruited as the Head of Research at NGO A in a voluntary capacity, which I accepted one month prior to starting my DPhil in August 2017. My role, although not clearly specified, was to generally support the local staff in conducting research.

Given this new role, Uganda therefore seemed like an excellent place to conduct the fieldwork for my DPhil. The local NGO A staff were welcoming and well-liked by the local community, particularly because several of them were originally CHWs. Furthermore, the Chief Medical Officer of NGO A, who was a Ugandan doctor, was familiar and adept with the relatively complicated in-country ethical review process which helped to facilitate my project. I was also attracted by the opportunity to be embedded within an American-funded, Ugandan-based NGO focusing on global health challenges. The opportunity would afford me the chance to witness first-hand the dramatic rise in international global health organisations which has sparked significant debate in recent years (Lasker, 2016).

3.6.3 The Government Health Centre III[26]

The CHWs supported by NGO A should, in theory, refer patients who require specialist input to the nearest Level Three Health Centre, which in this context is 'Health Centre III A*' located in the trading centre.

Health Centre III A is made up of several relativity dilapidated buildings, the vast majority of which are severely understaffed. It is solely funded by the government, whereas many of the other Level Three Health Centres in Mukono District are run on a private-not-for-profit basis and charge patients for clinical reviews and any subsequent treatment. These private-not-for-profit health centres are also heavily subsidised and funded by international donors, and are therefore not reflective of the government health system, which is generally under-funded across Uganda (Zikusooka et al., 2009).

Health Centre III A employs eight full-time staff and is managed by a Health Facility Manager (referred to locally as 'The In-charge'). Although my relationship with the manager

[26] The name of the local health centre has been omitted for purposes of anonymising my research. In the thesis I refer to it as 'Health Centre III A'.

was cordial and she granted permission for the project to take place at the health centre, it soon became apparent that she primarily viewed me as a financial patron and regularly sent me messages via the other staff members asking me to provide her with lunches or airtime for her phone. Furthermore, although she was the manager of the health centre, she was rarely present. Initially this took me by surprise; however, when I expressed this feeling, many of the CHWs laughed at my apparent naivety. One stated:

> *"Yes, it is very common for the boss to be absent. When you are the big man you have no one to answer to!"*

Similarly, like the health facility manager, the nurses were rarely present at the health centre and I often observed them scolding patients:

> *"Why are you here? Can you not see I am now going to eat. You come back later when I have eaten."*

Tweheyo et al. (2019) also noted this phenomenon in their study in central Uganda, documenting that health centre staff would misdirect frustration at absent colleagues onto patients, and would either be abusive or omit tasks (Tweheyo et al., 2019).

Although this was in sharp contrast to my experiences as a healthcare professional in the UK and initially left me shocked, over time I began to understand why many of the health workers adopted this stance. Salaries were often delayed and some staff claimed they had not been paid for their work for months at a time; something which has previously been documented in the existing literature (McPake et al., 1999, Tweheyo et al., 2019). Furthermore, there was a distinct lack of equipment and medications, making it extremely difficult for them to fulfil their caregiving roles, which left them feeling frustrated and undervalued. I reflect more on my relationships with the health centre staff in Chapter 10 (*see Section 10.2.2 'Health Centre III A staff':326-330*).

In 2018, a leading Ugandan newspaper highlighted the failings of Health Centre III A, including regular medicine stockouts. This seemed to be an ongoing occurrence throughout Uganda, and is in part linked to low government spending on public health services (Zikusooka et al., 2009). This shortage of medicines and lack of trained staff means that if patients require a specialist opinion or more complex treatment, they are referred to Kawolo Health Centre IV in the Lugazi District, or Mukono Health Centre IV in Mukono Town. However, the remote nature of Seeta Nazigo and the poor transport infrastructure already described in this chapter, mean that the majority of the 15,000 people residing in the parish are often reluctant and without financial means to access the specialist health centres. This reluctance is partly born out of negative past experiences and the poor state of the government referral hospitals[27,28]. Many locals explained to me that if they were actually seen by a clinician, they were asked to pay a fee. This is despite the fact that public health services are supposed to be free of charge. This practice of public healthcare professionals in Uganda charging patients has been widely documented in the literature and dates back to the 1960s. It occurs at all levels of the health system and is locally referred to as the 'magenda economy'. Given low government spending on public health services, health professionals often find other means to supplement their incomes. Pat Holden reflects on this issue from her experiences interviewing nurses at Mulago Hospital in Kampala, stating:

> *"The black market trade in drugs and the theft of equipment was acknowledged…the orderly who set up a centre outside the hospital offering injections given with a blunt safety pin"* (Holden, 1991:74).

Similarly, writing about his experience with health services in the Buganda region in 1985, Erisa Kironde notes:

[27] https://observer.ug/news-headlines/28372-kawolo-an-epitome-of-hospital-mismanagement
[28] https://nilepost.co.ug/2019/06/17/lunyo-health-centre-iii-partners-with-community-to-overcome-horrors-of-understaffed-maternity-wards/

> *"Services are technically free to all at all locations, but there are major hassles in obtaining them as various abuses have recently emerged. A sick person or his relative has to grease so many hands to get to the point of treatment, and pay even more bribes after diagnosis in order to get supposedly free drugs, that on balance most people in despair resort to private practitioners or unlicensed pharmacists thereby saving time, if not money"* (Kironde, 1985:66).

During the course of my fieldwork, the two individuals at Health Centre III A with whom I had the most interaction were the lead clinical officer and a HIV counsellor. The clinical officer was a middle-aged man who was approachable, knowledgeable and well-liked by both patients and the staff. He was contracted to work three days a week and expressed an interest in being involved in my research study from the outset. He subsequently became one of the main contact points for the CHWs to refer patients to as part of the project referral system. His willingness to engage in the project was undoubtedly vital for the overall success of the clinical element of the project and also meant that there was a local medical professional to whom CHWs could make referrals. His intimate knowledge of the local higher referral pathways proved extremely valuable, and his involvement in the project gave me some legitimacy and helped to build trust between myself, the staff at the health facility, and the wider community.

The other individual with whom I worked closely during the implementation phase of the project was a 21-year-old HIV counsellor. During the initial period when I visited the health centre I noticed that she was always present and often fulfilled roles beyond her job description when other staff were absent. She appeared very keen to learn and became one of the main points of referral at the health centre; however, due to her limited clinical training, she was unable to make direct referrals to the specialist health centres located in the major urban hubs and so would work closely with the clinical officer to fulfil these tasks.

She was also willing to speak very openly about the corruption and mismanagement that operated at the level of the health centre. For example, the building known as 'The Youth Corner' where we held most of our meetings or carried out clinical reviews of community members, had been built using a grant from The AIDS Support Organisation (TASO) and AusAID (Figure 6).



Figure 6 - The Youth Corner. The Youth Corner at Health Centre III A, built with a grant from TASO and AusAID.

Each year representatives from NGOs would visit the health centre to inspect the facility and prepare a report for the donor organisations, which were often located in high-income countries. On the days that donors inspected the health centre, young people from the neighbouring trading centre would be encouraged to visit the Youth Development Corner and a TV donated by AusAID would be fixed to the wall for them to watch. However, as soon as the donor representatives left the television would be removed and taken back to the staff house where it would remain until the next time the donors visited. Similarly, the condom box at the Youth Corner was usually empty, meaning many youths had stopped visiting the centre years ago (Figure 7).



Figure 7 - Inside the Youth Corner. The empty protective casing for the television in the Youth Corner and an empty box of condoms.

In the outpatient building, there was a lack of appropriate secure filing for patient records (Figure 8); in the maternity ward, equipment was often either not found or not working; and there was no running water for the entire health centre (Figure 9).



Figure 8 - The hospital records filing system. Record files, books and data charting files lie on an old examination couch.



Figure 9 - Out of water. Handwashing stations at the health centre, with no functioning water source, lie unused. Furthermore, power outages frequently affected Health Centre III A which was compounded by the lack of a back-up generator.[29]

3.6.4 Community Health Workers

I worked with a group of 14 CHWs, all of whom had different backgrounds, with unique personal circumstances and challenges. For example, Paul faced several hardships prior to enrolment in the project. The loss of his wife and separation from his children meant that he lived alone and drank alcohol frequently. Despite this, he promised he would reduce his drinking and was eager to take part in the project, hoping for a renewed purpose and respect amongst his peers.

[29] This was particularly problematic in the case of cold-chain for vaccines such as Measles, Mumps and Rubella and Varicella which need to be kept in a refrigerated environment between 2°C and 8°C (with a target temperature of 5°C).

The oldest member of the group was Albert. He was the former Local Chairperson (LC1)[30] of one of the villages where the project was taking place, which meant he was well known and liked in the local area. As the oldest CHW, he was also highly respected and was often referred to as "Mukkade" – a Luganda phrase that loosely translates as "elder" but infers reverence of the individual to whom is being referred.

Some of the CHWs were also related and thus had more than a professional connection. For example, Josephine, a 44-year-old CHW was also Albert's daughter. This demonstrates that I was not only working with a group of individuals, but a collective who had deeply intertwined personal relationships.

Living in close proximity to the CHWs was highly beneficial as it allowed me to build closer relationships with them and to spend time in their homes, which afforded me with valuable insights into their lives. Elizabeth, who was a farmer, also grew flowers and her garden was immaculately presented. She had several young children and thus her home often doubled up as an informal nursery. I found Elizabeth to be extremely inspiring – not only was she a farmer, entrepreneur and doting mother, but she was also a keen student and frequently attended night school to learn computer skills. She was hardworking, diligent and grasped new concepts quickly. She also came up with several suggestions to encourage group work and regularly conducted joint home visits with Julia, one of her neighbours, who was also a CHW. Julia ran a small stall at Seeta Nazigo trading centre selling food and drinks and had several children, some of whom had migrated to South Africa for economic purposes. She was therefore one of the CHWs who had a larger home, equipped with mains electricity and also owned a smart-phone prior to this project since her daughters often sent money home.

[30] The Local Chairperson of a village is an elected as the official representative of their village by their peers. They have a roles in local advocacy, acting as a communication channel between their village and the formal government, helping to settle disputes and assisting with self-help projects. They are typically highly respected individuals. (https://www.newvision.co.ug/new_vision/news/1481237/exactly-role-lc1-chairperson)

Dina, on the other hand, had never owned a smartphone before but took immense pride in it when she was eventually given one in January 2019 as part of the project. Subsequently, I often saw her stood at the local trading centre informing her friends of the national news as she downloaded the latest stories from the New Vision[31] website.

I spent a great deal of time with Susan in her home, which was well-constructed and immaculately kept. Susan placed a strong emphasis on educating her children and had managed to send two of her daughters to university. She was always well presented and was well known and respected in the local area, which resulted in her being elected a peer-supervisor by the other CHWs.

Edward was a well-liked man, who had been voted to be the other peer-supervisor to CHWs residing in Kavule and Kiruja Butoke villages. Edward was a farmer and the longest serving CHW, with over 11 years of experience. One could regularly find him at the health centre, where he fulfilled a voluntary role assisting with male circumcisions. In Uganda, the role of the circumciser is held in high regard in the community, given that circumcision is traditionally seen as a right-of-passage to manhood and in more recent times has been deployed as a means of combating HIV/AIDS (Sabet Sarvestani et al., 2012).

Two of Edward's supervisees, Rosetta and Samantha, were located in Kiruja Butoke, which was the most remote village covered by the project, and the furthest by distance from the health centre. Rosetta was a female CHW who was also a subsistence farmer and lived in an extremely rural area of Kiruja Butoke with her husband and two children. She was responsible for over 100 households as she had taken responsibility for those households covered by another CHW who had recently died. The other CHW in Kiruja Butoke was a

[31] Uganda's popular government-owned newspaper.

younger lady called Samantha. Initially, the CHWs who lived nearby suggested they would work together however Rosetta and Samantha had a strained relationship. Rosetta complained that Samantha was relatively unreliable and would often not turn up to conduct joint household visits. As such, they mutually decided to conduct independent work. Samantha was one of the youngest CHWs and also worked for another NGO in the district called Living Goods.

All of the CHWs had other jobs alongside their voluntary CHW duties. Although the vast majority were subsistence farmers, others ran small businesses and were extremely active with multiple community responsibilities. For example, Isabelle, a 45-year-old female CHW, was also a tailor who worked out of a small shop in Seeta Nazigo trading centre. Similarly, Luke, a 45-year-old male CHW, was extremely active in the community. He was regularly at the health centre where he had a role as a voluntary TB screener for the schools in the parish and was also involved in fish farming, building and catering for local events such as burials and wedding introductions. Alex was a teacher, farmer and owned a small shop selling soda and household items.

The final CHW who was initially recruited was Tayo, but he was unable to take part in the study beyond the first month. He was arrested by the local police for an apparent assault and put into jail. Despite many attempts to visit him in prison, after four months we still were unable to find out the full reason for his arrest and detainment, since on each occasion that we visited the prison we were turned away by the guards.

Despite their individual differences and hardships, all of the CHWs were bound by a common characteristic: they were keen to make a better future for their families and communities.

A summary table of CHW demographics and characteristics can be found below (Table 3):

CHW (ID)	Village	Sex	Age	Years of Education	Highest level of Education	Job	Years as a CHW	Number of households served
Josephine (CHW 1)	Makata	Female	44	9	Some secondary schooling	Farmer	8	30
Paul (CHW 2)	Makata	Male	40	11	Some secondary schooling	Farmer	8	35
Elizabeth (CHW 3)	Kavule	Female	42	12	Some secondary schooling	Farmer	8	38
Julia (CHW 4)	Kavule	Female	50	13	Some secondary schooling	Shop attendant and farmer	8	100
Samantha (CHW 5)	Kiruja Butoke	Female	31	13	Completed secondary school	Shop attendant and farmer	8	120
Alex (CHW 6)	Kavule	Male	53	11	Some secondary schooling	Farmer and teacher	10	35
Luke (CHW 7)	Seeta Nazigo	Male	45	7	Some primary schooling	Builder, farmer, fish monger	8	120
Albert (CHW 8)	Makata	Male	67	8	Some primary schooling	Farmer	8	35
Dina (CHW 9)	Seeta Nazigo	Female	34	9	Some secondary schooling	Farmer	8	68
Tayo (CHW 10)	Seeta Nazigo	Male	45	11	Completed secondary school	Farmer	8	30
Isabelle (CHW 11)	Seeta Nazigo	Female	43	13	Completed secondary schooling	Tailor	7	28
Rosetta (CHW 12)	Kirjua Butoke	Female	46	13	Some secondary schooling	Farmer	8	35
Susan (CHW Peer-supervisor 1)	Seeta Nazigo	Female	50	9	Some secondary schooling	Farmer	8	50
Edward (CHW Peer-supervisor 2)	Kavule	Male	39	13	Completed secondary schooling	Farmer	11	50

Table 3 - The demographics and characteristics of CHWs who took part in the project.



Figure 10- The CHWs of Seeta Nazigo Parish. Some of the CHWs involved in the research project at the NGO A compound.

3.7 Participant selection

To identify key stakeholders involved in community healthcare delivery, I held several informal consultation meetings in September 2018 with community health officials from the MoH, researchers from Makerere University in Kampala, CHWs in Mukono District and staff from NGO A. Following this consultation process, I compiled a list of key individuals and organisations to approach. These included stakeholders from national and local government, NGO programmes responsible for CHW maintenance, the staff at Health Centre III A, and active CHWs within Seeta Nazigo Parish. Although I broadly used non-probability

sampling, the specific recruitment and sampling strategy varied depending on the cadre of the stakeholder. Government officials and NGO programme managers were recruited using a mix of convenience and snowball sampling, whereas CHWs and facility-based health staff were selected purposively, since I aimed to have a balanced number of males and females. I contacted these individuals either via email, phone, or in-person to explain the general remit of the study and to find out if they were interested in taking part. Where I did not get an initial response, I contacted them a second time (*see Appendices, Appendix Figure 1:377*).

All participants who expressed an interest in participating were then provided with an information sheet describing the purpose and aims of the study in either English or Luganda depending on their preference (*see Appendices, Appendix Figure 2:378-380 and Figure 3:381-383*).

Participation was voluntary and written informed consent was obtained from all participants prior to enrollment. I was especially interested in soliciting the opinions and experiences of the CHWs, since it has previously been suggested that, "insufficient space is given to CHW voices" in research concerning their deployment and experiences (Ludwick et al., 2018:2).

In order to be eligible to participate in my study, CHWs had to be over the age of 18, actively practising, and willing to take part. There were no other exclusion criteria based on age, language, gender, sex or tribe. This broad inclusion criteria was in contrast to the highly technical selection process used by other organisations responsible for CHW training in the region, where CHWs are often excluded if they did not have a certain level of educational attainment on a written test assessing calculation and comprehension skills (Taylor et al., 2018b).

I selected this inclusive approach because I believed that all CHWs would have something to contribute to the group. Others have termed this concept 'what doctors cannot do' (Rosenberg, 2014). As Giorgio Commetto stated in his address to the Community Health Academy:

> *"Do not forget that CHWs are not a tool to achieve your health policy goals, or section for your policy documents, or a budget line in your spreadsheet. CHWs are, first and foremost, people with families, with friends, with daily needs and difficulties, with a history rooted in their past, a vision for their future, and especially with the right to decent working conditions and the ambition to fulfil their personal and professional dreams"* (Cometto, 2018).

Unfortunately, access to the MoH officials proved challenging; despite three MoH officials expressing initial interest in the study, they did not respond to my subsequent requests for an interview.

All participants, regardless of cadre, were assured of the right to refuse to take part in the study without consequence.

3.8 Research Partners

Given the gap in funding for health researchers in sub-Saharan Africa compared to their 'Global North' counterparts (Fourie, 2018), as well as the significant under-representation of African authors on research papers regarding studies conducted in sub-Saharan African countries (Rees et al., 2017, Cash-Gibson et al., 2018), I felt that it was imperative that I partnered with Ugandan scholars for this study. From the outset, I was aware of the potential effects my own position as a non-native researcher might have on resulting data I collected. Several other authors have written widely on the concept of, "publishing about Africa, without Africa" (Volmink and Dare, 2005) and parachute research, as well as the need for researchers from high-income countries to directly contribute to investing in individual

capacity building (Manabe et al., 2009). All of this informed my conscious decision to form local collaborations (Shuchman et al., 2014, Volmink and Dare, 2005).

I therefore established an informal research collaboration with a research team at Makerere University School of Public Health. This team has an extensive portfolio of research focussing on Community Health Workers in the Wakiso District of Uganda, underpinned by principles of PAR. I was aware of their research through my review of the literature and from following several members of the research group on Twitter. During our initial meeting, the head of the research group kindly shared his past experiences of working with CHWs in PAR projects and also suggested areas for me to consider in my own project. At the end of the meeting, we agreed upon an informal collaboration, where I would contact the group as needed and share results with them to offer their perspectives and inputs. For any resulting publications, the head of the group suggested that I should write the first draft and then send it to him and his team for their thoughts and inputs.

From a logistical perspective, I also needed to recruit Ugandan Research Assistants (RAs) fluent in both English and Luganda in order to help with translation and transcription of interviews with the CHWs. With a limited research budget and a high volume of work, professional translation services were not a realistic option. I therefore leveraged my personal network of contacts and contacted Jane Nalubwama* who had graduated from Makerere University with a Bachelor's Degree in International Development. I had previously worked with Jane on a smaller, unrelated project in 2017 regarding community concerns around Water, Sanitation and Hygiene issues in the district (O'Donovan et al., 2020d). At the time Jane was an intern at the Mukono NGO Forum and I had found her to be hard-working and diligent. I therefore reached out to her in June 2018 and she agreed to take part in the current

project. I soon learnt, however, that her role with the NGO Forum was informal and thus persuaded the founder of NGO A to employ her in a full-time capacity.

Anticipating a high volume of work I was eager to recruit a second RA. Jane therefore introduced me to her friend, David Kiyingi*, who was also a graduate in International Development from Kyambogo University. When I first met David in October 2018 he was employed working 14-hour shifts, six days a week as a petrol pump attendant on the busy Jinja Road. The under and unemployment situation that David and Jane found themselves in is common in Uganda (Ssempebwa, 2006). With the highest percentage of individuals under the age of 30 in the world, Uganda has long struggled to create enough jobs for young people, with estimated figures for youth unemployment in the country ranging between 62% and 83% (Mwesigwa, 2014). Every year there are an estimated 40,000 graduates from Ugandan universities, with less than 8,000 jobs available. David stated that he was grateful for the opportunity to work on the research project, and despite having no formal training in conducting interviews, after a week of intensive mentorship and pilot interviews with CHWs in a different parish, David and Jane were both ready to start. Throughout the course of the project I continued to mentor David and Jane, giving them feedback on their practice and encouraging them to enrol on online courses relevant to CHW focussed research, such as the "Strengthening Community Health Workers to Delivery Primary Healthcare" programme run by the Community Health Academy[32].

In Chapter 10, I reflect on how my relationship with both David and Jane and the other research partners evolved over the course of my fieldwork.

3.9 Research design

[32] https://communityhealthacademy.course.tc/

As already outlined in Section 3.2 of this Chapter, I took a CBPR approach towards the research design of this study, informed by the principles of action research.

In keeping with this action research approach, I planned my research to involve three linked phases:

A. **Phase One** was an exploratory phase with a dual purpose. Firstly, I wanted to gain a better understanding of the context in which I was working, especially with regards to the CHW's lives. Secondly, I wanted to understand the current conceptualisation of supervision amongst key stakeholders in this setting. This phase, which lasted for three months between October and December 2018, helped to inform Phase Two.

B. **Phase Two** was a design phase where the supervisory intervention was conceptualised and iterated upon with the CHWs, using feedback from Phase One in keeping with an action research approach. This phase took place in January 2019.

C. **Phase Three** was an implementation phase, where the supervisory intervention designed in Phase Two was implemented and evaluated. This phase lasted for six months, between February and July 2019.

A diagrammatic summary of the phases is presented in the diagrammatic timeline below (Figure 11).

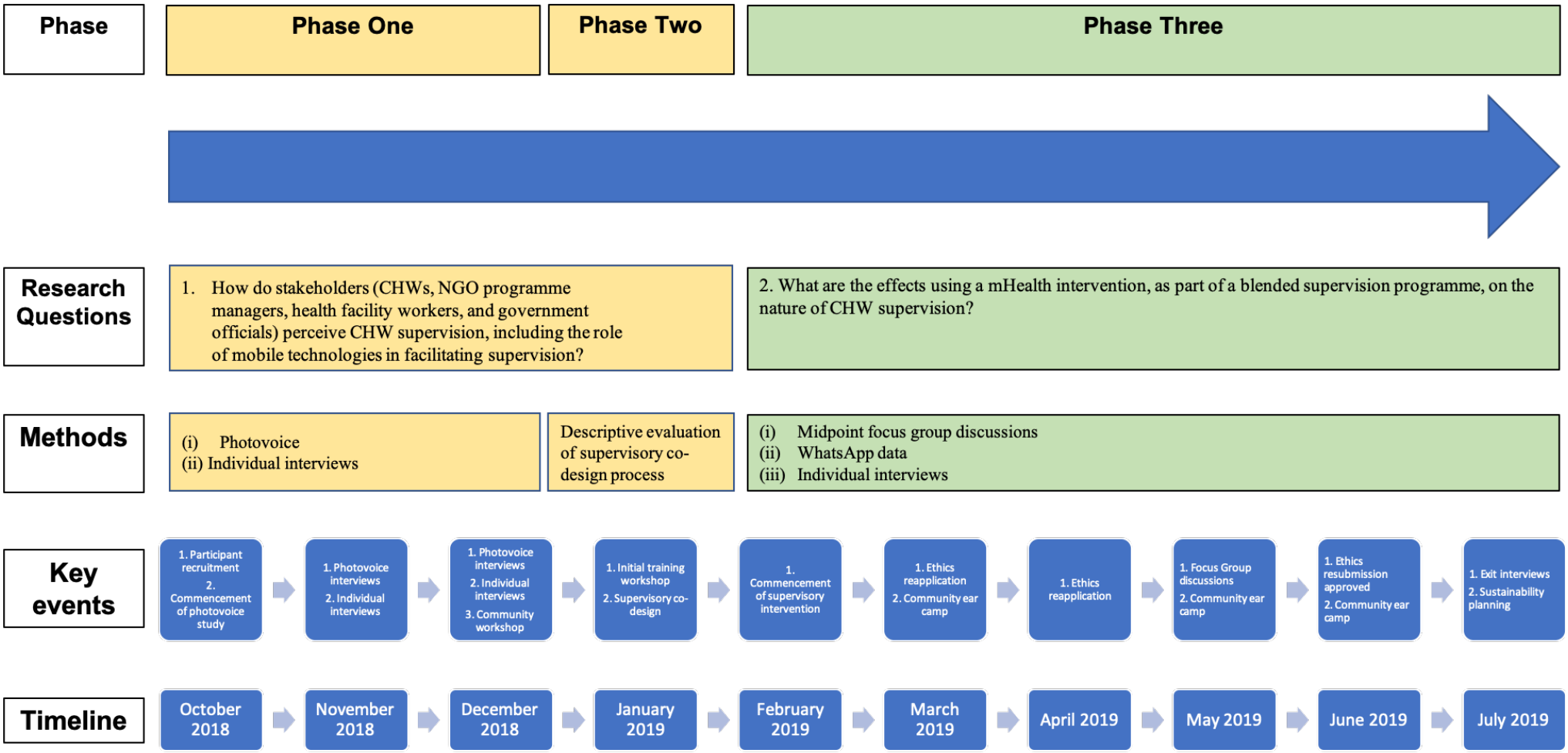


Figure 11 - A Timeline of Research Phases. A diagrammatic timeline of the three key phases in my study, how each phase relates to my research questions, the methods used to answer the research questions, and key events mapped against a timeline.

3.10 Ethics Approval

I initially applied for ethical approval for my DPhil from the Department of Education Research Ethics Committee (DREC) in June 2018 and approval was granted in July 2018 (ED-CIA-18-218 - The role of mobile technologies to support the supervision of Community Health Workers (CHWs) in Uganda) (*see Appendices, Appendix Figure 4:384*). In keeping with Ugandan ethics protocols, I also applied for ethical approval for the project from The Mengo Hospital IRB, which is an approved ethical review board accredited and overseen by the Ugandan National Council for Science and Technology (UNCST)[33]. Approval from both Mengo IRB (Number: 114/07-18) and UNCST (Number: SS 4723) was granted in August 2018 (*see Appendices, Appendix Figure 5:385-386 and Figure 6:387-388*).

Early on in Phase Three of the project (*February 2019*), it became apparent that there was a high burden of ear disease in children. Following a discussion with the CHWs and the RAs, we decided that it would be negligent of us to not offer screening services to children under the age of 18 who potentially had treatable ear conditions that could prevent hearing loss. Indeed, some of the CHWs felt morally compelled to offer treatment to the children and commented on how they were put in difficult positions when they had to refuse treatment due to ethics approval which was limited to individuals over the age of 18:

> "*We treat all people regardless, whether old or young we do not discriminate. You find one saying they cannot go to so and so because the ethics approval from the university says do not treat those under the age of 18. It challenges us VHTs [CHWs] and I am sure it is the reason some refuse to have their ears washed."* **Elizabeth, CHW 3**

Given that the original ethics approvals did not cover the involvement of individuals under the age of 18, I contacted the Department of Education DREC in February 2019 to seek advice. At this point I also notified the DREC of other minor modifications including

[33] https://www.uncst.go.ug/what-we-do/

reducing the number of CHWs that I initially had planned to recruit from 25 to 14, providing CHW participants with a small financial reimbursement to cover their travel costs and time, and changing the supervision platform to WhatsApp based on CHW feedback and requests. This was done because of the participatory nature of my work and wanting to ensure the project responded to the needs and requests of the participants.

The DREC advisory committee suggested that the modification of screening children for ear disease in the community would trigger a CUREC 2 application. I was also advised to contact the ethical review team at the Division of Medical Sciences (MSD) to seek their advice. The MSD team advised that I submit revisions to Mengo IRB and UNCST and create information sheets and new consent forms for individuals under the age of 18. These changes were subsequently approved by UNCST and Mengo Hospital IRB (*see Appendices, Appendix Figure 7:389 and Figure 8:390*). Following a resubmission to the Social Sciences and Humanities (SSH) IDREC, the revised CUREC 2 was eventually transferred to the MSD DREC, given the nature of the research.

Following several rounds of further revisions and clarifications the amendments were approved by the MSD DREC for a period of three months on the 22nd of May 2019, under reference R63610/RE001 - The role of mobile technologies to support the supervision of Community Health Workers (CHWs) in Uganda (*see Appendices, Appendix Figure 9:391*). It should be noted that until this approval was received, no children were treated as part of the project.

Within the subsequent sections of this thesis, I reflect on various ethical aspects in relation to this project, ranging from a critique of how informed consent was obtained in relation to the Photovoice study conducted in Phase One (*see Chapter 5, Section 5.4 'Reflexivity*

statement':157-160), to a more general reflection on the challenges and tensions of conducting research in a low-resource setting such as Uganda (*see Chapter 10*).

***

From herein I describe the action research phases of my project and tell the story of my action research project.

When describing the phases I also present some emerging findings. Although this is not in keeping with a 'traditional' research report, where Methods and Results are distinct sections of the thesis, the cyclical nature of my research meant that each stage drew upon findings from the previous stage. Therefore understanding some of the key findings is important to understand the methodological decisions taken as part of this multi-phase action research approach. The challenge of reporting action research projects has been discussed in the past by scholars such as Davis (2007), who commented that writing a doctoral thesis which conformed to the traditional architecture of a "literature review, methodology, research design, findings and conclusions" was an uncomfortable experience (Davis, 2007:181). Indeed, Stapleton and Taylor suggest that this represents the "structural template of positivism" (Stapleton and Taylor, 2004:1) and is a format not necessarily well suited to the cyclical, iterative nature of action research. This has led to calls for an "alternative architecture based on each of the action research cycle" (Davis, 2007:181).

I have therefore decided to structure my thesis in line with how my project unfolded. By doing so I aim to facilitate the reader in understanding the details of each phase of the action research cycle and explain how these informed and influenced the subsequent phases of my work.

For readability purposes, Phase One can be generally be considered the 'Observe' and 'Reflect' stages of the action research cycle, Phase Two the 'Act' phase of the cycle, and

Phase Three the ‘Evaluate’ and ‘Modify’ phases; however, in reality there were multiple iterations within each phase, including ongoing reflections, evaluation and modifications.

I begin with Chapter 4 which outlines the methodology for Phase One.

Chapter 4 – Methodology – Phase One (October-December 2018)

4.1 Chapter Overview

In the following sections of this chapter, I describe the methodology for Phase One of my project. I explain the purpose and aims of this phase, describe and justify the methods used, document the participants and dates, and describe how I undertook data analysis.

4.2 Phase One

4.2.1 Overview of Phase One

Edwards and Talbot suggest that the first stage of an action research cycle should involve an examination of current practices and the context in which the research will take place in what has been termed the "initial review" (Edwards and Talbot, 1999). This initial review can involve gathering information through literature reviews, conducting observations of current practice, or any other suitable method, in order to gain a better understanding of the environment in which a planned intervention will take place.

In the case of my project, this "initial review" was particularly important since supervision represents just one aspect of a well-functioning CHW programme (Cometto et al., 2018) and research on complex interventions in healthcare places significant emphasis on understanding the context in which the intervention takes place (May et al., 2016).

Indeed, other recent action research projects exploring CHW supervision have also undertaken a context analysis prior to implementing a supervisory programme (Karuga et al., 2019). In this study by Karuga et al. (2019), the authors justified their initial context review by stating that it would help them to better understand the broader factors influencing the delivery of community health services that might have an impact on the overall success of a supervisory intervention for CHWs in Kenya. Similarly the existing literature on CHW

supervision suggests that "multifaceted intervention designs" which factor in the system in which CHWs work are likely to be more successful (Strachan et al., 2012:112). Thus, I hypothesised that this background work would likely affect the overall success of the supervisory programme which I planned to design and implement in Phases Two and Three of the study.

I therefore decided to undertake two important pieces of contextual exploratory work in Phase One, which I will describe in the subsequent sections of 4.3 (Photovoice) and 4.4 (In-depth interviews). Both pieces of work in Phase One help to answer RQ1:

How do key stakeholders (e.g. CHWs and programme managers) perceive supervision for CHWs and, specifically, how are mobile technologies perceived as having a role in facilitating supervision?

In terms of the action research cycle outlined in Chapter 3, this phase of research fits into the 'Observe' and 'Reflect' stages (see Figure 12 below).

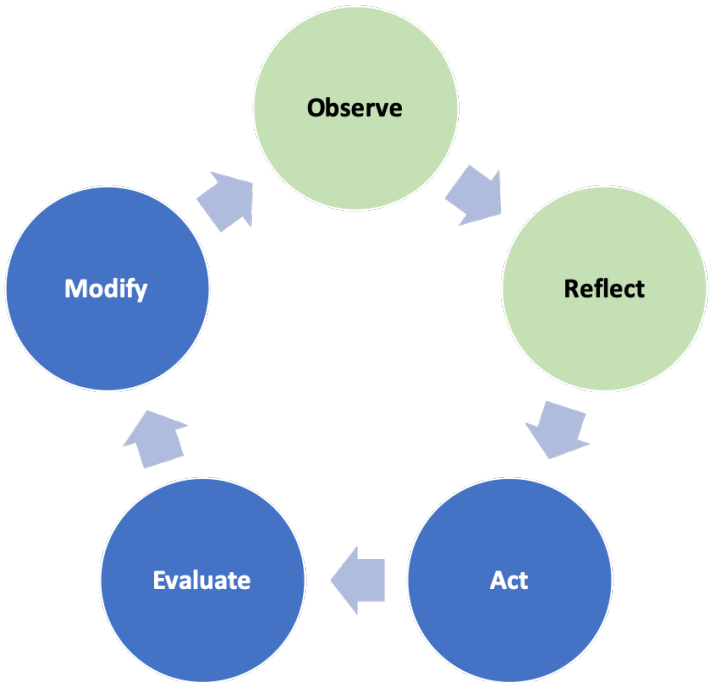


Figure 12 - The positioning of Phase One within the Action Research cycle.

4.3 Photovoice Method

There is a small existing body of work that explores the challenges faced by CHWs; however, little of this has been conducted from a participatory standpoint. As such, I used photovoice to explore the challenges faced by the CHWs I was working with.

4.3.1 Background and Justification

Photovoice is a participatory visual method (PVM) where individuals can, "identify, represent, and enhance their community through a specific photographic technique" (Wang and Burris, 1997:369). It involves participants using a camera to capture photographic images on a topic of community importance. The photographs are then used as discussion points and aim to promote, "critical dialogue and knowledge about important issues", with the ultimate goal of bringing about social change (Wang and Burris, 1997:370). Proponents of photovoice suggest that its participatory nature changes the emphasis on what is discussed during interviews, away from what is determined by the researcher to be an area of priority, and towards those considered important by the research participant (O'Donovan et al., 2019b).

I selected photovoice because of its flexibility as a way of exploring a topic of community concern. In addition, the emphasis placed on co-selection of images conveying issues of concern and subsequent display to the wider community is well aligned to the aim of bringing about change as part of a CBPR approach.

4.3.2 Participants and dates

The photovoice study for Phase One took place between October 2018 and December 2018. The participants for this first phase were the CHWs residing in Makata and Seeta Nazigo villages (n=8). I was introduced to the CHWs through Nobert*, a staff member of NGO A,

at an informal meeting at Health Centre III A, during which Norbert explained the purpose of my DPhil study to them.

At the outset of my study, I had only planned on working with this group of eight CHWs; however, during the first few months of being in the field I met several other CHWs who were residing in Kiruja Butoke and Kavule who expressed interest in the project. They had only recently started to refer patients to Health Centre III A, which is why Norbert did not initially introduce me to them. Therefore, in keeping with the participatory nature of the project and following discussions with the staff at NGO A, I invited a further six CHWs from Kirija Butooke and Kavule to be part of the wider project. They did not, however, participate in this initial photovoice study, as it had already commenced prior to their recruitment.

4.3.3 Initial information session

All eight CHWs attended the initial information session, which was facilitated by David and Jane and lasted for three hours. CHWs were informed of the specifics of the photovoice study and were given the opportunity to ask questions. Some concerns were raised by CHWs, including what they should do if they were unable to work the camera, or if they encountered challenges in obtaining consent from community members. The CHWs were provided with an information sheet and a copy of an informed consent form, both of which were written in Luganda. CHWs took the information sheet and informed consent form home and returned a signed copy to the research team at the end of the week if they agreed to take part in the study.

4.3.4 Materials

CHWs were supplied with a ZOOMK 2.7-inch display digital camera, a solar charger to charge the camera, a notebook, pens, and consent forms. CHWs also received a small

monetary reimbursement (5000 UGX) each time they attended a meeting, in order to assist with transport costs. All materials supplied were funded by my DPhil research grant from the Economic and Social Research Council, as well as grants I was awarded from The British Medical Association Charitable Arm and The Royal Photographic Society.

4.3.5 Training Workshop

All eight CHWs reconvened a week after the initial meeting. Signed consent forms were returned and CHWs were given another opportunity to ask questions to the RAs who facilitated the meeting. The first two hours of the workshop were dedicated to discussing the ethical aspects of photovoice and training the CHWs on how to take informed consent from members of the community who they might photograph (Devakumar et al., 2013, Harley, 2012). This was considered important given (i) the potentially sensitive nature of the photographs; and (ii) the best practice guidance for conducting photovoice studies (Hannes and Parylo, 2014, McIntyre, 2003).

It was explained to the CHWs that written informed consent was considered to be the gold standard; however, in certain situations where this would not be possible or acceptable, verbal consent could be gained (Devakumar et al., 2013). In such instances, CHWs were encouraged to document in their notebooks the fact that consent was verbally granted for the photograph to be taken, as well as the reason why written consent was not obtained. For example, if an individual granted permission for a photograph to be taken, but was reluctant to sign a consent form due to personal reasons, it would be acceptable for the CHW to take the photograph as long as verbal consent was granted and recorded in the CHW's notebook. However, given the Ugandan Ethics Institutional Review Board (IRB) protocol requirements, these photographs could not be used in subsequent publications. CHWs were also given example scenarios on how to take consent and were given the opportunity to practice doing

this in pairs. CHWs were then given approximately four-hours of training in the use of cameras given that this was the first time that any CHW had used a camera. CHWs were first shown basic features of the camera, including how to turn it on and off, how to charge it, how to take photographs and use features such as the flash setting and zoom. Then they worked in pairs to practise capturing photographs.

A group discussion was then facilitated by the RAs in order to elicit the specific topic that the CHWs wished to explore. CHWs shortlisted topics that they wished to capture in photographs, then proceeded to collectively rank such topics in order of preference and importance. Each CHW was asked to write down a topic they wished to explore, which they then placed into a box. Where the CHW had more than one suggestion, they were advised to rank their suggestions in order of priority. Following this group discussion, CHWs reached a consensus that they wished to capture issues they felt challenged them in their role as CHWs. Other issues not selected, but suggested, included domestic violence, local sanitation issues, and local opportunities for business.

4.3.6 Photovoice Assignment

During the photograph-taking process, CHWs had the ability to contact the research team at any time via mobile phone to discuss challenges or concerns they had. The research team also visited the health centre at least twice a week to allow CHWs the opportunity to meet face-to-face.

Every two weeks, over a period of six weeks, CHWs met at the health centre to present and discuss their photographs with the research team. One-to-one interviews were conducted in Luganda by the two RAs to discuss the perceived challenges represented by the photographs (Figure 13). As mentioned previously, I had delivered formal training in conducting semi-structured interviews to the RAs, so that they felt confident to undertake interviews

themselves. Prior to the interviews taking place, photographs were transferred from the cameras to the RAs' laptops. Interviews were explicitly framed to elicit and explore challenges faced by the CHWs and the photographs were used as the focus of the discussion.



Figure 13 - A Photovoice Interview. A female CHW, Susan, (left) discusses the photograph she captured with Jane (right). The photograph is displayed on Jane's laptop and Jane audio-records the conversation.

The discussion for each photograph was framed around the 'SHOWED' mnemonic; a commonly deployed method in photovoice projects (Wang and Burris, 1997). As part of the framework, five questions are asked about each photograph, including:

"1. What do you **S**ee here?

2. What is really **H**appening here?

3. How does this relate to **O**ur lives?

4. **W**hy does this condition **E**xist?

5. What can we **D**o about it?" (Wang and Burris, 1997).

As part of the individual interviews, all of the photographs taken by the individual CHW were discussed in turn. Individual CHWs were initially asked whether or not the photograph related to the central theme of challenges they faced as a CHW. Where photographs were not relevant to the central theme (e.g. a personal photograph of the CHW with their family), they were not discussed at length using the SHOWED framework, but a more general discussion was held to gain a better understanding into the CHW's life. For those that did relate to the central theme, an in-depth discussion was facilitated by the RA using the SHOWED method (*see Appendices, Appendix Figure 10: 392*). In partnership with the CHWs, we conducted a visual thematic analysis on each of the images. Each CHW was asked what each photo represented before we engaged in an in-depth discussion around the photograph. Interviews were recorded using a handheld audio recorder and then immediately transcribed and translated into English. Each interview lasted between 40 minutes and 2 hours.

At the end of the individual interviews, a FGD was held, where all of the relevant photos identified during the interviews were discussed. The decision was made to discuss all of the relevant photos so as to avoid potential selection bias by the researchers. The FGD was done in order to share the photographs taken by each CHW and to explore the opinions of the whole group, so as to establish whether or not the issues raised by individual CHWs were considered as challenges by others. All eight CHWs attended the FGDs, which were facilitated by a RA. Photographs were projected onto an empty wall at the health centre using a low-cost projector (Figure 14).



Figure 14 - A FGD at Health Centre III A where CHWs view each other's photographs.

Finally, the RAs reviewed the notebooks with the CHWs to capture any further relevant information, or to clarify any points of ambiguity. At the end of FGD, CHWs were asked to review all of the photographs and group similar photographs into clusters (e.g. photographs relating to equipment challenges were all put into one folder). This was an important part of the participatory co-analysis and helped to guide the final thematic analysis. In total, the study lasted for six weeks.

4.3.7 Data Analysis

I formatted interview transcripts for style consistency in Microsoft Word and then exported them into NVivo (Version 12) for Mac qualitative analysis software (QSR International Pty Ltd, 2018).

Transcripts were read several times independently by both myself and the one of the RAs. The first read-through aimed to ensure the accuracy of the typed transcript and to ensure meanings of words and phrases had not been misinterpreted in the translation process. We then re-read the transcripts a second time, following Braun and Clarke's six-step framework for conducting thematic analysis (Braun and Clarke, 2006).

Following this process, initial codes were generated relevant to perceived challenges faced by the CHWs. An open-coding framework was used, meaning the codes were developed and modified throughout the process of reading the transcripts. Once an initial set of codes was compiled by myself and the RA, these were discussed jointly, and a preliminary unified set of codes was determined. Each set of transcripts was read by both myself and the RA, and codes were modified, generated, or changed throughout this process. After generating the final set of codes, we grouped these into themes. Themes and coding nodes were then reviewed in NVivo to ensure they were coherent, had supporting data, and to see if there were any potential sub-themes or missing themes. The final themes were then refined and defined, which Braun and Clarke describe as "identifying the 'essence' of what each theme is about" (Braun and Clarke, 2006). A random sample of codes and example quotes were also checked by a different RA to ensure consistency in code application. The codes were then discussed with the CHWs to ensure they represented their views and were an accurate reflection of their perceptions; again, an important part of the participatory process.

4.3.8 Community Workshop

Upon completion of the photovoice assignment, a one-day workshop was held at the NGO A offices in December 2018, to celebrate the achievements of the CHWs, and to share the photographs with the wider community and key stakeholders. The CHWs were asked which key stakeholders should be invited to the community workshop. Invitations were sent to key

stakeholders identified by the CHWs during the FGDs. Transport refunds were offered to attendees in line with nationally published rates and a hot meal and soft drinks were provided for all participants in the style of a celebratory meal (Figure 15).



Figure 15 - Food at the celebration workshop. Caterers serving food to participants. The Matooke[34] was particularly delicious (and perhaps why Luke is waiting expectantly for more food in this photo!)

The workshop consisted of short speeches lasting 10-15 minutes from key stakeholders as to what the study meant to them, how it had been important, and areas for improvement (Figure 16).

[34] A starchy variety of banana that is steamed and pounded into a mash. It is considered to be part of the national meal in both Uganda and Rwanda.



Figure 16 - Speeches at the workshop. The Chief Executive Officer (CEO) of NGO A (left) and CHW peer-supervisors (right) address the participants of the workshop.

Participants were then invited to view the photographs captured by the CHWs as part of a gallery style display. Photographs were grouped according to the CHW who took them to allow the CHW the opportunity to stand near their photographs and discuss what they represented with attendees. The workshop concluded with an open-floor discussion about how any issues that had been identified should be taken forward and who should be responsible for this. Finally, there was a certification ceremony recognising the work of the CHWs (Figure 17). This information dissemination component is an important part of the CBPR process, yet one which is often excluded from project reports involving CHWs (Coulter et al., 2020).



Figure 17 - Certification Ceremony. Participants being presented with certificates during the workshop by the project management team.

The workshop was filmed by a journalist from the major Luganda-speaking national television station, Bukedde TV (Figure 18).



Figure 18 - A Journalist from Bukedde TV filming the workshop.

***

I describe the findings and analysis from this photovoice study in Chapter 5.

4.4 Towards a deeper understanding of supervision – individual interviews with key stakeholders

The second important component of Phase One was to gain a better understanding of how supervision was defined and conceptualised in this setting.

To achieve this aim I first conducted a brief structured survey with the CHWs to understand how supervision was currently delivered in this context, prior to undertaking a series of individual interviews with key stakeholders (*see Appendices, Appendix Figure 11:393-396*).

4.4.1 In-depth interviews – Description and justification

I used semi-structured one-to-one interviews to collect data regarding key stakeholders' perceptions of CHW supervision and how mobile technologies could have a role in facilitating it. Interviews also allowed me to probe stakeholders on certain issues that were raised and gain a more in-depth understanding of key areas of concern, compared to using a standalone survey.

I chose individual interviews since I wanted stakeholders to answer questions and share their opinions freely without others present, hypothesising that individuals would be more likely to express themselves freely or openly in a one-on-one situation (compared to a group setting where a supervisor or manager might be present). I was also aware from previous work that during group discussions more senior CHWs were more vocal due to their community status. This meant younger or less experienced CHWs felt less able to voice their opinions. Similarly, many CHWs commented that they were reluctant to oppose group opinion in this setting, concerned they would be seen as disrupting the status quo.

4.4.2 Participants and dates

For the interviews which took place between October and December 2018, I recruited 14 CHWs, 5 District Health Officials, 2 Health Facility coordinators, and 5 NGO programme managers. Framed through the lens of action research, I decided to select this diverse range of participants given that:

> *"The action researcher is trying to delve into what is happening or what has happened, and, as such, needs to ensure that this initial reconnaissance phase frames the rest of the project effectively and accurately, and is informed by as complete a range of perspectives as possible"* (McAteer, 2013b:67).

4.4.3 Piloting of interview questions

To test the usability and clarity of the interview questions, I developed semi-structured interview guides which were piloted with 10 CHWs in a different parish and NGO programme managers from a different district (*see Appendices, Appendix Figure 12:399*). This also gave me an opportunity to observe David and Jane conducting interviews and give them feedback on their interview technique, as well as answer any questions they had. This formed the basis for their training as RAs. This process also meant that David and Jane could help modify and shape the final questions, which was an important part of the participatory approach towards my work.

4.4.4 Interview process

Initially, I planned to conduct all of the individual interviews myself; however, given the language barrier between myself and the CHWs, this was not possible. Instead, I conducted all of the interviews with Mukono District Health Officials and NGO programme managers in English, while interviews with the health facility staff and CHWs were carried out in Luganda by either David or Jane. All interviews were recorded using a digital audio-recorder.

4.4.5 Data Analysis

Within 24-48 hours of the interview taking place, the audio-recordings were transcribed (and, where necessary, translated into English) for analysis. When recordings had been translated, they were checked for accuracy and clarity by myself and the same RA who conducted the interview to ensure no meanings had been lost during the translation process. Where necessary, participants were contacted to clarify any points of ambiguity in the transcript. Like the photovoice interview transcripts, these interview transcripts were formatted for consistency and imported into NVivo Version 12 for Macintosh (QSR International Pty Ltd, 2018). Jane and I first read the interviews in full. The first read-through aimed at ensuring the accuracy of the typed transcript. Jane and I then re-read the transcripts a second time, following Braun and Clarkes six-step framework for conducting thematic analysis (Braun and Clarke, 2006). Following this process, initial codes were generated by referring back to the research questions. An open-coding framework was used, meaning the codes were developed and modified throughout the process of reading the transcripts. Once Jane and I had compiled our own initial set of individual codes, we discussed these and determined a preliminary unified set of codes. Each set of transcripts was re-read for a third time, and codes were modified, generated, or changed throughout this process. After generating the final set of codes, we grouped these codes into themes. Themes and coding nodes were then reviewed in NVivo to ensure they were coherent, had supporting data, and to see if there were any potential subthemes or missing themes. In keeping with a participatory approach, the themes and supporting examples were then discussed with the stakeholders to ensure they agreed that I was accurately representing their opinions and experiences. This co-analysis of data has been highlighted as an important part of CBPR research with CHWs since it can help in "explaining study findings, interpreting the voices and perspectives of the study participants, and further validating the data based on their lived experience" (Coulter et al., 2020). The

final themes were then refined and defined (Braun and Clarke, 2006). A thematic map was created, illustrating the major themes and subthemes, the relationships between them and how they related to the research questions.

I have decided to use thematic analysis as the basis of my analytical approach throughout this thesis for several reasons. First, thematic analysis is aligned with the overall goals of my thesis given that it aims to report, "experiences, meanings and the reality of participants" (Braun and Clarke, 2006:81). In my research, I was particularly interested in exploring the experiences and reality of the CHWs in relation to the challenges they faced and understanding how these might influence their experiences of supervision. Importantly, thematic analysis has also been considered a good way to generate a 'thick description' of the data and generate unanticipated insights (Braun and Clarke, 2006, King, 2004). Here I use the term 'thick description' to describe a detailed account of experiences which contextualises cultural and social relationships (Holloway I, 1997:154). Second, it has been suggested that the results of a thematic analysis are generally accessible to the public. One of the principal aims of my work was to relay findings back to the community, as part of a CBPR approach. Having accessible and understandable findings was therefore important. Furthermore, a thematic analysis approach has been suggested to be an "accessible form of analysis" suited to those early on in a career in qualitative research (Braun and Clarke, 2006:81). Given that one of the secondary aims of my work was to train David and Jane in basic research techniques in order to facilitate capacity building, I felt this was not only an appropriate form of analysis for interpreting the data, but it was also an appropriate way in which to facilitate a more genuine, participatory collaboration as a group of early-career researchers.

In summary, by the end of Phase One I had gained a fuller and richer understanding of the complexities facing CHWs, which was an important part of the PAR 'Observe' and 'Reflect' phases. The findings of Phase One are now presented in Chapters 5 and 6.

Chapter 5 – Understanding the Challenges Faced by CHWs in Seeta Nazigo Parish through the use of Photovoice

> *"…the ethics board, in rejecting our way of research, of giving consent or engaging, is practicing old order research, where white academics know best for… people of colour how to do ethical research."* (Tauri, 2017).

5.1 Chapter Overview

In this chapter, I present the findings from the photovoice study undertaken during Phase One (October-December 2018). Although the primary aim of this initial exploratory study was to understand the general challenges facing CHWs in their roles as primary healthcare providers, I specifically relate these findings back to the topic of supervision, which is the central focus of my thesis. I subsequently explore CHWs' perceptions surrounding why such challenges exist and try to identify roles for key stakeholders to address these. I conclude the chapter with a critical reflection on the role of photovoice as a participatory method and my role within this particular element of the wider project.

Through this photovoice study, I was also able to gain a deeper understanding of the broader context in which the CHWs work, which was vital in helping me design the subsequent supervisory intervention in Phase Two.

Please note that the findings presented in this chapter have already been published in the peer-reviewed journal *Global Public Health* (O'Donovan et al., 2019a), but are expanded upon here. Furthermore, for ease of reading, I have incorporated the interpretation and discussion of the findings within the results section.

5.2 Results and interpretation of findings

A total of eight CHWs took part in this photovoice study, all of whom were from Makata or Seeta Nazigo villages. There was an equal split of males (n=4) and females (n=4), all of who had served for eight years as a CHW.

A total of 107 photographs were taken by the CHWs over the six-week period, and 62 were relevant to the topic of interest which concerned challenges they faced in their roles as CHWs. The remaining photographs were of themselves, their families, or functions in the village that they had attended (for example church services, burials, or weddings) (Figure 19). Although I did not formally analyse the conversations around these more personal photographs, they gave me important insights into the daily lives of the CHWs beyond their job roles. For example, I began to better understand the importance placed on attendance at community events such as burials and weddings. These were often multi-day events where CHWs, as important members of the community, were expected to be in attendance; indeed, non-attendance was not an option and would have been looked upon badly by other community members. This made me wonder how (and indeed *if*) CHW programmes, which closely monitor CHWs attendance and judge performance by metrics, such as the number of households they visited, take these cultural factors into account.



Figure 19 - A local church service. A CHW took this photograph of the choir she was part of at her local church. It does not represent a challenge related to her role as a CHW, but she wanted to capture it to show us an important part of her life not related to her duties as a CHW (Credit: CHW 3, Elizabeth).

I will now present the challenges highlighted by the CHWs and potential solutions to address these challenges in section 5.2.1 below.

5.2.1 Challenges Identified Through the Use of Photovoice

A. Supervision and training challenges

The first subtheme concerning perceived challenges faced by CHWs was a lack of supervision, as well as appropriate training, to deal with the shifting disease burden (such as the increase in NCDs, e.g. cancer and ear and hearing disease).

The topic of supervision was raised through different photos, such as those depicting CHWs attending the health centre for a meeting (Figure 20). CHWs used this opportunity to discuss the lack of regular supervision, which they perceived as negatively impacting upon their

roles. They cited factors such as a lack of regular supervision, supervisors not accompanying them on home visits, and a lack of feedback as being particularly challenging. Importantly, they appeared to make a distinction between 'ongoing training' (which they perceived as one-off refresher training sessions held at the health centre) and 'supervision' (which they appeared to refer to as an ongoing process).

> *"We do not get regular feedback or supervision. For example, we get this one training session on pneumonia for half a day, then that is it. You wait a whole year until you see them [the trainers] again."* **Luke, CHW 7**



Figure 20 - A supervision meeting at Health Centre III A. This photograph depicts an in-person ongoing supervision session held outside at the local health centre (Credit: CHW 9).

I explore this particular issue of CHW supervision and how it is conceptualised in greater detail in Chapter 6 through the analysis of in-depth interviews with multiple key stakeholders. In Chapter 6, I also explore the views of key stakeholders as to how supervision could be redesigned in order to address some of the challenges identified here.

Similarly, the content of supervision and training was also cited as problematic. To illustrate this issue, many CHWs took photographs of community members who suffered NCDs such as ear disease, diabetes, hypertension, and cancer, and stated they had not received appropriate training to help address community members concerns, manage their conditions, or give appropriate advice (Figure 21 and Figure 22).

> *"We appreciate the training we have had on child health, but we don't get enough on other diseases like ear disease, diabetes, eye disease, cancer… and there is a weakness in supervision."* **Luke, CHW 7**

> *"That is the child whose mother had applied a crushed bone to her ears as treatment…I am not sure why ear problems are common… Many of those health workers [CHWs] have little or no knowledge about what they could be doing."* **Susan, CHW peer-supervisor 1**



Figure 21 – A photograph of a local community member with hearing loss. Photos depicting individuals with medical problems that the CHWs perceived as challenging were common (Credit: CHW 2, Paul).



Figure 22 - A photograph of a child with an infected ear. This photograph was captured by one of the CHWs to illustrate the high burden of ear disease in the local area. During the resulting discussion, she mentioned that many of her fellow CHWs were unaware of how to manage such cases since they had not received specific training on this particular topic (Credit: CHW peer-supervisor 1, Susan).

Similarly, CHWs lacked training on issues pertaining to mental health. This was highlighted when one of the CHWs took a photograph of a man with post-traumatic stress disorder and stated:

> *"Such a person is a threat in society, so I have to be concerned. Those mentally ill people are rapists! He may end up raping children on their way from school or even women along the way. As a CHW I have to ensure he is treated to avoid such scenarios from happening."* **Paul, CHW 2**

When the issue of mental health was raised during a group discussion, several of the CHWs commented that mental illness was perceived as a curse for evil deeds in a previous life, or viewed it as a divine punishment. All eight CHWs were unaware however that there were different subtypes of mental illness:

RA: *"Have you ever had any training on mental health?"*
CHW: *"No. We have had training in other things, like HIV and TB, but not that."*
RA: *"Do you know about the different types of mental illness?"*
CHW: *"Huh? There are types? I just thought all mental illness was the same!"* **Paul CHW 2**

The challenges around supervisory content have been cited across other CHW programmes in Uganda (Ojo et al., 2017) and potentially reflects a weakness in the Ugandan CHW training model, which to date has largely focused on maternal and child health issues and infectious diseases. It therefore does not reflect the epidemiological transition that the country is going through (i.e. an increasing burden of NCDs) and thus it is important that CHW training and supervision is updated to reflect this. It is important, however, that reforms of training and supervision are thought of in a more holistic, person-centred manner, rather than a disease-specific, vertical manner, which could otherwise result in a siloed approach to practice. This has been critiqued in the wider literature pertaining to CHW training and supervision, given that the historical focus on maternal and child health issues has resulted in knowledge gaps for other important, but increasingly neglected disease burdens such as trauma, mental health issues and disabilities (Winters et al., 2019). It was for this reason that photovoice was a useful method to help me better understand some of the disease burdens in the local area and helped to ensure that the design of the subsequent training and supervisory programme in Phase Two was contextually relevant, appropriate and focussed on an unaddressed area of concern from the perspective of CHWs, i.e. ear disease and hearing loss.

B. Infrastructure challenges

The second major theme identified by the CHWs concerned issues with private and communal infrastructure, which directly affected the communities they served and was thus perceived as a challenge to their role as the main primary healthcare providers in their respective villages.

For example, some CHWs took photographs of the poor state of the local roads, which caused them difficulties in attending home visits, as well as the local health centre for ongoing training and supervision sessions (Figure 23). For example, during the rainy season, a journey which might normally take 20 minutes by boda-boda could turn into a four hour round trip on foot. Given that CHWs are volunteers with responsibilities beyond their caregiving roles, many of them may understandably choose not to attend in-person meetings in such circumstances.

> *"Now the problem is with the heavy trucks which come in the village, some come to carry sand and the state in which they leave the roads is very bad, making it difficult for us to pass through…meaning we can't easily get to the health centre to submit our reports. It is the same for the residents too."* **Josephine, CHW 1**

> *"[I am] inconvenienced with the muddy roads…yet I would have visited many homes."* **Elizabeth, CHW 3**



Figure 23 - The dirt roads common to Seeta Nazigo Parish (Credit: CHW 3, Elizabeth).

This challenge presents an argument for adopting alternative models of supervision and was part of the reason for choosing to adopt a blended model, combining in-person supervision with remote supervision facilitated by mobile technologies (*see Chapter 7*).

Other infrastructure-related challenges were tied to communal services, such as protected water sources. In recent years several protected water sources had dried up, forcing residents to queue for several hours to fetch water (Figure 24).



Figure 24 - Waiting for water. A woman waits by a protected water source with her child to collect water in 'jerry cans' (Credit: CHW peer-supervisor 1, Susan).

CHWs felt this was a challenge to their role since certain individuals would prefer to use unprotected sources as an alternative way of collecting water. As a result, CHWs had to manage the community members who fell sick as a result of waterborne illnesses:

> *"…water is essential when it comes to health, and that's my biggest concern as a CHW. Without clean water people are bound to fall sick since they are forced to use water from unprotected water sources."* **Josephine, CHW 1**

There were also unexpected consequences as a result of poorly functioning water sources, including disruption to infant vaccination schedules:

> *"The women who have children are mainly responsible for fetching water. If a water source is drying up, she might find herself in a difficult situation on a Wednesday, which is the day for immunisation. She needs the water, she needs the immunisation, but of course she is more likely to prioritise water so the baby misses out on being vaccinated."* **Susan, CHW Peer-supervisor 1**

The impacts of poor infrastructure on the communities' access to healthcare providers have a long history in Mukono District. Even in 1985, Kironde notes the challenges in infrastructure from a village perspective:

> *"Also the bridge connecting our village to the teaching health centre at Kasangati was broken three years ago, and the bus service once provided has been discontinued. Such developments have further cut off our access to medical services in places close to our village."* (Kironde, 1985:66)

Visualising healthcare through the dominant biomedical lens risks failing to understand the multi-faceted nature of issues that determine the health of individuals, and the subsequent challenges faced by CHWs in addressing these. In this sense, photovoice helped to shed light on the broader social determinants of health and allowed me to reflect wider contexts in which communities live. For example, through the photographs and subsequent interview analysis, I learnt how addressing issues with people's homes and communal water sources could be an important way of improving community health and alleviating some of the burdens faced by the CHWs. One way to achieve this could be to reshape CHW supervision so that CHWs are encouraged to reflect on the social determinants of health, and to encourage them to act as community advocates to address such issues. This concept of "community-oriented primary care" is not new and has been successfully enacted in the past

(Mullan and Epstein, 2002). For example, after receiving training in advocacy and leadership skills, a collaborative of CHWs in Arizona were successfully able to engage their community to make positive systems and environmental change to improve their households and lobby policymakers to address their living environment (Ingram et al., 2014). In the Ugandan context, NGOs could play an important role in supporting the development and holistic training of CHWs to fulfil this role by adopting a role as stewards to ensure promotion and advocacy for the relevant provision of community-based health services, and championing the needs of the CHWs they support (Delisle et al., 2005). In this sense there is a need to reimagine the purpose and nature of CHW supervision, moving beyond supervision rooted in the biomedical paradigm, to one which critically addresses the broader determinants of health which affect the communities they serve. In Chapter 9, I document how this was enacted in practice by modifying the nature of supervision, away from a didactic form of information dissemination to a model of collaborative discussion, facilitated by the use of a shared online learning space on WhatsApp.

C. Relationship challenges with staff from the formal health system

Another challenge articulated by the CHWs concerned relationships with staff at Health Centre III A. For example, one CHW took a photograph of the empty waiting room in the Outpatient Department and indicated that health centre staff often failed to turn up for work (Figure 25). Another CHW gave an example of the government health workers failing to turn up to the health centre at weekends, which they reported to the district councillor:

> *"Earlier on we met the district councillor and told him about nurses not being at the health centre during the weekends - a matter that he took seriously and called for a meeting…Now they work on weekends, but for some time our relationship with them was so tough as they knew we had reported them and some failed to even speak to us."*
> **Dina, CHW 9**



Figure 25 - An empty Outpatient Department at Health Centre III A (Credit: CHW peer-supervisor 1, Susan).

As a result of this, some of the CHWs had stopped making referrals because they deemed it futile if there were no staff at the health centre to manage the patients who attended:

> *"Supervisors come (to check on the staff), but the few health workers they find at the workstation cover up for their colleagues who are not around…One may defend another by lying to the supervisor that their colleague went for burial, yet the person just decided not to show up. It's a common problem and frustrates us. Why would we refer a patient if there are no staff to see them?... It impacts badly on our reputation with the people we serve."* **Susan, CHW Peer-supervisor 1**

Tensions between CHWs and facility-based health workers in Uganda have been documented previously in a study conducted in Luwero District (Musinguzi et al., 2017). In this study, CHWs demanded preferential treatment for the patients they referred to government health centres, which resulted in tensions arising between the facility-based staff and CHWs. In addition, the authors pointed to minimal communication between the two cadres leading to further tensions.

This challenge has particular relevance to supervision, given that staff at the health centre could potentially act as supervisors to CHWs. Such models of supervision, whereby CHWs are linked with a facility-based supervisor, have been explored in other contexts such as South Africa (Tseng et al., 2019). This approach aims to ensure that patients in the community, who require an onward referral from the community to a health centre, receive their referral in an appropriate and timely manner. Finding a way to improve the working relationship between CHWs and the facility-based health staff is therefore of vital importance, since the success of CHW interventions "depends on high levels of community involvement and participation, and a positive relationship between the CHW programme and the formal health system" (Grant et al., 2017:2). In this context, unless the working relationships between CHWs and healthcare professionals at the local health centre can be improved, certain important elements of a patient's journey through the health system could be compromised (e.g. timely referrals). In other resource-limited contexts, interprofessional collaboration and communication between different members of the healthcare team have been suggested as important ways of improving the quality of patient care and safety (Busari et al., 2017). Collaboration between interdisciplinary healthcare professionals has been defined as "(understanding) complementary roles within a team, work(ing) cooperatively, shar(ing) the responsibilities for problem-solving, and mak(ing) the decisions needed to formulate and carry out plans for patient care" (Busari et al., 2017:228). Supervision therefore represents a potentially important mechanism to improve ongoing training and learning, and as a conduit for improved collaboration between healthcare professionals. However, in order for supervision to be effective, and for the aspects of good supervision (*which I discussed in Chapter 2*) to be enacted, addressing these underlying relational tensions between members of the interdisciplinary healthcare team need to be understood and addressed. This is also an important challenge to highlight, since advocates of CHW

programmes often state the benefits of linking the community to the formal health system (Haines et al., 2007); however, there is a danger that this claim fails to acknowledge the counter-argument i.e. that tensions between CHWs and other members of the interdisciplinary healthcare team could actually serve to weaken links to the formal healthcare system and thus compromise patient safety.

D. Equipment challenges

Several CHWs took photographs of equipment they lacked to fulfil their role as CHWs, including gumboots, mobile phones, umbrellas, means of transport, and water bottles (Figure 26). Photographs of these items were taken with the permission of other community members who owned them.



Figure 26 - Equipment that CHWs need to do their work. A – A mobile phone; B – Gumboots; C – A motorbike; D – A bag for their equipment.

Some CHWs took photographs of basic feature phones (Figure 26A) and suggested that they might help to improve the way in which supervision is delivered by improving and facilitating communication:

> *"Now, like our supervisors, they may want to communicate to us sometimes; the patients may want to talk to you but you even don't have a phone. I may also need the phone to call at the health centre to ask whether there is medicine."* **Josephine, CHW 1**

This finding was clearly of particular relevance to the subsequent phases of my research project.

Other CHWs took photographs of gumboots to represent the protective footwear which they lacked but wished to own (Figure 26B). One role of CHWs is to check the status of latrines in the households they are responsible for. Many mentioned how passing through such areas without protective footwear was unhygienic. Others cited the challenge of the long distances between the homes they serve, and the need for provision of transport such as bicycles or a communal motorbike (*boda-boda*) to assist them in completing more home visits (Figure 26C). Interestingly, the government provided bicycles to the CHWs in 2002; however, several of them fell into disrepair and are no longer in use. Some CHWs blamed the government for allowing this to happen, stating that they purchased poor quality bicycles and misappropriated the remaining money. Others, however, felt that because the bicycles were distributed without cost, many CHWs failed to maintain or take care of them due to lack of perceived ownership:

> *"To some, who received the bicycles for free from the district, they don't care because after all it was given for free, they didn't incur any cost themselves, so why look after it?"* **Tayo, CHW 10**

Several CHWs also felt a major challenge was a lack of medications and properly functioning equipment. One of the CHWs had been provided with a medicine box by the Ministry of Health in 2002; however, he had not been supplied with medicine since 2004 (Figure 27). The box now lies unused in his home.

> *"People always ask me why we don't receive medicine, yet we got this box. It affects me because we are the immediate health workers who have to give first aid to the people, so it frustrates me and them when there is nothing to give!"* **Albert, CHW 8**



Figure 27 - A male CHW with a medicine box supplied by the MoH in 2002 (Credit: CHW 8, Albert).

Other CHWs asked for new uniforms, stating that the t-shirts they had been originally provided with in 2008 were now old and dirty. This led to local people mocking them and not taking them seriously as healthcare professionals.

This finding, regarding a lack of equipment, is common across other CHW programmes in different contexts (Oliver et al., 2015, Jaskiewicz and Tulenko, 2012, Kadzandira and

Chilowa, 2001). For example, Jaskiewicz and Tulenko identified that Lady Health Workers in Pakistan were forced to procure medications in the local market due to poor supply chains, causing them to lose respect amongst the community (Jaskiewicz and Tulenko, 2012). Other CHWs have reported feeling disempowered due to the lack of control that they are able to exert over their work (Kane et al., 2016). For example, poorly designed programmes, which provide inadequate support to CHWs, can undermine their ability to act in an autonomous fashion. This was illustrated well in a quote from a CHW in Indonesia who stated:

> *"When I participated in the asphyxia training, I wanted to disseminate it to village midwives, but we don't have Ambu bag [breathing aids] up until now. So when I wanted to disseminate it, I didn't have any related materials, which made it useless."* (Kane et al., 2016:31).

In the context of Uganda, this mirrors extensive work already conducted by Kyakuwa with nurses, which has found that nurses feel undervalued and unrecognised within the current system in which they work (Martin, 2009, Kyakuwa, 2011). In this setting, nurses did not have access to important equipment to fulfil their job roles, which led to feelings of dissatisfaction, and in some cases nurses vacated their roles. This also parallels earlier work conducted by Patricia Holden, who explored the role of nurses in colonial and post-colonial Uganda. One of the common challenges faced by nurses was a lack of equipment, which she notes reduced the prestige attached to nursing. Similarly, nurses prided themselves on clean and smart uniforms as a sign of rank, which in turn commanded respect. Uniforms play an important part in the, "symbolic systems associated with colonial nursing, by emphasising order, control, and devotion to duty" (Holden, 1991). These vestiges of colonialism and the formalisation of the health system still have implications today: several of the CHWs commented on the need for new t-shirts to help them garner respect amongst the community and make them easily identifiable as trained health workers.

It is clear there is a pressing need for the District Health Office and Ugandan Ministry of Health to ensure CHWs have appropriate supplies of medication and working equipment. It is not enough to simply train CHWs in the recognition of disease and community concerns; it is vital to also provide the necessary and proper equipment in order for them to manage the issues they identify. This holistic, multifaceted approach to strengthening CHW programmes has been suggested in the 2018 WHO guidelines to optimise community health worker programming, in order to achieve maximum impact (Cometto et al., 2018). Such efforts include supporting CHWs with appropriate remuneration, transport, career advancement, and ongoing support. These concerns regarding equipment are important to understand, since supervision cannot be viewed as existing in a silo or as a simple intervention, but rather one which needs to be designed and positioned in relation to other wider factors, which are likely to impact on its success. This finding therefore guided several design decisions that I made during Phase Two, such as supplying the CHWs with necessary auxiliary equipment in order to help facilitate the supervisory process.

5.2.2 Underlying reasons for the challenges identified by the CHWs through the photovoice study

During the individual interviews and FGD conducted as part of the photovoice study, I explored the reasons why the CHWs felt the challenges they identified exist. The underlying reasons for the challenges were attributed to two main groups; the government and broader system in which the CHWs work, and NGO A.

A. Government and system-level factors

There was a strong belief among many of the CHWs that the government were to blame for the challenges they faced, especially regarding the lack of medicines at the health centre. During a group discussion, one of the senior CHWs stated:

> *"I blame the government for all that. I remember very well in Obote's regime every health centre used to treat all kinds of diseases freely! Medicine was there in plenty... Now corruption and theft are the order of the day! Can you imagine they stole the money meant to buy Anti-Retroviral Therapy (ART) for HIV and AIDs patients? If they stole that, what of that meant for diabetes patients? Developed countries give us so much money for ART but it keeps getting stolen by the government officials."* **Luke, CHW 7**

Others cited a lack of empathy from those in positions of authority as to why challenges in a rural area such as Seeta Nazigo had not been addressed:

> "*When their children fall sick, they [government officials] take them to expensive private health centres, so they don't even feel touched about the person who can't afford. For example, you never see the children of Government officials in government-run health centres."* **Tayo, CHW 10**

> *"Nobody cares about these challenges apart from us at the grassroots who are facing them. We are the people whose opinions don't matter. The government don't care. They sometimes come, hear about our problems, and then do nothing. They show their face like it is a requirement to check a box, but don't really care."* **Dina, CHW 9**

B. The supporting NGO

Some CHWs attributed their challenges, especially those regarding supervision, to NGO A. For example, they felt the feedback they received on their performance was irregular and infrequent, partly due to the shortage of trained staff to act as a supervisor. Similarly, they felt that the training they received, which NGO A was responsible for delivering, did not reflect the diseases encountered by the CHWs:

> *"NGO A only have four or five staff. With us CHWs there are hundreds. So how can four or five staff support us well with supervision?"* **Josephine, CHW 1**

> *"NGO A need to provide us with medications and train us in different things. We get the same training all the time."* **Paul, CHW 2**

"Personally, I may put the blame on our supervisors of NGO A. They have not taken time to supervise and also find out what is taking place in the villages and how the CHWs are working, the transport means and how the CHW communicates with the people. You may give your concerns but the year goes by without even getting feedback. We appreciate the trainings they give us because we always have more training but there is a weakness in supervision." **Tayo, CHW 10**

5.2.3 Suggestions to address challenges

Various suggestions were raised by the CHWs as to how the challenges they had identified could be addressed. These included roles for the government, NGO A, and individuals (such as the CHWs themselves).

A. Government roles

The majority of the CHWs suggested the government had an important role to play, through the provision of medicine at the health facilities, increasing staffing at rural health centres, and improving the quality of communal infrastructure.

"It all goes down to the government. They must provide medicine for all types of diseases so that all patients can benefit." **Tayo, CHW 10**

"The government, through the Ministry of Health, should send more health workers to coordinate with the VHTs [CHWs] – we are overwhelmed with patients in this area and can't deal with them alone." **Josephine, CHW 1**

"The government should improve the quality of the roads so that people can move easily when they need treatment." **Albert, CHW 8**

However, despite these suggestions, tensions were raised when discussing the role of the government in addressing the challenges. Some CHWs felt that even when they highlighted challenges to government officials, many did not listen or respond to them, citing a lack of respect for workers at the village level, as well as self-interest, as reasons for this:

"My efforts as a CHW would be to focus on applying pressure to the government. But we have tried this, and even if you approach them after discussing the issues, they don't do follow up. The moment you leave their offices they start doing their other things… They undermine us, the CHWs, they don't take us seriously. Some say we don't know English and we can only write in Luganda…so it appears useless to write to them or approach them." **Tayo, CHW 10**

"We want the government to help but they claim they have no money… but we know they do since they buy expensive cars for the members of parliament and giving money to those who support constitutional amendments. You just cannot trust the government." **Elizabeth, CHW 3**

B. NGO roles

There were calls from CHWs for NGO A to play a more critical and involved role in addressing their challenges. Instead of just delivering training on disease recognition, management and prevention, CHWs wanted them to play a greater role in advocacy.

"NGO A can write to those who are responsible, because as a registered organisation in direct contact with the government it can be heard and feedback more easily than a CHW… Another thing that I think that must be done is that when NGO A comes here it just brings training, but they need to understand more about the issues at the health centre asking questions like is the medicine enough, are the facilities working well etc." **Luke, CHW 7**

"NGO A should convince the government to provide diabetes medicine freely. I am sure they will listen to them." **Paul, CHW 2**

C. CHW roles

Although conveyed less strongly than potential roles of the government and NGO, some CHWs highlighted their own potential role in addressing some of the challenges they identified, by taking on the role of community advocates and activists:

"What I can do is what I am doing right now. Raising awareness! If I weren't responsible enough, I would either not have bothered finding out the problem or just kept quiet after finding out." **Luke, CHW 7**

> *"I think we can address some of the challenges by speaking up, for example the way I am doing now. Imagine if all us CHWs talk about it! Then it would be considered a serious concern."* **Dina, CHW 9**

Others, however, felt they were unable to affect change, or did not have the time given their own personal commitments alongside their volunteer work as a CHW:

> *"As people at the grassroot level, we cannot do much to effect change. I would love to help but I also have my own responsibilities."* **Tayo, CHW 10**

The identification of these potential solutions to challenges faced by CHWs was a useful way of helping me understand how they envisioned addressing such issues. However I was also cognisant that practically addressing all of these challenges was far beyond the scope of my DPhil project. I was also worried that there could be an expectation for me to solve some of the issues and that failing to do so might result in feelings of disappointment from the CHWs. I therefore made sure that I listened to their concerns and assured them that I would relay them to the appropriate stakeholders, but stressed that I was unable to promise action on challenges which were outside of my control (e.g. improving the state of the local roads). This was disappointing for some of the CHWs, since they assumed that part of the action research approach was to enact change, but this early setting of expectations was an important part of helping to build trust from the outset through transparency and clarity.

5.3 Chapter contributions and limitations

This work adds to the relatively narrow body of existing evidence regarding the role of photovoice with CHWs. In an earlier published systematic review concerning the use of PVMs with CHWs I identified only six relevant studies (O'Donovan et al., 2019b). This is important because, although challenges faced by CHWs in Uganda have been explored in the literature before (Kimbugwe et al., 2014), this has largely been done using surveys or semi-

structured interviews, which might only provide "a partial insight into the views and concerns of CHWs" (O'Donovan et al., 2019b:723).

In addition, challenges are also context-dependent – for example, challenges faced by these CHWs in Seeta Nazigo are likely to be different to those in other regions of Uganda, given the difference in supporting providers and cultural factors. Similarly, challenges faced by volunteer CHWs in Uganda are likely to be highly different to those faced in Liberia, where CHWs are a paid cadre. Understanding these challenges at a local level is important as the global evidence base on CHW programmes continues to grow. As such, my research answers the call from leading academics in the field of CHW research, such as Scott et al. (2018), who have suggested the need to expand the evidence base for CHW programmes with context-specific methods (Scott et al., 2018). These close-to-the-ground findings are also timely, given the planned changes to community health delivery in Uganda and the planned introduction of a new cadre of CHEWs (O'Donovan et al., 2018). Highlighting key challenges from the perspectives of current CHWs may help policymakers and practitioners, who are responsible for reshaping the Ugandan CHW programme, enact policies and programmes that are responsive to the needs of those delivering primary healthcare services on the front line.

In terms of limitations, the use of photovoice was not without its challenges, some of which have been previously documented in the literature (Woodgate et al., 2016, Liebenberg, 2018, Given et al., 2011, Milne and Muir, 2019). In particular, I wish to reflect on the ethical challenges presented through the use of photovoice. Although the challenges concerning the ethics of PVMs in the field of global health more broadly are beginning to be explored in the wider literature, a detailed description and analysis of such concerns are often missing from existing empirical studies (Black et al., 2018). Although the CHWs reported that the majority of people were happy to sign a consent form and have their photograph taken, a small

minority were resistant, even after the process was explained to them and their anonymity was guaranteed. This was out of fear that the photographs might be misused or might result in government persecution against them. One CHW stated:

> *"Some of them had never seen anything like that [a camera] their entire life. It's almost like they were afraid of being a part of something they had never been a part of before. Others felt like we were going to exploit their photos for our own benefit… You know these days they hear stories from the media about the government arresting people and people don't like having their image taken."* **Dina, CHW 9**

Another stated that some community members did not want to sign consent forms, out of fear of subsequent reprisals:

> *"They just fear signing documents, they think something wrong may happen to them after signing. I tried to explain but they did not understand me."* **Julia, CHW 4**

Other CHWs found that some people did not want their photograph taken as they were tired of false promises from previous research projects:

> *They say "Don't waste my time, we are tired of those things… there is no change, just promise…it's the same story."* **Tayo, CHW 10**

In contexts such as Uganda, where there are levels of suspicion and resistance to having a photograph taken, photographic methods of enquiry may not be culturally acceptable to certain members of the population. This was particularly understanding because the community participants did not know me, and signing a form in this setting is rarely done apart from transactional exchanges involving the sale of land. Alternative methods of obtaining consent, such as oral consent, should therefore be considered as an appropriate equivalent in similar contexts.

One challenge associated with exploring alternative approaches, however, is navigating the established IRB protocols already in place, which often specify that written consent must be

obtained from all participants (Glass and Kaufert, 2007). When I broached this subject with the Ugandan IRBs, they made it clear that the only acceptable form of consent was written consent. This tension, brought about by the underpinning concept of universalism, has been identified in previous related literature concerning research with indigenous populations, where communal informed consent is considered more culturally appropriate than written informed consent (Tauri, 2017). Such challenges have been expressed and debated for many years in the context of ethical research with indigenous populations (Wax, 1991, Glass and Kaufert, 2007, Foley, 2000), but with increasing interest and use of CBPR approaches in the field of global health, now must be the time to enact reforms to ethics review procedures so that they are better aligned with cultural values in many settings. In the context of indigenous research, indigenous ethics review boards have been established as one way to counter the marginalisation of their people in the research process. Other solutions include the idea of 'process consent', where the consent taking process is considered to be ongoing in its nature (Israel M, 2015).

It is also important that I caveat my findings in relation to the eight CHWs involved in capturing the photographs. Although care was taken when selecting the CHWs as participants, their views cannot be claimed to be representative of other CHWs. It is also important to note that some of the CHWs felt the initial period of two weeks to collect photographs was too short and required an additional month to complete the study in a satisfactory manner. I would therefore recommend that other researchers ensure appropriate time is allocated for capture and discussion of photographs.

Finally, although public dissemination meetings have been suggested as one important way to engage with key policy stakeholders and share findings (Liebenberg, 2018), how the findings are acted upon in a meaningful way remains a key challenge. Despite inviting several government officials to the community workshop, only one District Health Official

was in attendance. It is therefore not possible to claim that this photovoice project was able to truly 'empower' the CHWs, since true empowerment involves engagement and change of complex support structures, as well as the resources to bring about change; something which my photovoice study, in isolation, cannot address. Critically, by simply taking part in the process of photovoice, CHWs were not necessarily able to enact change themselves. Rather, it provided the opportunity to reflect more deeply on the issues challenging their daily work, which I suggest is a valuable outcome in itself.

5.4 Reflexivity statement

Although some commonalities were shared between the research team and the CHWs (for example, Jane was native to the Mukono District), other aspects of our identities were very different (for example, none of the direct research team were CHWs). Similarly, all of the research team had achieved a minimum of a bachelor's level qualification, whereas the majority of CHWs had stopped formal education after secondary school. In addition, all of the direct research team were employed in full-time, relatively well-paying jobs in either the NGO or academic sector. It is not fully clear how these dynamics were perceived by the CHWs, but it is important to note that our positions might have influenced the interactions with the CHWs, and the answers they provided in the one-to-one in-depth interviews. For example, one of the RAs stated:

> *"Because a mzungu [a white person] was involved in the project, VHTs [CHWs] might have been more fearful of giving truly honest answers. This might have been out of fear that if they provided an answer you did not agree with you might have dropped them from the project."* **Jane, Research Assistant**

This challenge of the complex power dynamics at play in research involving, "marginalised community members together with experts" has previously been documented in the literature (Gaventa J, 1993, Black et al., 2018:23). In this particular context, despite the aim of a

participatory process, the direct research team had relative privileges over the CHWs, which made discussing some of the challenges they faced uncomfortable at times. For example, one of the major challenges identified by the CHWs was access to reliable transport, something which the research team did not face: we owned a private vehicle. Therefore, despite our best efforts to co-construct the narrative through joint interpretation of the data during the individual interviews and FGD, it is very possible that the different identities and experiences of those involved in the research study resulted in a narrative which may not truly reflect all of the challenges perceived by the CHWs.

My own positionality as a white British researcher could be considered potentially problematic in this context. In the past, white researchers have come to this particular community, taken photos and then used the photos in resulting publications, with the community seeing no benefit from the process. Jane noted:

> *"Some people strongly believe mzungu currently use manipulation to steal from Africa instead of the initial direct theft that existed in the colonial era. They think mzungu take their photos and use their stories to fundraise for money that they instead use for their own selfish gains and give a small percentage to them if at all."* **Jane, Research Assistant**

This view has been echoed by other researchers conducting work in sub-Saharan Africa, such as Chisomo Kalinga, who states that there is often concern amongst communities about, "their knowledge being used by Westerners to enrich themselves, whilst they remain poor" (Kalinga, 2019:271).

Understanding and openly addressing such concerns from the outset could therefore be an important part of the community engagement process for similar projects in the future. I reflect further on the influence my role had on the overall project in Chapter 10.

When I wrote up this study for publication with my Ugandan colleagues, I encountered an additional challenge. At several points, I was advised to tone down criticisms of the government which had arisen through the CHW discussions. My initial sense of judgement was that we should include all relevant challenges and criticisms; however, I reflected that this was a convenient, yet naive position to take. I was a non-Ugandan researcher, with the ability to freely critique the government without fear of persecution or reprisal. On the other hand, my research colleagues were faculty in a university which has been referred to as the "Oxford of Africa" (Mwesigire, 2016). In the photovoice project, one of the CHWs commented on the rife corruption present at the government level and blamed President Museveni for setting this precedent. However, when I wished to use this as a quote in the paper, I was advised by one of the collaborating Ugandan academics to remove it; for native researchers being more critical was problematic, especially given the recent dismissal of Professor Stella Nyanzi (a medical anthropologist and Professor at Makerere University Institute of Social Research who was dismissed from her position in 2017 for criticising President Museveni)[35].

Importantly, this issue is not uncommon. For example, in her book 'Scrambling for Africa', Johanna Tayloe Crane documents the challenges surrounding ownership of data from a US-funded HIV project in the South-West region of Uganda (Tayloe Crane, 2013). Tayloe Crane highlights the tensions that arose between the US research team and Ugandan collaborators over the ownership of a large patient dataset, which was used to support grant applications and investment into the local clinics and research institutions (Tayloe Crane, 2013). What started off as an informal data set stored on a basic Excel spreadsheet evolved over time into a formal and complex database which became increasingly valuable to all stakeholders

[35] At the time of writing (August 2020) Professor Nyanzi is being held at Luzira Prison in Kampala (https://www.universityworldnews.com/post.php?story=20190116144430642)

involved in the project. Yet no conversation was held from the outset of the project as to who formally 'owned' the data sets. From the perspective of the Ugandan collaborators, the database had been gifted by their American partners and as such they felt they had ownership over the data. However, this feeling was not reciprocated by the US colleagues. As such, this led to a protracted period of negotiation, whereby formal agreements were developed. Although the issue was eventually resolved, this led to "lingering feelings of wariness among the collaborators" (*ibid.*:119) and raises questions around the equity of collaboration.

Reflecting on this theme in relation to my own work, it would have been wise to hold a more explicit discussion with my research partners from the outset of my project, covering issues such as data ownership and the rights of individuals to veto or censor publication of certain materials. However, I felt uncomfortable to initiate this conversation given that this was a newly brokered academic partnership and I did not want to offend my colleagues. Furthermore, at the outset of the study, I was not fully aware of the difficulties of criticising the government in academic writing and so did not think of broaching this topic during my initial meeting with the collaborating research team at Makerere.

5.5 Chapter Summary

The use of photovoice was an important first stage of my research project and helped me to understand some of the challenges faced by CHWs in the area I was working. These included challenges directly related to supervision, such as a lack of appropriate supervision and infrequent supervision, as well as indirectly related challenges such as infrastructural challenges, relationship challenges with staff from the health centre and equipment challenges.

This work also helped me to better understand the complexities of undertaking a methodological approach underpinned by the principles of CBPR. By experiencing such

challenges at an early stage in the project, it forced me to reflect on the ethical implications of my work and indeed my own position within the project which, in turn, helped me to interpret my findings more critically in subsequent phases of the study.

This initial exploratory work was also an important part of the CBPR approach I took. Table 4 (*see below*) summarises how this phase of research helped to enhance my understanding of supervision in this context. Importantly, through this period of observation and reflection, one of the important issues identified by the CHWs was the burden of ear and hearing disease as an unmet area of training and supervision which needed to be addressed. This subsequently formed the basis for the training and supervisory intervention in Phase Two.

Phase of research	**Core concepts related to supervision**	**Ways in which this informed the design/evaluation of the subsequent intervention**
Phase One – *Photovoice study*	**Supervision challenges** • In this context, CHWs felt there is a lack of supervision. • Content of supervision is not reflective of daily practice e.g. there is a lack of supervision on local disease burdens, such as ear and hearing disease and mental health. • The structure of supervision means that supervisors do not accompany the CHWs on home visits which they feel would be beneficial to give them feedback on their practice. • Distinguishing between ongoing training (as a one-off training session) vs. supervision (as an ongoing process). • Various suggestions were put forward to improve	• There is a need for an increased frequency of supervision. • Content of supervision should reflect the local disease burden. This is in keeping with good pedagogical principles for supervision i.e. that supervision should be situated and contextualised. Given the CHWs identified ear and hearing disease as a topic of interest this formed the basis for the subsequent supervisory programme which I describe in Chapter 7. • The structure of supervision should be modified to include in-person supervision where possible; this influenced the subsequent design of the supervisory programme which I describe in Chapter 7. • It is important to consider supervision as an ongoing

	supervision, including an increased role for NGOs.	process, rather than a stand-alone event. The design of the supervisory intervention which I describe in Chapter 7 reflects this.
	Infrastructural issues • Wider 'system level' factors also influence CHWs experiences of supervision. This included infrastructural challenges (such as the poor state of the local roads during the rainy season) which made attending in-person supervisory sessions at the local health centre challenging.	• The mHealth component of supervision (which facilitates 'remote supervision') could be a potential way to address this challenge.
	Interdisciplinary relationships • Relationships between different cadres can be tense; therefore being cognisant of potential existing tensions is important during the selection of supervisors.	• Having an understanding of existing tensions was a useful background for my work (especially during the design phase of the project – Chapter 7). • Supervisor selection should be undertaken in a participatory manner where possible. • Having multiple supervisors may help mitigate potential tensions by ensuring that CHWs have more than one supervisor to consult depending on the challenge they face.
	Equipment shortages • CHWs highlighted a shortage of equipment which prevented them from fulfilling their roles to their maximum potential	• When implementing a supervisory programme consideration needs to be given to the wider elements which are essential to supporting CHWs. It is not enough to simply make one intervention without considering the other holistic factors which might influence the success of this intervention.

Table 4 – My evolving understanding of supervision – Summary Table B. Here I highlight core concepts regarding my understanding of supervision developed through the process of photovoice and how this informed the design and evaluation of the subsequent mHealth facilitated supervisory intervention.

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In conclusion, the use of the photovoice helped me to gain a unique insight into the broad range of challenges faced by a group of eight CHWs in Seeta Nazigo Parish and laid the foundations for me to explore supervision in this context in more detail through in-depth interviews with key stakeholders. I now present the findings of this important component of Phase One in Chapter 6.

Chapter 6 – An in-depth exploration of CHW supervision with key stakeholders in Mukono District

"Supervisors come after three months and organise a training session; then they take a whole year before you see them again." **Female CHW**

6.1 Chapter Overview

In this chapter, I build upon the findings from Chapter 5 and explore the specific challenge of CHW supervision. I did this by conducting a survey with CHWs (n=14), aiming to understand how supervision was currently delivered in this context. The findings of this are presented in Section 6.2.1 of this chapter - '*The current delivery of supervision'*.

I then conducted 26 individual interviews with key stakeholders, including the CHWs (n=14), and those in managerial positions who were responsible for the oversight and delivery of supervision. This included District Health Office officials (n=5), NGO programme managers (n=4), and facility-based health staff (n=3). The interviews aimed to understand:

6.2.2 The conceptualisation of CHW supervision

6.2.3 The desired characteristics and qualities of a supervisor

6.2.4 Challenges related to supervision and potential ways to address these

6.2.5 The perceived role and challenges of mobile technologies in facilitating supervision

This work was carried out during Phase One of the project and helped me to answer RQ1:

How do stakeholders (CHWs, NGO programme managers, health facility workers, and government officials) perceive CHW supervision, including the role of mobile technologies in facilitating supervision?

The methodology for this phase of my study has already been described in Chapter 4 (*see Section 4.4; 'Towards a deeper understanding of supervision – individual interviews with key stakeholders':128-131*) and here I present the findings from the survey and the thematic analysis of these interviews. Please note that for readability purposes, I integrate my analysis and interpretation of the findings within each subsection of this chapter.

6.2 Findings

6.2.1 The current delivery of supervision

Supervision frequency

The majority of CHWs stated that they received supervision every three months (n=12); however, one indicated that they received it monthly (n=1), and for another only when there was a special community outreach programme, which had no pattern as to the frequency of delivery (n=1).

Style and mode of delivery

The style of supervision delivery varied across the group of CHWs. The majority of CHWs stated that they received in-person group supervision only (n=10). However, two CHWs stated that supervision was delivered individually (n=2), one stated that supervision was carried out through mobile phone support only (n=1), and one said that they received supervision through a mix of one-to-one in-person supervision and additional support via mobile phone (n=1).

Perceived supervisor

Half of CHWs surveyed considered NGO A staff to be their supervisors (n=7). In contrast, five other CHWs stated it was a fellow CHW (n=5) and two stated it was a mix of individuals including health facility staff members, NGO A staff and fellow CHWs (n=2).

From this preliminary survey, it became clear that even amongst this relatively small group of CHWs the current model of CHW supervision in this particular context was disjointed and inconsistent. This finding is in keeping with previous studies conducted in other LMICs which suggest that CHW supervision is often poorly implemented (Assegaai and Schneider, 2019a, Hill et al., 2014a, O'Donovan et al., 2019a, Kok et al., 2017a). For example, in a study from Tanzania by Roberton et al. (2015), the frequency, duration, and style of supervision varied significantly, with 25% of CHWs stating that they had never been visited by their supervisor in the village (Roberton et al., 2015).

This short yet important survey therefore helped me to better understand the challenges that I would likely face in the design of a subsequent supervisory intervention. It also highlighted the potential for divergent views amongst stakeholders about how they might conceptualise supervision.

6.2.2 The Conceptualisation of CHW supervision

From the thematic analysis of the 26 stakeholder interviews, three main themes were developed around the conceptualisation of CHW supervision. In this context, CHW supervision was perceived mainly as a means of (i) Monitoring and accountability; (ii) Motivation; and (iii) Supporting ongoing training and professional development. Here I discuss each of these themes in more detail.

i. Monitoring and accountability

The concept of supervision as a means of monitoring the CHWs' work and holding them accountable was strongly expressed by stakeholders at both the CHW and managerial level. 11 of the CHWs perceived supervision as a way for their supervisors to check up on the work they had been assigned. This is exemplified through the following quotes:

"[Supervision is] when an organisation comes to see if we are doing what they trained us to do…and if there is a difference in the community since then." **Susan, CHW peer-supervisor**

"Supervision is when someone comes to find out what you do concerning health issues and where you have reached with your work." **Josephine, CHW 1**

Similarly, at a managerial level, supervision was perceived as a means by which to monitor the CHWs and ensure they were conducting their work to an appropriate standard. In particular, District Health Officials cited supervision as a way of ensuring CHWs did not practise beyond what they were trained to do. In this sense, the monitoring purpose of supervision was one way to enable oversight, and to carry out quality assurance and safety checks of CHW practice:

"They [CHWs] may come with data that is not very accurate, so supervision supports the accuracy of data collection." **District Health Official**

"Supervision is to see if they [the CHWs] are doing their roles, if they are doing their tasks. How are they doing it? Are they doing it correctly? Because some go beyond what they are supposed to do. You find that some of these VHTs [CHWs] decide to call themselves 'Health Workers'. So we find out how are they moving. Are they working within what we trained them for?" **District Health Official**

However, alongside the emphasis placed on quality assurance and patient safety, supervision was also viewed as a means of holding the CHWs accountable for their work, especially amongst managerial level stakeholders. From this perspective, supervision could potentially be considered as overburdening, problematic and unsupportive, given that some NGO managers framed supervision as a way of policing the CHWs' work. For example, some NGO managers stated that if they discovered some CHWs were not active, then they would attempt to phase them out of the programme:

"If you are supervising someone, you need to know, "Are they active?" Sometimes these VHTs [CHWs] just disappear. So if you're a supervisor you need to know, "Ok I have two VHTs [CHWs] in this village, and they are active." **NGO manager**

> *"So if someone is not attending [supervision] we phase them out, yeah. Because we don't see any point in keeping them in the programme if they are not active."* **NGO manager**

The specific reasons for wanting to phase out the inactive CHWs were articulated by the CEO of one NGO who stated:

> *"...we have the interests of our private investors who are all social impact investors who have an interest financially."* **NGO CEO**

Essentially this meant if the CHWs were not active and generating a profit (e.g. through the sale of medications or health-related products), then they would be phased out of the programme. This was because certain NGO programme managers felt they had an obligation to their funders to demonstrate 'social-impact' through quantitative metrics such as the number of active CHWs, how many products they were selling and the profit margins generated by the CHWs through the sale of such items. This positioning of CHWs (as sales agents) by certain NGO managers was, in my mind, problematic and highlighted the potential tensions that could arise between different stakeholders involved in CHW programming depending on their worldviews and how they positioned CHWs within the health system.

ii. Motivation

Closely linked to the theme of '*Monitoring and Accountability'* was the concept that supervision served as a means to motivate the CHWs.

Notably, there were two different sentiments expressed to a relatively equal extent amongst the CHWs as to why supervision motivated the CHWs to carry out their work. On the one hand, supervision appeared to inspire some CHWs to carry out their duties, and they valued the positive recognition and a sense of appreciation from their supervisors and the communities they served. This is demonstrated through the following quotes:

"When they [supervisors] supervise us it motivates us to work harder…it makes us feel like they value us and love what we do." **Elizabeth, CHW 3**

"There are times they [the supervisors] come and check on three of your households and you feel encouraged that they still remember you." **Dina, CHW 9**

Indeed, the sense of positive motivation expressed by the CHWs was echoed by managerial level stakeholders, who felt that supervising CHWs was a way of 'high-level' stakeholders recognising and appreciating the work of the CHWs, which in turn could motivate them.

"There is motivation. If we know about it they [the CHWs] will say, "Oh! District Health Officials came here, you are moving with this person!" … They want to see themselves working with some key people who appreciate his or her role in the community… Also there is a way you feel that someone has come up and knows I exist. That recognition. I exist. And that is good because sometimes you say, "I exist, but who at the District Level knows me?" But when key people come and supervise you and you call people by the name and say, "Thanks for the good work!" that motivates them." **District Health Official**

However, in contrast to the more positive motivational sentiments that supervision appeared to instil within some CHWs, others suggested that supervision motivated them to carry out their work in order to avoid punishment or blame. This is demonstrated through the following quotes:

"When someone realises that they are being supervised, that person tries their best to improve their work with the fear of being blamed for not doing enough." **Tayo, CHW 10**

"Since the work we do is entirely voluntary, we tend to relax. But with supervision, we feel pressured to do whatever we are supposed to do, like making reports and submitting them, knowing if we do not someone is coming to find out why and there may be a penalty." **Julia, CHW 4**

Several stakeholders at the managerial level agreed with this latter sentiment, and also recognised that supervision might motivate the CHWs to perform their work in order to avoid blame:

"During supervision we will do some verification. Let us visit two or three homes and see how they are performing. So, by going into the village as a group those people [CHWs] realise "Ah! That other time we got ashamed! Let us go do something about that!" **District Health Official**

iii. Supporting ongoing training and professional development

Both the CHWs and managerial level stakeholders suggested that supervision has an important role in supporting ongoing training and professional development (*although this opinion was expressed less frequently than the conceptualisation of supervision as a means of monitoring CHWs work*). In this sense, supervision was perceived as a way to help the CHWs develop new skills and improve their clinical practice through the provision of constructive feedback. This concept is illustrated through the following quotes:

"When I am supervised, I am taught something new that I can pass on to the others. We usually get new information from supervision and share it with others…Every time I am supervised I get to know where I went wrong and they [the supervisors] give me measures to improve on my work performance." **Elizabeth, CHW 3**

"It's from supervision that we are able to know our weaknesses that need to be improved." **Rosetta, CHW 12**

"They [CHWs] also learn because they are taught a number of things during supervision. Because of that they are able to influence positive change in their particular villages." **Health Facility Worker**

"You are going to this person, appreciating the good things and correcting what is not going well in a good way." **District Health Official**

To a lesser extent, some managerial level stakeholders also suggested that supervision was a way to assist career development, given that supervisors would be aware of the skills and leadership potential of individual CHWs and could nominate them for additional training opportunities. Similarly, some CHWs felt that supervision was a way to support their own professional development since they could learn about new opportunities to pursue:

"If I supervise you, I can recommend you for career development as I know your qualities…like who is a leader." **District Health Official**

"Another benefit is that it expands our work. Through supervision you may end up receiving a phone call for an opportunity." **Edward, CHW peer-supervisor 2**

These varied and diverse views highlight the plurality in the conceptualisations of supervision by key stakeholders. It also reflects the challenges that I subsequently faced in co-designing an intervention in Phase Two of my study that could encapsulate these purposes of supervision.

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Although a shift towards supportive supervision has been encouraged in the academic literature on CHW supervision (Kok et al., 2018b), it is not always enacted in practice. This could partly be due to the way supervision has been framed historically, which I highlighted in Chapter 2 (*see Section 2.2 – A History of Supervision in Healthcare:41-45*). For example, Vasan et al. (2017) built upon earlier work by Clements et al. (2007), to suggest that traditional supervisory structures in LMIC health systems were designed in a way which reinforced "a hierarchical and often punitive manner aimed at local staff" and that workers with higher professional positions were placed in charge of those with lower professional standing to oversee them (Clements et al., 2007a, Vasan et al., 2017:440). Marquez and Kean (2002) have developed this argument further, suggesting that the "inspection and control" element of supervision came about in part due to the notion that front-line health workers tended to be, "unmotivated and lacking incentive for high performance" (Marquez and Kean, 2002:1) and as such required tight supervision (Vasan et al., 2017). This led me to reflect on the potential challenges I might encounter through the design and implementation phases of my DPhil, given that the conceptualisation and nature of supervisory interactions are historically embedded and that the complex relational hierarchies might prove challenging to

address. Although I was initially worried that the supervisory intervention might fail to be adopted, I was also cognisant that understanding and reflecting on these unfiltered perceptions was an important part of the exploratory phase of participatory based action research and would ultimately help in the subsequent design and implementation phases. Understanding the existing views of key stakeholders around supervisory practices and conceptualisations would also help me interpret subsequent evaluations of a supervisory intervention.

Furthermore, I hypothesised that some of the apparent challenges surrounding the implementation of supportive supervision in this setting could be due to the lack of training on good supervisory practices. This therefore represented an opportunity during the design phase to create clear roles for supervisors and provide them with the appropriate training to enable supervision that not only monitors CHWs' performance but is also supportive in nature. This meant that I had to pay particular attention to training the nominated supervisors in good supervisory practices during Phase Two of the project. I also actively encouraged them to provide supportive and encouraging feedback to the CHWs whenever possible. Given that fault-finding supervisory practices are one of the main demotivating factors for CHWs across Ethiopia, Kenya, Malawi and Mozambique (Kok et al., 2017b), this supervisory training was crucial.

6.2.3 The desired characteristics and qualities of a supervisor

The next important part of understanding supervision in this setting was to explore who stakeholders believed should be a supervisor and the qualities that potential supervisors should have. This was important for the subsequent design of the supervisory intervention in Phase Two of my study, which I described in the next chapter (*see Chapter 7*).

i. Who should be a supervisor?

There was a general consensus across all levels of stakeholders that CHWs themselves should play an active role in the supervisory process. Several CHWs cited that fellow CHWs would understand the challenges they faced from a first-hand perspective and were thus uniquely placed to fulfil the role of supervisor, whereas others cited practicalities such as close proximity and availability as to reasons why CHWs would make good supervisors:

> *"A VHT [CHW] amongst us should be doing it…You know they know us and we know them. They know our difficulties with our lives and the problems we have with the people in the village. They just get us… It is also easy to talk to them."* **Josephine, CHW 1**

> *"I think it's better to choose someone from the VHTs [CHWs] who can do the work of supervision and one who is always available because this helps them to give a quick response and feedback about people's concerns."* **Albert, CHW 8**

Having CHWs act as peer-supervisors has been suggested in the existing theoretical literature on CHW supervision, where it has been hypothesised that peers can "more readily empathize with the perspective of CHWs" and are more likely to be aware of local issues (Strachan et al., 2012:114). Likewise, in a study by Kok et al. (2017), CHWs from Malawi felt unable to connect on an emotional level with their existing supervisors and felt "disconnected because of the different worlds supervisors and HSAs [CHWs] came from, lived in, and had to cope with" (Kok et al., 2016:9).

Some CHWs therefore suggested that they should elect a peer to be their supervisor:

> *"It would have been better for us [CHWs]to first supervise ourselves, before those supervisors of NGO A come. This could be done through choosing amongst ourselves someone capable to supervise the work."* **Alex, CHW 6**

However, despite this general agreement that CHWs should play a role as supervisors, there were also disagreements across the stakeholders regarding who else should take on supervisory positions. For example, whereas a strong sentiment was expressed by the

majority of CHWs that NGO representatives should be supervisors, this was not the case amongst the managerial level stakeholders (e.g. District Health Office representatives and Health facility workers) who felt that representatives from the Health Centres should be supervisors instead.

The reasons for CHWs recommending NGO staff as supervisors varied, but included that the staff had access to transport, were perceived as being knowledgeable regarding healthcare issues and were seen as having a duty to fulfil, since NGOs were the organisations who had originally recruited and trained the CHWs:

> *"It would be good to have NGO A as our supervisors because they have transport means."* **Paul, CHW 2**

> *"I think it should be NGO A because for someone to supervise they must be well trained. Your supervisor must have sufficient knowledge of whatever they are supervising you about."* **Dina, CHW 9**

> *"I personally think the organisation that assigns VHTs [CHWs] responsibilities should be the one to supervise them."* **Susan, CHW peer-supervisor 1**

In contrast, some health facility workers stated that it was their entitlement to supervise the CHWs as they felt they were responsible for them; however, other health facility staff noted the impracticalities of this approach, citing their already high workload and staff shortages as barriers towards taking this approach. This led them to suggest that CHWs as peer-supervisors would be a good alternative solution:

> *"It should be me because I am in charge of that health facility. So I am supervisor of that whole sub-county. I am entitled to supervise all health personnel."* **Health Facility Manager**

> *"The people at the health facility centre cannot because they have their own roles at the health centre. I don't think we can find time to supervise (the) VHTs [CHWs] apart from those who go to the health centre…but accompanying them where they are? We cannot. We cannot abandon the government work to do voluntary work. I suggest they get specific leaders just for supervision… What I think can be done is to recruit supervisors from amongst VHTs [CHWs] to supervise their fellows. The reason for that*

is because we the current supervisors are few in number compared to the areas we have to supervise which makes our work quite difficult. We take long to go back and supervise those we earlier on monitored because we still have so many other VHTs in other areas to work on and that ends up looking like negligence. (The) best solution is to select a VHT per parish to supervise the rest." **Health Facility Worker**

Importantly, a small minority of stakeholders raised the idea of having multiple supervisors in a network (in contrast to simply assigning supervisory responsibilities to an individual or one organisation):

"We also need to establish a relationship amongst us VHTs [CHWs], the health facility staff at the parish and that at the sub-county. We can form a chain." **Edward, CHW peer-supervisor 2**

"At the district level we had the District Health Educator and the District Health Inspector…But at health centre level, those workers are the contact point. So you'll see the in-charge of the health centre or his representative. He could get someone to supervise. Because there the VHTs [CHWs] will have to work across issues of immunization, sanitation, water, child health, not just vertical programmes, so to have someone specifically appointed at the health centre is important too." **District Health Official**

These findings played an important role in how the subsequent supervisory intervention was designed and influenced the decision to trial a multi-stakeholder supervisory network. This built upon the suggestions raised during these in-depth interviews and aimed to draw upon the multiple strengths that each expert within the network had. For example, it was hypothesised that CHW peer-supervisors would be aware of the logistical challenges faced by their peers and could provide emotional and day-to-day support (factors which have been cited in the existing literature as important for effective supervision (Portoghese et al., 2014)), whereas the trained healthcare professionals would be appropriate co-supervisors to address technical and theoretical questions that the CHWs might have. One of the criticisms of this approach, however, is the emphasis placed on having a high number of supervisors, which is potentially at odds with the human resource constraints faced by health systems in

LMICs; a factor which I discuss in Chapter 9 in greater detail (*see Section 9.7 'Strengths and Limitations:304-313*).

ii. What qualities should a supervisor have?

In terms of supervisor qualities, stakeholders expressed several important features and characteristics of a 'good supervisor', however, there were four commonly recurring themes that were suggested across managerial and CHW stakeholders alike. These were that supervisors should have (a) technical knowledge and expertise; (b) cultural awareness of the context in which they are working; (c) strong interpersonal skills (e.g. empathy, enthusiasm for their role); and (d) good communication skills.

a. Technical knowledge and expertise

All stakeholders stated that a supervisor should have good technical knowledge about the subject matter they are supervising, with managerial level stakeholders placing significant emphasis on the need for supervisors to have a medical background. The justifications for this included the need for a supervisor to be able to help if the CHW was stuck on a particular topic and to have mastery of technical skills in order to be able to instruct and guide the CHW.

> *"This person should have a medical background, at least for the basics. Even if they have not been to medical school they should know the matter covered in the VHT [CHW] trainings…so they can help the VHTs [CHWs]."* **Health facility manager**

> *"[The supervisor] should be trained, who has the competencies, skills and is knowledgeable about healthcare."* **District Health Official**

> *"… [The supervisor] should be a well-trained person who is above us. As a VHT you may not always know what to do, but when you contact someone like a nurse, they may be able to assist you."* **Julia, CHW 4**

b. Local knowledge and cultural awareness

In addition to supervisors having technical knowledge and expertise regarding healthcare-related matters, several stakeholders also suggested the need for supervisors to have cultural awareness of the context they were working in. This ranged from practical issues such as a grasp of the local language to having an in-depth understanding of community structures. Importantly, the District Health Office officials highlighted the difference between traditional governance structures and those implemented during the era of British colonial rule. They stressed that many people in the region had a stronger allegiance to the traditional governance structure. Therefore it would be important for supervisors to be familiar with this system and part of it where possible. These concepts are illustrated in the following quotes:

> *"The supervisor should be fluent in English and Luganda because that is the language people in the community understand best."* **Health facility worker**

> *"Knowing the place where he [the supervisor] is working, knowledge of leadership the community structures and all this. Because here we have the political structure and the more traditional structure…. You've heard of the Baganda [the largest tribe in central Uganda]? If you go to a community and they love their Kabaka [King] so much, he'd rather go through the community leadership of the traditional leader. Then they will be very happy to work. Rather than the political structure."* **District Health Official**

c. Interpersonal skills

CHWs prioritised strong, positive interpersonal skills as qualities that a good supervisor should have. These skills included empathy, supportiveness, trustworthiness, confidentiality, being non-judgemental, and approachable.

> *"We need someone who is not rude, especially when talking to us because the work we do is voluntary!"* **Paul, CHW 2**

> *"Supervisors need to build from the small achievement. If you go somewhere, you don't need to blame. Supervisors who say "Why didn't you do this? You are very lazy. The other time I never found anything!" are not good. So we need to appreciate the little which we have found on the ground."* **District Health Official**

> *"The person should not be tough. They have to be simple, easy to deal with and approachable."* **Josephine, CHW 1**

> ***"****It is good to be simple with people and to not always be commanding. Every time you command, you discourage someone. You have to know what the other person thinks and share opinions with them."* **Luke, CHW 7**

d. Communication skills

This quality was emphasised across both group of stakeholders as important for potential supervisors, and included both active listening skills as well as written and verbal communication skills:

> *"A supervisor should have good communication skills…and should be literate knowing how to read and write."* **Health Facility Worker**

> *"If you are to be a good leader, you have to listen…communication. Effective communication is very important if we are to supervise effectively."* **District Health Official**

Other characteristics deemed as potentially important by the stakeholders, but expressed to a lesser degree, included that the supervisors be well equipped and able to support the CHWs work (*which is perhaps not strictly a characteristic or quality per se, but rather a feature of how well resourced the organisation responsible for providing supervision are*); have skills as a mediator (e.g. able to deal with conflicts); and general professionalism (e.g. well dressed, prompt and good at timekeeping).

Building upon these findings, supervisor training is a necessary but neglected area which needs to be developed further. In Ghana, guidelines have recently been developed by government and NGO partners to help train CHW supervisors, representing an opportunity for other countries to follow suit. These guidelines place a strong emphasis on enhancing supervisors communication skills - such as active listening, developing leadership qualities and providing constructive feedback (World Vision International and Ghana Ministry of Health/Ghana Health Service, 2015). Developing the interpersonal skills of a supervisor is worthwhile given that previous studies have demonstrated that enhanced feelings of trust and

support between the supervisor and supervisee can result in enhanced levels of CHW performance (Kok et al., 2017b). It is also important to remember that "CHWs are professionals whose professionalism comes not from formal degrees but from their life experience" (Brown et al., 2020). Alongside ensuring the supervisor has technical abilities, emphasis should also be placed on developing their existing strengths and understanding how these can contribute to a contextually appropriate supervisory intervention.

The cultural background of the supervisor was also highlighted as an important characteristic of a good supervisor; thus this should be considered during the selection process. Given that a new cadre of community health professionals called Community Health Extension Workers (CHEWs) have been recently proposed by the Ugandan MoH to oversee the work of CHWs (O'Donovan et al., 2018), it would be pertinent to try and ensure that CHEWs are native to the area in which they will be working so that they have some shared cultural identities with their supervisees.

The selection of CHW supervisors also represents an important area for future research. Whereas research has begun to emerge on CHW selection more generally, little empirical research has been conducted in the field of supervisor selection. Indeed, significant emphasis has been placed on technical mastery of skills in order to ensure patient safety in recently developed guidelines for CHW selection (Taylor et al., 2018a, Taylor et al., 2018b) which include the use of pre- and post-training tests to assess clinical competence and safety. Although this is important, overemphasising this aspect risks neglecting the non-technical qualities of potential supervisors and local knowledge, which are also important and valued by the CHWs. This challenge is representative of the epistemological challenge facing the "multiplicity of conflicting forms of knowledge" in the field of healthcare (Cornish and Gillespie, 2009:800).

6.2.4 Challenges related to supervision and potential ways to address these

In Chapter Five, I documented how CHWs perceived supervision as one of several broad challenges to their general work (*see Section 5.2.1 'A. Supervision and Training Challenges':134-138*). Here, I explore two challenges specifically related to supervision from the perspective of key stakeholders in more detail, namely (i) funding challenges and (ii) challenges related to the design and structure of supervision

As part of the interviews I also asked the stakeholders to reflect on the potential ways these challenges could be addressed. These findings will be incorporated into this section; however it is important to note that not all of the challenges were met with corresponding solutions.

i. Funding challenges and suggested solutions

At a managerial level, the District Health Office staff cited a lack of funding as a barrier to implementing CHW supervision. Officials were largely critical of the MoH, stating that they had failed to allocate sufficient funds to community health programmes in Uganda which in turn had resulted in a reduced budget for supervisory activities. However, the staff at the District Health Office also recognised their own role in failing to obtain funding, stating that they had not adequately budgeted for supervisory activities in their annual costings and as a result this was not reflected in their budgetary allowance from the MoH.

> *"Even when you look at investment, money allocated to these programmes by the Ministry of Health, is little. They think community care doesn't matter. It does need prioritisation… and the resulting supervision doesn't happen or function as it should were it properly funded!"* **District Health Official**

> *"We [the District Health Office] haven't prioritised supervision of VHTs [CHWs]. Because funding cannot just come when you've not lobbied for it. You need it in your work plan. You show it as an unfunded priority to key stakeholders, who may be there."* **District Health Official**

This lack of funding also helped to highlight some of the existing tensions between key stakeholders. For example, District Health Office stakeholders felt that some partner NGOs would not share the details of how much they spent supervising CHWs with them, meaning that they were unable to reflect this in their budget reports to the MoH. This meant that sustainability of such programmes could be called into question if the NGO programmes withdrew support:

> *"When you look at the funding…most of the help we are getting is not in the budget line. Whatever you look at what we are proud of and what we have achieved, most of it is supported by external programmes… they are off budget… these partners come and do A, B, C and D without fully communicating it to us."* **District Health Official**

NGO stakeholders stated that the frequency of supervision was lower than they wished, given the high costs associated with travelling to different villages and the remote islands in the district for which they are responsible:

> *"Supervision takes a lot of money. Like for us, we go to the islands [Koome Islands – part of the Mukono District]. Goings to the islands, taking a boat. Those things they take a lot of money."* **NGO facilitator**

CHWs stated that they would often spend their own money to attend supervisory sessions held at the local health centre. The voluntary nature of their role meant that many CHWs elected not to attend supervisory sessions since they had other needs to address, such as tending to their farms in order to generate income. This is illustrated through the following quotes:

> *"We don't show sometimes because we aren't getting paid. We all have jobs and need to make money as we are not rich."* **Paul, CHW 2**

> *"You may invite the VHTs [CHWs] to come for supervision but then they fail to come because they are looking for money to buy food and educate their children…one may have to attend a four-hour supervision session but then they remember their children don't even have supper for the day."* **Luke, CHW 7**

In order to address this challenge, increased funding for supervision was highlighted as an important factor, especially by the CHWs, who suggested that a financial payment for attending supervisory sessions would help to motivate them. This appeared to be particularly important for female CHWs, many of whom had a dual caring role as both mothers and CHWs.

> *"Another challenge is when we are called for supervision. For example, a breastfeeding mother like me and others that left their homes without lunch are not facilitated in any way. They should motivate us the few VHTs [CHWs]…because truth is we endure all situations with or without financial facilitation which would help us greatly."* **Elizabeth, CHW 3**

These tensions between different stakeholders, regarding lack of transparency and collaboration around funding, bring into question the need for tighter regulation and reporting accountability for partner NGOs to ensure that cost data is shared so that government stakeholders are aware of the financial costs of supervision.

Challenges of appropriate funding also extended to individual CHWs, who often struggled to attend centralised supervision sessions because they lacked the funds to travel. Payment of CHWs is deemed essential for well-functioning programmes and a previous study in Uganda demonstrated that combining supportive supervision with a financial incentive for CHWs helped to improve CHW impact in their communities. For example, when CHWs in Arua District received payment, there was an increase in the number of malnourished children admitted to intervention facilities (Lazzerini et al., 2019). Therefore, within the limited budget of my study, I worked with the RAs and NGO A staff to ensure a small stipend was paid to the individual CHWs involved in my study to recompense them for their time and work. This does not address the long-term issue of the need for appropriate sustainable strategies for financial costing and planning for supervisory activities, which is far beyond

the scope of my study. However, moving forward, I wish to highlight this as an essential area of consideration for government and NGO stakeholders alike.

ii. Challenges (and solutions) related to the design and structure of supervision

Given the emergent findings from the initial survey on supervision done during the early stages of Phase One (*see Section 6.2.1*), it was unsurprising that all stakeholders commented on the challenges of how supervision was designed and structured.

Managerial level stakeholders suggested that implementation challenges were rooted in a lack of formal supervisory structures, as well as a lack of health professionals to fill supervisory roles, as illustrated through the following quotes:

> *"The system does not stipulate what exactly a supervisor should look into. And that is an issue to do with guidelines. Trust me there are guidelines missing on supervision."* **District Health Official**

> *"Supervision is…very fragmented. The issues are that the organisations currently involved are kind of all doing their own thing and they are all trying to do good, but it requires some overall coordination"* **NGO manager**

> *"But where you are in a situation where you don't have a medical worker… who can do the supervision. Because that is what is on the ground. Because if you are not even having enough in the facility, then how can you have even additional people to do supervision?"* **District Health Official**

Health Facility and NGO managers highlighted the high ratios of supervisees to supervisors as a major barrier towards the delivery of supervision:

> *"We the current supervisors are few in number compared to the areas we have to supervise which makes our work quite incompetent. We take long to go back and supervise those we earlier monitored, because we still have so many other VHTs [CHWs] in other areas to work on…."* **Health Facility Worker**

Similarly, CHWs highlighted several challenges regarding supervision. Firstly, there were difficulties relating to logistical factors, such as the long distances needed to travel to receive

supervision, poor communication between supervisors and CHWs (meaning that the CHWs are often unaware of supervisory sessions), and the infrequent and erratic nature of supervision.

> *"Well it is a long way to the centre [the health centre where supervisory sessions take place]. We are not paid and we have to take a boda-boda there. That costs money."* **Elizabeth, CHW 3**

> *"There are times when they call VHTs [CHWs] for supervision and we refuse to turn up…it is because they don't let us know early enough. We all have our own programmes."* **Paul, CHW 2**

> *"The supervision happens sometimes…other times it does not. It is erratic."* **Paul, CHW 2**

There were also challenges related to the nature of supervision. For example, several CHWs felt that the content of supervision was outdated and failed to cover topics relevant to the issues they encountered in their daily practice (*discussed previously in Chapter 5*).

> *"Our fellow VHTs [CHWs] also discourage us [from attending supervisory sessions]. I may have made up my mind to attend but then they stop me from going claiming I am going to be told the same information I was told the last time. Assumption is we are only going to be reminiscing about what we previously discussed."* **Elizabeth, CHW 3**

To address some of these challenges around the design and structure of supervision, managerial level stakeholders suggested creating designated job descriptions for supervisors. Furthermore, they suggested that those who were assigned a supervisory role should receive specific training in how to carry out this function, as well as the importance of assessing the quality of supervision through regular meetings and check-ups.

> *"Then tell the person in their job description that they should do the supervision. Because then when I am evaluating you, I will ask you as supervisor "Why did you not meet this output? You were supervising these VHTs [CHWs]. Tell me the positive of what came out of the supervision."* **District Health Official**

"But we also need to meet up. Understand how the VHTs [CHWs] can work and speak with the supervisor in charge. Speak with them, check if the issues seen by the VHTs [CHWs] in the community are acted upon." **District Health Official**

CHWs suggested improvements that could be made in the way supervision was designed and delivered, including having supervision conducted at the village level (rather than at the health centre), increasing the frequency of supervision, having supervisors listen and respond to the concerns and challenges they faced in a more collaborative manner, and facilitating remote supervision using mobile phones:

"They need to come and visit us in our villages too." **Luke, CHW 7**

"Now they have been supervising us quarterly, but I suggest they do it at least after every two months or whenever we have a problem, instead of just set times." **Dina, CHW 9**

"They [the supervisors] should take time to ask you about the challenges you are facing as a VHT [CHW]." **Tayo, CHW 10**

"Mobile phones also simplify communication. You can briefly call your supervisor and ask them a question for example." **Julia, CHW 4**

Drawing upon these findings was an important part of the reconnaissance phase and helped to inform the design of the blended supervisory model in Phase Two which aimed to incorporate in-person supervision at the village level (e.g. supervisors accompanying the CHWs on home visits) with remote supervision facilitated by mobile phones which helped to support ongoing contact not only between CHWs and their supervisors, but between the collective group of CHWs. This could enable ongoing supervision, rather than a one-off, stand-alone event. I hypothesised that this participatory approach could help make the design and delivery of supervision more responsive to the needs of CHWs and was in keeping with good pedagogical principles of mLearning described by Kearney et al. (2012), being situated and contextually relevant (*see Chapter 2*). For example, by having a component of

supervision in which supervisors accompanied the CHWs on home visits, subsequent learning encounters could be based around cases which the CHWs encountered during their daily practice. This case-based learning approach has been used in the past with other healthcare professionals and has been defined as:

> *"…an inquiry-based pedagogical approach that prepares students for clinical practice through authentic cases to develop their clinical decision-making skills"* (Nunohara et al., 2020)

Supervision using case-based training has previously been well received by CHWs in the USA, with CHWs citing real-life relevance as to why they were particularly satisfied with this style of training (Ferguson et al., 2011). Furthermore, centring supervision around real-world cases has been suggested to encourage interactive dialogue and between learners (Thistlethwaite et al., 2012), in comparison to more tradition didactic forms of learning such as lecture based learning. This is important given the socio-cultural theory of learning I outlined in Chapter 2, which suggests that "*learning is a situated, social endeavour, facilitated and developed through social interactions and conversations between people*" (Kearney et al., 2012:1).

Other features of supervisory design that have been proposed in different contexts include a mixture of individual and group supervision. With appropriate feedback, these mixed-model designs have been shown to yield positive results in terms of CHW motivation and performance (Kok et al., 2018a).

The use of mobile phones to facilitate supervision will be discussed at length in the next section of this chapter (*see Section 6.2.5*). Whilst the use of mobile technologies should not be regarded as a panacea to addressing the complexities and challenges of CHW supervision (*see Information Communication Technology for Development (ICT4D) literature, for example (Heeks, 2020, Vrasidas et al., 2009)*), nor should they replace high quality in-person

supervision, they should be considered as an adjunct to facilitate supervision in this setting, especially since such approaches have been deployed with success in the past (Henry et al., 2016).

6.2.5 The perceived roles and challenges of mobile technologies in facilitating supervision

In this section of Chapter Six, I present and analyse the findings from the interviews with key stakeholders regarding the potential roles and benefits of mobile technologies to facilitate supervision, as well as some of the potential challenges. This was an important area to explore, given that in Phase Three of this study I planned to specifically evaluate the use of mobile technologies to support CHW supervision.

Across both groups of stakeholders, there was a unanimous consensus regarding the technical advantages that mobile technologies could confer, including helping to facilitate and improve communication between supervisors and supervisees by making communication faster, helping individuals to reach multiple people at any given time, reducing the need to travel to in-person supervisory sessions and improving the sharing of information. This is illustrated in the following quotes:

> *"With mobile phones we shall be able to do our work on time since we shall be getting messages faster. When you get the messages faster you get to prepare yourself earlier."* **Josephine, CHW 1**

> *"It [the use of mobile phones] can reduce on transport costs because we do not have to move on a daily basis delivering information and submitting reports to our supervisors."* **Paul, CHW 2**

> *"I may receive the information, but Mariam fails to do so. In that case I can use the mobile phone to contact her. We can basically use it to share information amongst each other about what may be happening."* **Dina, CHW 9**

It was also suggested that the use of mobile phones could help to improve documentation and evidencing of work; a sentiment that was strongly expressed by managerial level

stakeholders, but less so by the CHWs. This perhaps reflected the different priorities from the different groups of stakeholders:

> *"The main benefit I see is you can never get wrong information since they are evidence based. If a VHT [CHW] finds something interesting or relevant to their work, all they have to do is take a photo or record and send to their supervisors"* **Health Facility worker**

> *"…any data that [is] entered in that phone is seen by central point people. So data collected by the VHTs [CHWs], could be easily seen by supervisors"* **District Health Office staff member**

However, potential tensions around the role of mobile technologies to collate data as part of the supervisory process were noted, especially by staff at the District Health Office level, who expressed concerns that data may not be shared with them by partner organisations (e.g. NGOs), which could in turn hinder planning of health activities in the region:

> *"Look we see this a lot. These 'save our souls organisations' come in and think "Ok we are going to help you" … They somehow get the funding. But they what? They bypass the district [The District Health Office]. They have their funding and they think "We will just go do our thing. Our own thing." But then we have no idea what data is being collected. What are you even teaching them? Who are they responsible to? And this is the problem with the NGOs who come in. They think they own the VHTs [CHWs] but in reality, no, those VHTs are Mukono VHTs. They belong to Uganda. So the mobiles are used to collect data, but what good is this data to me if I cannot see it."* **District Health Office staff member**

From a pedagogical perspective, the use of mobile technologies was also perceived as a way to improving ongoing training and learning. However, this potential benefit was expressed by fewer than half of the stakeholders.

> *"With a phone you can discover new diseases and their treatment and share the information with other people. It is important because there are many diseases that keep coming up, but with internet you can get to know about them and how to prevent them."* **Luke, CHW 7**

Yet, despite the envisioned uses and benefits of mobile technologies to facilitate supervision, all stakeholders recognised that this would not be without several challenges.

The most common potential challenge cited by all stakeholders were the technical issues associated with the use of mobile technologies, including issues with charging phones in a region with unreliable access to mains electricity, issues with accessing reliable network coverage, digital literacy and potential challenges with the quality of the phones.

> *"There is a challenge of airtime, sometimes it affects when you have insufficient funds, also another challenge is about charging the phone, we have not had power for a couple of weeks in our area, recently we were given cameras but they also need to be charged, may be if we had some solar panel to help in situations where there is no power even as I speak now the soda that we are taking is warm, it could have been cold from the refrigerator so there is a challenge of power."* **Albert, CHW 8**

To address some of these challenges, CHWs suggested some plausible solutions: they should be supplied with solar chargers or power banks to address issues related to charging the mobile phones, monthly data packages to address the challenges around the cost of data and appropriate training and ongoing support to help them use the mobile phones. These suggestions are illustrated in the quotes below:

> *"The challenge is charging…but again we can get solar panels. Power banks can also help us so if possible, they can give us both a power bank and a solar panel. Now, seriously how can one complain of low battery after that?"* **Luke, CHW 7**

> *"I therefore request they buy for us data even if it's just per month to help us. You see the supervisor may send you photos…but then you fail to access them because you have no money."* **Luke, CHW 7**

> *"Can they use it [the mobile phone] or not? You know with this technology…there is always something to learn. They should make sure they teach us how to use them through a training course."* **Elizabeth, CHW 3**

This feedback influenced the design decisions taken during Phase Two to supply all of the CHWs with a solar charger (*see Chapter 7, Section 7.7 – 'Equipment':210-212*).

From a data accuracy and security viewpoint, stakeholders at both the CHW and managerial level cited several anticipated challenges. These included misinformation (e.g. through inaccurate recording of data), challenges with capturing data on a mobile platform without gaining informed consent from individuals in the community and issues with data privacy on a shared platform. Although these challenges were highlighted by just a small number of stakeholders, they are important to consider given the potential implications they have for acceptability and uptake of the intervention, as well as potential for harm:

> *"Another thing may be using the phone badly, like telling the supervisor things that don't exist…telling lies and contradicting what is on the ground. I think this may be a challenge about using the phone."* **Rosetta, CHW 12**

> *"People may not approve of their photos being taken…someone might refuse the CHW to take their photo and they have that right."* **Health facility worker**

> "*The information that we have collected on our phones must be kept carefully…it requires some confidentiality and privacy because not everyone is supposed to see what is on the phone."* **Rosetta, CHW 12**

To address some of these challenges, CHWs proposed that their supervisors accompany them on home visits to ensure the accuracy of the data they collected, having their own phones and avoiding sharing them with their families or friends (*which was a common practice in the local area when an individual owned a smartphone*), and ensuring that phones were password protected:

> *"I may take photos and send them to the supervisor, but if they are responsible they must still come on the ground to prove because it is possible I may just be taking photos around me without going any further."* **Susan, CHW peer-supervisor 1**

> *"It could be better if we don't share the phones with other people, because they may easily go through the data that is only relevant to the CHWs and the supervisors."* **Rosetta, CHW 12**

> *"Keeping information confidential, especially information got from people in the community. This should be kept safe using passwords because some people are so sensitive about their privacy."* **Samantha, CHW 5**

Again, these points were actioned when designing the supervisory intervention in Phase Two and led to the decision to supply all CHWs with individual, password protected phones. Additionally, during the initial training sessions CHWs were encouraged not to share their phone with family members and shown how to minimise sharing unnecessary patient-identifiable information via the WhatsApp group.

The way mobile technologies were positioned as a potential way to facilitate the work of CHWs was also contentious. For example, some NGO programme managers suggested that the mobile phones were an "investment proposition" which could help to increase the productivity of CHWs as sales agents and should therefore be paid for directly by the CHWs themselves. This is illustrated by the following quote:

> *"So what is the investment proposition? They invest $25, they receive in exchange after they have been qualified a tablet. They will receive five days training including training in how to use a tablet which has two apps – the health app and the product app. They get a total of $70 credit, which they pay back in one year and then only a monthly basis then they get delivered their products."* **NGO manager**

The way in which mobile technologies were conceptualised and framed was also different between and across different groups of stakeholders. Some managerial level stakeholders strongly perceived mobile phones as a tool for accountability and monitoring purposes.

> *"So you can use technology for two purposes…One is for data, the other is for reporting or improving the performance of entrepreneurs [CHWs]…From our business point of view I want to know what is their turnover, what items have been sold, what items have been distributed...how many educational sessions did they organise using apps and how many people have been met with."* **NGO manager**

Indeed, this particular NGO manager stated that he would restrict the use of the phones to work-related activities only. When asked why he would do this, he stated:

> *"Because we don't want them to use this as their own personal device! Then they would do no work!"* **NGO manager**

In contrast, other stakeholders including both managers and CHWs, believed that the phones should be used to their full capacity. For example, some of the CHWs felt that the mobile phones should be unrestricted in order to allow them to access the internet to carry out their own research into certain diseases or conditions they encountered in the community. Similarly, a health facility manager suggested that if the phone was kept unlocked then it would serve as a motivator to the CHWs, based on the experiences of past projects:

> *"WhatsApp, Facebook and Internet…I can use all of these for research. Every time you research it not only helps you as an individual, but everyone else."* **Luke, CHW 7**

> *"I think let it be open. It can act as a motivator. So they'll do this work effectively, rather than the phone to only be for this activity."* **Health Facility Worker**

These opposing sentiments highlight the potential tensions around the deployment of mobile technologies to facilitate CHW training and supervision, and further demonstrate the challenges I faced when co-designing an intervention that would be acceptable to the multiple stakeholders involved in supervision. They also speak to the way in which CHWs are sometimes viewed in the healthcare hierarchy in this setting. For example, the sentiments expressed by the NGO manager in this context might suggest that some managerial level stakeholders feel that CHWs cannot be trusted to use the phones in a responsible manner. This goes back to the way in which supervision is positioned as a means of control and oversight and thus brings into question how elements of 'good supportive supervision' can be enacted within the context of these entrenched viewpoints.

6.3 Strengths and Limitations

As I have already discussed at length in Chapter 2, supervision is an important, but underexplored area of CHW programme design and delivery. This empirical work therefore

helps to shed light on the conceptual and logistical challenges facing CHW supervision in this region of Mukono, Uganda.

My work helps to address the relative paucity of literature which explores the views of multiple key stakeholders regarding the conceptualisation of supervision, as well as supervisory related challenges and perceptions of the use of mobile technologies to facilitate supervision. One of the only previous qualitative studies exploring the views of stakeholders involved in CHW supervision was published in 2012 by Strachan et al. (2012); however, in this study the participants were predominantly from the USA and held senior roles in NGO management, consulting and academia (Strachan et al., 2012). Of the 15 participants in this study, only three were from the East Africa region. My study, on the other hand, involved a range of in-country stakeholders (including CHWs), which is in keeping with the participatory and inclusive approach I took towards my overall research study. My study therefore adds to the small body of existing qualitative research concerning CHW supervision undertaken with in-country participants, such as the study by Ndima et al. (2015), which explored the views of key stakeholders in Mozambique regarding how supervision impacted the motivation of CHWs. This study, like mine, found that supervision was irregular and infrequent and called for an "improved supervision system to enhance [CHW] support and motivation" (Ndima et al., 2015:1).

Despite the relative strengths of this phase of my overall study, it is also important to caveat that my findings are only reflective of one area of Uganda and included a relatively small sample of CHWs supported by one NGO, therefore these results may not necessarily be reflective of the experiences of stakeholders in other countries, or indeed CHWs who are supported by other NGOs in Uganda. Importantly, the supervisory experiences of CHWs in this study were self-reported and only related to volunteer CHWs, rather than paid CHWs. There are several other NGOs responsible for the training and maintenance of CHWs across

the Mukono District, including Living Goods, BRAC and Healthy Entrepreneurs, who provide financial remuneration to the CHWs they supervise. As a result, their experiences of supervision – especially regarding financial recompense - may be different to this cohort of CHWs. For the purpose of my DPhil, I decided only to recruit volunteer CHWs both for logistical reasons (including access) and because this is the current government model of community health delivery. Future work could therefore compare CHW supervision strategies of private NGOs with those of the public sector. There were also other stakeholders who I wished to interview, including stakeholders at the Ugandan MoH; however, due to access reasons I was unable to fulfil this aim.

Another potential limitation of my work was the use of an unvalidated survey at the beginning of this phase to determine supervision frequency and nature of delivery. Although this approach has been used in other settings (Crigler et al., 2011), newer validated tools have been developed to explore the perceived satisfaction CHW supervision which aim to measure supervisory experiences of CHWs (Vallières et al., 2018). My justification for using this particular survey was that I simply wanted to gain a broad and general understanding of how supervision was delivered at that time, before exploring particular issues in more detail through the in-depth interviews.

6.4 Chapter Summary

To summarise, this phase of research enabled me to address RQ1, which was:

How do stakeholders (CHWs, NGO programme managers, health facility workers, and government officials) perceive CHW supervision, including the role of mobile technologies in facilitating supervision?

This is important because few studies to date have conducted an in-depth exploration capturing the views of key stakeholders regarding how supervision for CHWs is

conceptualised, as well as the associated challenges and potential solutions accompanying its delivery. This was an important part of the action research process, which allowed me to explore and reflect on the nature of supervision in order to generate a rich understanding around how supervision could be redesigned in later phases of the project. As MacAteer suggests, the process of action research is about:

> *"…problem posing…continually subjecting practice to critical inquiry, challenging the 'taken for granted' and consciously seeking alternate perspectives as means through which to generate understanding that will bring practical improvements into being"* (McAteer, 2013b:17).

The initial survey I conducted at the start of this phase provided a macro-level overview of the fragmented current state of supervision. Even amongst this relatively small group of 14 CHWs there was no unifying consensus regarding the frequency, duration and model of supervision. This helped lay the foundations for the subsequent in-depth interviews with key stakeholders from which several important findings emerged.

Firstly, there were a diverse range of opinions amongst the stakeholders regarding the conceptualisation and purpose of supervision. Supervision in this context was primarily viewed as a means of monitoring the work of CHWs, which is in keeping with the historical positioning of supervision as a form of managerial oversight which I discussed in Chapter 2 (*see Chapter 2, Section 2.2 – A History of Supervision in Healthcare:41-45*). However, beyond the conceptualisation of supervision as a means of monitoring CHWs work, supervision was also viewed as a way of supporting ongoing training and motivating the CHWs. It is important to note that the underpinning sentiments behind the motivational purposes of supervision varied from supportive, to the avoidance of punishment. It therefore was apparent to me that placing emphasis on the supportive aspects of supervision and the positive sentiments of motivation should be emphasised in the subsequent design and implementation phases, and assessed in the evaluation phase.

There were also a range of opinions regarding the qualities and characteristics of a potential supervisor. This led me to co-design a supervisory model which had several different supervisors who were selected in a participatory manner, rather than nominating one individual as the named supervisor (*see Chapter 7, Section 7.6 - 'Ongoing supervision':208-210*). In terms of supervisory qualities although emphasis was placed on supervisors having technical knowledge and expertise, there was also an emphasis placed on supervisors having cultural awareness and sensitivity to the context they work in, as well as strong interpersonal and communication skills. The importance placed on these latter qualities carries significant implications for the ongoing reformation of the Ugandan CHW programme, which I have already highlighted in Chapter 3 (*see Section 3.5.3 – Challenges facing the CHW programme in Uganda and proposed reforms:87-89*).

Finally, this phase of research allowed me to better understand the specific challenges related to supervision, which built upon the more general challenges raised in the photovoice study described in Chapter 5. This included the need to have a structured model of supervision, in which stakeholders are aware of their roles and responsibilities.

By eliciting the opinions of multiple stakeholders, I was able to highlight the complex nature of CHW supervision in this setting. This not only helped me to gain a better understanding of the current supervisory status-quo, but it enabled me to strengthen my subsequent work in the design (*Phase 2*) and implementation (*Phase 3*) phases. This exploratory research phase (*which was an essential part of the participatory action research cycle (McTaggart, 1991)*) therefore represents an important contribution to the wider literature on CHW supervision and an integral 'grounding' component to the subsequent phases of my overall project.

Through this work, it became clear that supervision cannot be viewed as a vertical, siloed intervention existing in a vacuum, but rather as an intervention within a wider community

health system – a concept which has been suggested by other researchers in the past (Schneider and Lehmann, 2016), but which has not yet been built upon in the wider literature on CHW supervision. Therefore, gaining an insight into these broader challenges helped me to better understand how supervision might occur in this context and consciously give attention to these wider factors in the subsequent design of the supervisory intervention which occurred during Phase Two of study, and is the subject of Chapter 7.

***

Phase of research	**Core concepts of supervision**	**Ways in which it informed the design/evaluation of the subsequent intervention**
Phase One – *In-depth interviews with key stakeholders*	**Current supervisory structure** • There appears to be significant variability in supervisory frequency in this context – *in keeping with findings from Chapter 5*. • There is variability in the style and mode of supervision; however the majority of CHWs state that supervision takes place in an in-person manner only (n=10). • There is variability as to who is considered to be a supervisor.	• Supervisory structures need to be established – *see Chapter 7 for how this was achieved*. • Given the challenges outlined with infrastructural and access issues in the earlier stages of this project, models which offer alternatives to in-person supervision should be explored. • Nomination of supervisors is important.
	Conceptualisation of supervision Supervision was conceptualised as having three main purposes: 1. Monitoring and accountability; this ensuring included quality, patient safety and monitoring work. 2. Motivation; view as both positive (i.e. praise) and negative (i.e. blame avoidance).	• Reframing of supervision may be challenging given the way in which it is viewed as a means of monitoring and accountability; therefore emphasising other more holistic aspects of supervision (e.g. praise, empathy, support) would be important during initial training. • Ensuring supervision includes the provision of real-time and ongoing feedback is important – this was part of the reason for

	3. Ongoing training – the provision of constructive feedback is important.	designing a mobile-facilitated supervisory programme.
	Desired qualities and characteristics of a supervisor • CHWs felt they should play an active role as peer-supervisors. They felt a fellow CHW could best empathise with the challenges they faced. • Suggestions were put forward for a potential network of supervisors e.g. health-facility workers, NGO workers and CHWs. • Desired qualities of a supervisor included: 1. Technical knowledge and expertise 2. Cultural awareness 3. Strong interpersonal skills 4. Communication skills	• These suggestions helped to shape the subsequent design of the supervisory intervention described in Chapter 7 and were an underlying reason for CHWs electing peer-supervisors from amongst themselves.
	Supervisory challenges • Stakeholders highlighted a lack of funding, including NGOs not sharing of supervisory costs with government stakeholders meaning their budgets often did not reflect this cost. • Further challenges around supervisory frequency/design/delivery were highlighted, building upon what I have already documented.	• This highlights the need to ensure government stakeholders are invited to be part of the design process of programmes and influenced my decision to involve the Mukono District Health Office in this study.
	Roles for mHealth to support supervision • Mobile phones were mainly positioned as a means for accountability, improving communication and improving documentation of work; the pedagogical benefits of mobile technologies to support	• This framing of mobile technologies to support supervision is generally in keeping with the existing literature; therefore framing my work through a pedagogical lens is important and novel (see Chapter 9).

	supervision were expressed less strongly. • Challenges raised included technical challenges, data-security issues and information reliability.	• The design phase described in Chapter 7 tries to address some of these challenges.

Table 5 - My evolving understanding of supervision - Summary Table C. This table highlights core concepts regarding my understanding of supervision following the individual interviews in Phase One. I summarise how this emerging and evolving understanding informed the design and evaluation of the subsequent supervisory intervention in Phases Two and Three.

Chapter 7 - Methodology and Findings – Phase Two (January 2019)

7.1 Chapter Overview

In this chapter, I present the methodology and findings from Phase Two of my research project. Phase Two involved two stages:

(i) Initial training of the CHWs on a topic of community importance (*in this case, ear and hearing disease*).

(ii) The design of the mobile-facilitated supervisory intervention.

In terms of the action research cycle, this phase of research broadly fit into the 'Act' stage (see Figure 28 below); however it is important to note that within this stage there were micro-iterations following the feedback obtained from the CHWs, especially around the choice of the mobile-platform to be used in the supervisory process.

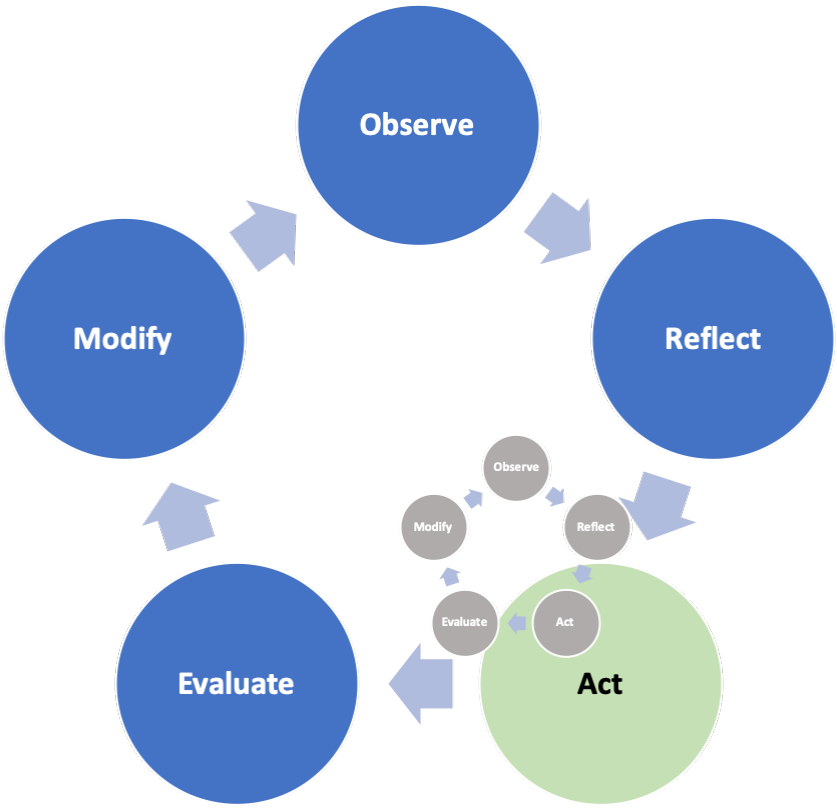


Figure 28 - The positioning of Phase Two within the Action Research Cycle.

7.2 Participants and dates

Phase Two involved all 14 CHWs as primary participants and took place in January 2019.

7.3 Initial training

At the beginning of Phase Two, CHWs were asked to formulate a shortlist of topics for training that interested them and which they considered to be an important disease burden in the local area. Suggestions put forward by the CHWs included diabetes, eye disease, hypertension, mental health, and ear and hearing disease.

For several reasons, the topic of ear and hearing disease was selected as the primary area of focus for training and supervision. First, I had already identified ear and hearing disease as a neglected and poorly understood area of CHW training from a previous review of the literature (O'Donovan et al., 2019b). I therefore tentatively proposed this as a potential area of exploration in my initial ethics submission to the review boards in the UK and Uganda. Second, the reported incidence of ear disease and disabling hearing loss from epidemiological studies conducted in Uganda suggests that this is an important health problem, with an estimated 11.7% of adults and 10.2% of children suffering from disabling hearing loss, much of which is preventable (Westerberg et al., 2008). Third, and most importantly, ear disease had explicitly been identified as an area of concern by the CHWs in the photovoice study in Phase One (*see Chapter 5, Section 5.2.1 - Challenges Identified Through the Use of Photovoice:134-138*) (O'Donovan et al., 2019a).

Following a discussion in which I proposed ear disease as the primary topic of training, the CHWs agreed that this would be a good area of focus for initial training and subsequent supervision. Given financial and human resource limitations, David, Jane and I decided that focussing on several areas of training at this early stage would be unmanageable, since we were the main project administration team who would be dealing with the logistics of the

entire day-to-day running of the study. As a result, the remaining topics identified by the CHWs (*e.g. diabetes and hypertension*) were noted and relayed to the NGO A staff during a subsequent weekly meeting for future training sessions. Following a group discussion with the CHWs, myself and the RAs agreed that during the implementation of the project we would review this decision and, if appropriate, add more training topics based on CHW feedback. This is because we were keen to avoid a 'vertical approach' to programme delivery where possible, but had to balance this with logistical constraints.

At this point, it should be noted that the purists of a CBPR approach may critique how the topic of ear and hearing disease was selected. Critics might argue the community themselves should solely select the topic of research. Indeed, Minkler reflected on this topic in her 2005 paper, where she states:

> *"...it is often the privileged outside researcher who initiates a CBPR project"* (Minkler, 2005:ii5).

However, she goes on to caveat this by stating:

> *"In these instances too, however, a genuine commitment to high-level community involvement in issue selection, with NGOs and formal and informal community leaders engaged as equal partners, can help ensure that the research topic decided upon really is of major concern to the local population"* (Minkler, 2005:ii5).

In this light, I took a pragmatic approach to the selection of the subject, whilst also trying to stay true to the ideals of CBPR by ensuring that the topic was of genuine concern and importance in this setting, as well as engaging stakeholders in the decision-making process.

Having identified the initial topic for training based on an area of community concern and importance, I then began to design an initial training and ongoing supervision programme in a participatory manner. Through existing relationships with The WHO Ear and Hearing Care Division, I was aware of a set of Primary Ear Care Training Manuals. These were initially

designed to facilitate training of primary health workers on basic recognition, treatment, and management of ear disease (World Health Organization Prevention of Blindness and Deafness, 2020). I was therefore able to use this resource as a primary reference source to design the content of the training programme. I also met with the Director of the Division in Geneva in January 2019[36], with the intended aim of engaging with policymakers from an early stage in the project.

Following this positive initial meeting, I secured help from two Ear, Nose and Throat (ENT) surgeons based in the UK and Australia who had experience in training health professionals in LMICs and who agreed to assist in an initial training workshop. I also contacted a Ugandan ENT surgeon, Dr Doreen Nakku, who I had met at a scientific meeting in Europe a year prior to commencing my fieldwork. Dr Nakku expressed a strong interest in the project and recruited two of her junior residents, Dr Nyanzi and Dr Nakasagga, to assist in the training and running of the project. Having the Ugandan ENT surgeons agree to take part in the study was important for local buy-in and the potential for sustainability of the project.

7.4 Design of Initial Training Workshop

The timetable and contents of the training workshop were designed collaboratively by a consortium made up of CHW representatives, NGO staff, ENT experts, myself and the RAs. Before the delivery of the in-person training workshop, an initial plan was circulated via email to individuals in this consortium to elicit initial impressions and feedback. Minor suggestions were made via email regarding the structure of the workshop, ideas for additional content and for how to tailor the training to the local context. Recommendations put forward at this stage included ensuring that the presenters were Ugandan and that the presentations were delivered in Luganda.

[36] https://www.who.int/violence_injury_prevention/about/whos_who/chadha/en/

Following this initial email exchange, the consortium members agreed that an in-person meeting prior to the workshop would be beneficial in helping to finalise the workshop design. Therefore, on Monday 28th January 2019, we met at the NGO A compound. We spent the day editing and rehearsing the presentations and altering them for language, clarity, and content. These were then translated into Luganda and printed handouts were made for distribution the following day.

7.5 Delivery of Initial Training Workshop

The workshop was held in the ART Clinic at Health Centre III A between Tuesday 29th and Thursday 31st of January 2019. Timings of the workshop were chosen based on feedback from CHW representatives. As a result, the workshop started at 9.15 am on all three days, since CHWs had to fetch water and tend to their crops in the early morning *(see Appendices, Appendix Figure 13:400)*.

The content of the workshop covered the basic anatomy of the ear, common problems affecting the ear, an overview of hearing loss (including causes, prevention, diagnosis and treatment options) and several practical procedures such as otoscopy, basic hearing assessments, ear washout, dry mopping and instillation of antibiotic ear drops. CHWs also had the opportunity to see hearing aids and try them on (Figure 29).



Figure 29 - A practical demonstration of hearing aids. An ENT surgeon shows CHWs a set of hearing aids.

Presentations were delivered in Luganda by the Ugandan ENT experts and were projected on a white bed sheet hung on one of the walls of the clinic using a portable micro-projector, which had its own power source (Figure 30).

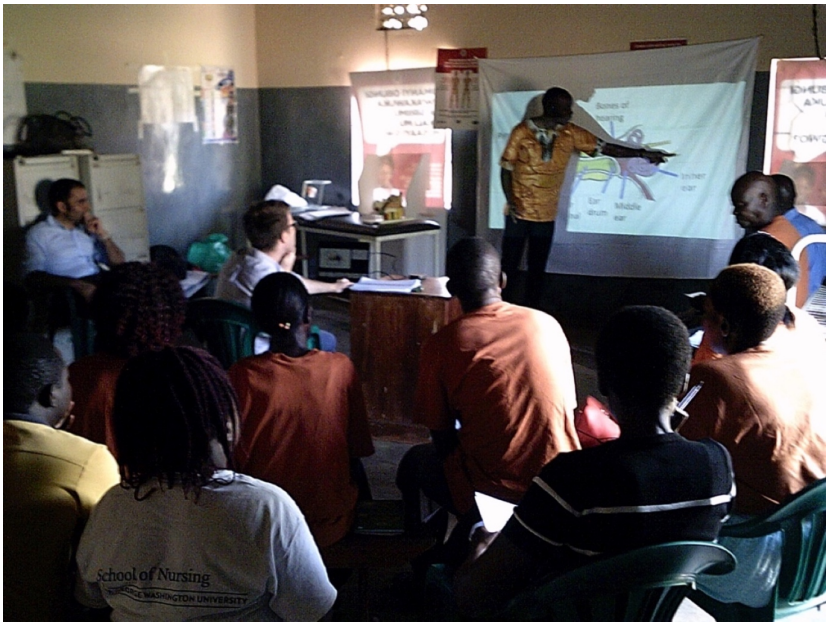


Figure 30 - A workshop presentation. Dr Nyanzi gives a presentation outlining the basic anatomy of the ear. The presentation is projected onto a white sheet hung from the wall of the ART clinic at Health Centre III A.

Presentations were kept to a maximum of 25 minutes based on feedback from the CHW representatives who attended the initial planning workshop. The presentations were interspersed with practical demonstrations and regular breaks to allow CHWs the opportunity to ask questions or clarify any points of uncertainty.

During the practical demonstrations, one of the ENT experts demonstrated the relevant practical procedure which was being discussed to all of the CHWs. CHWs were then divided into groups of three or four to practice with each other (Figure 31). There was one facilitator per group of CHWs (an ENT expert or qualified medical doctor) who would observe the practical sessions and give direct feedback to the CHWs.



Figure 31 - Observing one-to-one practical work. A male CHW practices otoscopy on a female CHW whilst I observe and give direct, in-person feedback.

Day two of the workshop included a session on features of 'good supervision'. This was based on a previously published paper by Henry et al. (2017), which outlined core features of good supportive supervision in the context of healthcare professionals in Uganda (Henry et

al., 2017). As part of this session, CHWs were instructed on the importance of ensuring supervisees were aware of the purpose of supervision and establishing aims in a collaborative manner from the outset. We also discussed concepts of joint problem solving, collaborative learning, constructive feedback and emotional support. CHWs were then divided into groups and given scenarios where they practised giving constructive feedback to each other, handling tensions and conflict and setting mutually agreed learning agendas.

The final day of the workshop was an assessment day, which aimed to assess CHWs' diagnostic and management skills in relation to the topics and practical procedures covered during the first two days of the workshop. CHWs were divided into small groups of three or four and rotated around three Observed Structured Clinical Exam (OSCE) style stations. The stations were as follows:

Station A		**Station B**		**Station C**
Otoscopy	Whispered Hearing Test	Ear washout and dry mopping	Instillation of antibiotic ear drops	Case Management questions

The content for these stations was selected for several reasons. First, the ENT experts felt that the skills assessed were those deemed necessary for basic accurate diagnosis and management in the community of common ear conditions. For this reason, Stations A and B concentrated on four key skills: (i) Otoscopy (*visualising the eardrum*); (ii) Whispered hearing test (*a crude measure that can be used to assess for hearing loss in a community setting without the need for specialist equipment*); (iii) Ear washout and dry mopping (*two low-cost but effective management skills for patients with a chronically discharging ear secondary to Chronic Suppurative Otitis Media (CSOM)*)[37]; and (iv) Instillation of antibiotic drops (*an effective treatment option for patients with CSOM*).

[37] CSOM is a common disorder in LMIC settings and is inflammation of the middle ear, often caused by a bacterial infection, which if left untreated can result in permanent hearing loss. Treatment usually involves washing out the ear with sterile water, applying antibiotic ear drops, and keeping the ear dry and is typically very effective at reducing inflammation and infection and thus preventing hearing loss.

Secondly, the consortium agreed that it was important to assess applied knowledge with clinical reasoning and judgement skills. For this reason, written tests and multiple-choice question tests were deemed inappropriate for this setting. Instead, five cases were developed for Station C. These cases covered core topics based on cases that the CHWs were expected to encounter frequently in the community (e.g. ear wax, acute otitis media, chronic suppurative otitis media, otitis externa and hearing loss) and those which were potentially life-threatening (e.g. mastoiditis or cholesteatoma).

For each station, an ENT specialist was acting as an assessor and, where necessary, a RA to facilitate in translation and respond to any questions from the CHW (Figure 32).
The stations were timed by a central facilitator (20 minutes per station) and CHWs were informed when they had five minutes and one-minute remaining at each station. The assessors received a briefing on how to use the mark schemes prior to use. Each station had 20-marks assigned to it (*see Appendices, Appendix Figure 14:401-404*). The mark schemes were designed using information from the WHO Primary Ear Care Manuals. They were designed to include areas of patient safety, good clinical practice and to ensure basic core skills.



Figure 32 - OSCE style assessment stations. Image A - A female CHW performing otoscopy observed by an ENT specialist in the background. Image B - A male CHW performing dry mopping of the ear using tissue spears.

Five months after this initial assessment, we conducted a repeat assessment. The format for the assessment was identical to the initial post-training assessment and the assessors were the same. This repeat assessment was done in order to understand whether the CHWs had been able to retain the skills acquired during the initial training workshop. Importantly, there was no evidence of decline in mean OSCE scores at the six month repeat assessment across any of the domains.

7.6 Ongoing supervision

In addition to the initial training workshop, the central component of Phase Two was the co-design of a supervisory programme, facilitated by mobile technologies.

One week after the initial training workshop, an informal meeting was held with all 14 CHWs at Health Centre III A. The meeting was facilitated by the RAs, and each CHW was given the opportunity to voice their opinions on how they felt the supervisory programme should be designed, which was in keeping with a participatory research approach. Based on findings from Phase One and from this informal FGD, it was decided by myself, the RAs and the CHWs that we would pilot a blended supervisory approach, combining in-person supervision and remote supervision facilitated by the use of mobile phones.

According to Bersin, blended learning models combine:

> *"different training 'media' (technologies, activities, and types of events) to create an optimum training program for a specific audience. The term 'blended' "means that traditional instructor-led training is being supplemented with other electronic formats"* (Bersin J, 2004:15).

Such approaches have been widely adopted and explored in the field of education. For example, blended learning has been suggested as a way to improve student motivation, improve test scores, and improve student retention rates (Kintu et al., 2017). However,

important consideration needs to be given during the design phase of a blended learning programme in order to maximise success. There have been well-documented challenges relating to the abandonment of technology leading to drop out, lack of peer-support and interaction, and individual challenges such as self-regulation on the part of the learner (Song et al., 2004, Eom et al., 2006, Abou Naaj et al., 2012).

In the context of the supervision of healthcare professionals, blended approaches have been under-explored. For example, only recently were they used in remote parts of Australia with General Practice trainees (Ingham and Fry, 2016). In this setting, it was hypothesised that this blended model of supervision could help to promote the professional development of the trainee through improved resourcefulness, resilience and increased reflective practice (Ingham and Fry, 2016). Conversely, it has been suggested that the lack of face-to-face time might be detrimental for practical skills development and role-modelling (Wearne et al., 2015). Indeed, face-to-face time was especially important in my study, given the need for CHWs to master technical skills related to the provision of ear and hearing care in the community such as otoscopy, ear washouts and dry-mopping.

At the same meeting, CHWs were asked to select peer-supervisors from amongst themselves, since these were not already in place. CHWs were asked to consider factors such as approachability, literacy in technology (since part of their responsibility would be to help other CHWs who were struggling to use their phone), reliability and organisational qualities. Given that all of the CHWs had performed to a passing standard in the OSCE assessments, clinical knowledge and skills were not considered as part of this selection process, particularly as technical questions could be answered and addressed by either the RA or the medical professionals involved in the study. The criteria suggested as part of the peer-supervisor selection process built upon the findings from Phase One (*see Chapter 6; Section*

6.2.3 – 'The desired characteristics and qualities of a supervisor':172) which again was in keeping with the overall participatory approach I took towards my work.

To select peer-supervisors from amongst the CHWs, a democratic vote was held using a majority system to elect one peer-supervisor for the villages of Seeta Nazigo/Makata, and one for Kirujja Butoke/Kavule, with the stipulation that CHWs could not vote for themselves. Each CHW was given one vote and they were asked to write the name of their preferred peer-supervisor on a piece of paper and place this in a box. The two CHWs with the most votes were then elected as the peer-supervisors.

In addition to myself (a trained medical doctor), one of the ENT specialists who was part of the initial training workshop also volunteered to be a supervisor. This ensured there was a level of clinical expertise, which was an important aspect for safe clinical supervision highlighted during my literature review (*see Chapter 2*).

7.7 Equipment

To facilitate the mobile aspect of blended learning approach, all CHWs were all supplied with an iTel A8 smartphone at a cost of 125,000 UGX (≅ £26.50) and a portable solar charger at a cost of 40,000 UGX (≅ £8.40) (Figure 33). I decided to supply all CHWs with a smart phone because I hypothesised that the technical capabilities of the smartphone (i.e. the ability to capture photographs, videos and audio recordings) would lead to richer exchanges of information. Furthermore, there was no way to facilitate large group-based chats on the more basic feature phones which many of the CHWs owned and were familiar with. This meant that peer-to-peer exchanges would have been challenging and more sophisticated learning opportunities might have been lost. The idea of selecting 'an appropriate technology' for CHW training has been addressed by Winters, who suggests that taking a social justice approach to this issue would result in the smartphone being the technology of choice (over a

more basic feature phone). This is guided by the key north-star question, *"What is the highest standard intervention that can be developed?"* (Winters, 2014).



Figure 33 - Smartphone and solar charger. Itel A8 smartphone connected to a solar charged power bank.

This phone was selected since it had all of the key technical features requested by the CHWs, including a camera with video recording capabilities, good reported battery life and a dual SIM-card holder. This model was also selected as it was a relatively low-cost smartphone and the project had financial constraints. All phones were housed within a protective case and had screen protectors in order to minimise risk of damage. A solar-powered charger was also provided because the CHWs requested this during the initial consultation process, since many CHWs did not have mains electricity supplies in their home. In addition, all CHWs were supplied with 10GB of data each quarter. The cost of data varied depending on the carrier (MTN or AirTel), however it ranged between 72,000 and 78,000 UGX (≅ £15-16.50) per CHW, per quarter. The CHWs came to a collective decision that the provision of data was important in order to avoid out-of-pocket-payments for work-related duties. This is important to note because a previous study conducted with CHWs in Ghana found that CHWs based in

rural areas were using their own phones at significant personal cost to fulfil duties related to their roles as CHWs, such as making referrals, checking up on patients in the community and sending messages regarding logistical information (Hampshire et al., 2017). In addition, it was necessary to pay Over-the-Top-Tax (OTT), a tax levied by the Ugandan government for mobile phone users to access social media[38]. This is because WhatsApp - the mobile-app that was selected to facilitate supervision - falls under the classification of a social media app. OTT was paid for all CHWs for the duration of the project at the flat cost of 18,000 UGX (≅ £3.75), per CHW, per quarter and was paid using my research grant money.

In addition to the mobile phones and solar chargers, I also supplied CHWs with several additional pieces of equipment to help facilitate their work in delivering primary ear and hearing care services in the community. This equipment was selected based on feedback received from the photovoice study in Phase One (*see Chapter 5*). It included t-shirts, backpacks, umbrellas, gumboots and record books, as well as diagnostic and treatment equipment (e.g. a low-cost otoscope). The full details of the otoscopes used can be found in the Appendices (*see Appendix Figure 15:405-406*). CHWs were also supplied with a small monthly stipend of 20,000 UGX (≅ £4.20 GBP) to facilitate work-related transport (e.g. travelling to and from patients' homes).

7.8 Digital literacy training

CHWs were given their phones at the health centre in mid-January following the initial training workshop. A three-day training programme was organised by myself and the RAs. Each training day lasted between three to four hours and CHWs were divided into three groups. Each group contained a CHW who had their own personal smartphone (which allowed them to provide support and troubleshoot basic issues for their peers) and was

[38] https://www.dw.com/en/uganda-one-year-of-social-media-tax/a-49672632

facilitated by a project coordinator. At the first workshop held on a Monday, CHWs were instructed on how to use the basic features of the phone such as turning the phone on and off, adjusting the volume of the phone, creating a password (for data security purposes), locking and unlocking the phone, and familiarising themselves with the layout of the phone, as well as the sensation of 'swiping' and not having keys to press. CHWs kept the phone and returned for a second workshop during the same week. At this second workshop the first hour was spent troubleshooting any problems, before training CHWs on the more advanced features of the phone, e.g. recording videos, taking photographs, recording voice notes. The third training workshop was held on a Friday and CHWs took turns practising sending messages to each other and using the phones together. CHWs who were unsure about how to use the phone after these initial three workshops were invited to schedule a time for an individual training session.

This initial training workshop was important, given that previous studies have commented on the relatively low technical literacy of rural health workers in sub-Saharan Africa (Sukums et al., 2014). Ensuring that participants feel comfortable navigating the technology is an important factor in the acceptability of digital interventions (Agarwal et al., 2000), and without it can lead to non-adoption of the mobile intervention (Greenhalgh et al., 2017).

7.9 Digital supervision platform

At the outset of my DPhil, I initially intended to customise an existing App with input from the CHWs to facilitate supportive supervision. This App was Forward™ - a secure instant messaging App designed to improve communication between clinical teams working in the UK National Health Service (NHS). Unfortunately, however, I was informed in December 2018 that Forward™ would no longer be able to offer this service. Instead, they offered me use of the existing App, with the English interface; however, I was aware from CHW

feedback that they felt their command of English was not good enough to navigate the App's complex interface. Furthermore, although the CHWs were fluent in spoken Luganda, many were unable to write, and much of the Forward™ interface relied on users being able to write in order type messages. The concept of imported interfaces being used to support supervision has been critiqued in the wider literature regarding digitally-enabled education projects (*see, for example, (Unwin and Unwin, 2009, Hakimi, 2015)*). Similarly, the existing literature on mHealth interventions for CHW supervision strongly encourages the active participation of CHWs in the intervention design:

> *"When introducing new technologies it is important to consult CHWs on the most appropriate ways in which to implement them as they will be in the best position to adapt technology to the local community"* (Strachan et al., 2012:116).

A decision was therefore made early on in Phase Two by myself, the RAs and the CHWs not to pursue this option further and instead to explore alternative solutions. This was in keeping with the overall PAR approach I took, which requires the researcher to be responsive to change, adaptive and to work in partnership with stakeholders (Baum et al., 2006).

As a result, several different existing Apps were shortlisted based on relevance to the project and the potential to be customised. A period of in-depth consultation and software trilling was held during Phase Two of the study in January 2019. This co-design phase of the study helped to ensure that the software selected to facilitate supervision was decided in a collaborative, participant-led manner.

The first App to be trialled was Padlet™.[39] Padlet™ is an online interactive space, which has been used in school settings in the UK and USA for several years. The concept is similar to asking students to write on sticky notes and stick these on a wall – expect Padlet™ is a virtual

[39] https://padlet.com/

space to facilitate this collaborative activity. Learners log in to a virtual space via an App on their phone and are then able to share notes, audio files, videos and images to a centralised virtual wall (Fuchs, 2014). Users can see each other's posts and use the shared virtual space to create arrows called connectors between linked posts (Figure 34).



Figure 34 – An example of a virtual shared learning space on Padlet™.

Due to the ability for CHWs to see and comment on their peers' contributions in real-time, we initially hypothesised that the Padlet™ platform might be a good online space for CHWs to facilitate supervisory activities and encourage peer-to-peer exchanges. We also hypothesised that the social nature of interactions would in turn motivate learners which has been demonstrated in previous studies utilising digital platforms which support group learning (DeWitt et al., 2014). It also allows the learner to anonymise their posts. This was appealing in this particular setting where CHWs might be anxious about giving an incorrect answer in front of their peers. It was also a 'group space' (vs. private one-to-one individual messaging) and so from an evaluation perspective it would easily allow me to view and download exchanges for analysis purposes. Furthermore, from a technical perspective, the

App saved historical exchanges, allowing learners to refer back to them at a later date if desired.

Padlet™ was therefore installed onto all of the CHWs' phones over a two-day period and a training session was held over a three-day period at Health Centre III A and the end of January 2019. The CHWs then used Padlet™ for a week before reconvening at the health centre for a group meeting, of which the primary purpose was to hear CHWs' opinions on the App. In this meeting, the CHWs were generally opposed to the App. From a technical standpoint, it was large (60MB) and significantly slowed down the speed of the phone. CHWs also voiced a preference for the ability to send voice messages since many of them were either unable to write in Luganda, or found it difficult to use small touchscreen keyboards to type messages. Recording voice messages on Padlet™ required several steps which the CHWs found cumbersome. From a usability standpoint, the CHWs found the App to be glitchy and did not follow basic rules of user-friendly design. The App also crashed on several of the CHWs' phones and also required them all to set up email accounts. Finally, from a pragmatic viewpoint the App was costly, costing over £400 GBP for a 6-month subscription for 14 CHWs.

After this unsuccessful trial period with Padlet™, in keeping with principles of participatory research, I convened another meeting at the health centre. During the meeting, several suggestions were raised ranging from stopping using Apps altogether and relying on voice calls instead, to reverting to using basic non-smartphones. Ultimately these suggestions proved unpopular with the majority CHWs and three of the CHWs who owned smartphones suggested that we should trial the use of WhatsApp™.

WhatsApp is a publicly available instant messaging App which is free to download. It allows users to exchange text, voice and multimedia messages in real-time, providing they have an

internet connection (Dove J, 2020). As of 2020, it is the most popular messaging App in sub-Saharan Africa and has an estimated 2 billion users globally (Vogt, 2020). A key feature of WhatsApp is that it allows users to create and participate in group chats – an important component of mLearning underpinned by socio-cultural learning theory. It also allows users to record and send voice-notes, which is especially beneficial to illiterate users.

WhatsApp has previously been used in healthcare-related projects in sub-Saharan Africa (Awotiwon et al., 2018), including the support the supervision of CHWs (Vu Henry et al., 2016, Pimmer et al., 2017). More recently, during the current COVID-19 pandemic, I reported on the use of WhatsApp to support cross-continental collaboration between CHWs in Ghana and Uganda to share best practices regarding COVID-19 prevention strategies (O'Donovan et al., 2020a). The enormous reach of WhatsApp, as well as the capabilities it infers, makes it an attractive platform to investigate further for supervision of CHWs.

However, the use of WhatsApp to support healthcare delivery is not without its challenges. In the UK, concerns have been raised about the use of WhatsApp in clinical settings due to data security issues (Thomas, 2018) (*an issue I discuss in relation to this project in Chapter 9*). Furthermore, there are risks of mis- and dis-information given the nature of largely unregulated multi-user group messaging. There are also equity-related challenges, given that WhatsApp requires the individual to own a smartphone. It has been documented that individuals living in rural areas within LMICs are less likely to data-enabled smartphones and so are potentially in danger of being excluded from such interventions (Seebregts et al., 2018), unless this is addressed during the programme design phase.

Bearing these potential challenges in mind, a group decision was made to select WhatsApp as the tool through which to facilitate the mobile component of the blended supervisory

programme, which I describe in detail in the next subsection of this chapter – '7.10 - Supervisory Design'.

7.10 Supervisory Design

Based on feedback from CHWs, a blended supervisory model was designed combining (a) in-person supervision in the form of accompanied home visits, with (b) remote mHealth-facilitated supervision using WhatsApp. For the purpose of my DPhil I focus predominantly on evaluating the mHealth component of the supervisory intervention; however, an understanding of the process of the in-person supervisory sessions is helpful since the outcomes of these helped inform the mHealth facilitated component of the programme.

(a) In-person supervision

The first aspect of the blended-model of supervision was to have in-person supervisory support. CHWs were therefore encouraged to carry out home visits with their peer-supervisor (Figure 35 and Figure 36).



Figure 35 - A male CHW peer-supervisor (black shirt) supervises a male CHW (orange t-shirt) on a home visit.



Figure 36 - A female CHW peer-supervisor (plaid shirt) observes a male CHW (orange t-shirt) on a home visit.

The content of these supervisory exchanges focussed mainly on the delivery of primary ear and hearing care services in the community (however other issues relevant to the CHWs work-related duties were also covered during these sessions). I describe herein how this took place to help the reader better understand the nature of the CHWs' practice.

CHWs were encouraged to visit the households they were responsible for, in order to assess individuals for ear disease and hearing loss. Initially, I envisioned that the CHWs would visit every household in a systematic manner and screen every household member. However, it soon became apparent that this method was not only extremely time-consuming (since some households were densely populated) but, also, there were a significant number of symptomatic patients who needed to be attended to urgently. As such, a collaborative decision was made by the research team and the CHWs for them to go door-to-door systematically, but instead of screening every person in the household, they would ask a basic

screening question to the head of the household, or adult member of the household, which was:

"Does anyone in this house have problems with their ears or difficulty hearing?"

For any positive responses to this initial screening question, CHWs would then explain the aims of the project to the individual concerned. Where possible, this was done in the presence of the head of the household as per local custom. The CHW read the project information sheet to the individual (and where possible head of household), explaining the aims of the project and that participation was entirely voluntary (Figure 37; Photo A) (*see Appendices, Appendix Figure 16:407-411*). The individual was then asked to sign a consent form agreeing to participate in the study (*see Appendices, Appendix Figure 17:412-413*). Where the individual was unable to write, their thumbprint was used instead (Figure 37; Photo B). The CHW then began the assessment by taking a basic clinical history (Figure 37; Photo C). They asked for basic demographic information, such as the age of the patient, before inquiring which ear was affected (left, right, or both). The CHW then asked six basic questions regarding symptoms that the individual might be experiencing. These were, "*Do you have any (i) hearing loss, (ii) ear discharge, (iii) ear pain, (iv) dizziness, (v) itching, or (vi) tinnitus*[40]?"

The CHW then performed a clinical examination of the ear. This involved inspecting the outer ear for signs such as redness, swellings or discharge, before using the Arclight™ to inspect the ear canal and tympanic membrane for pathological signs, such as a perforation (Figure 37; Photo D). The CHW concluded their formal assessment by performing a whispered hearing test on both ears to screen for hearing loss (Figure 37; Photo E) before coming up with a diagnosis. If necessary, the CHW would do one of the following:

[40] A 'ringing' sensation in the ears.

(i) For benign cases, offer treatment to the patient in their home and conduct their own follow-up if necessary (Figure 37; Photo F) (*e.g. placement of olive oil drops and an ear wash out with sterile water for impacted ear wax causing a mild hearing loss*);

(ii) For non-benign 'simple cases', give some initial treatment and advise follow up at the health centre (*e.g. perform a washout and dry mopping of the ear with sterile water and iodine solution and refer to the health centre for review by a medically trained clinical officer and the prescription of antibiotic ear drops for CSOM*);

(iii) For non-benign, complex cases, simply make a direct referral to either the health centre or an 'ear-camp' for review by a medical specialist. CHWs were also advised they should refer any cases they were uncertain about. I will discuss the exact nature of the referral pathways in detail in Chapter 9, since this was an important outcome of Phase Three of my research.



Figure 37 - A CHW conducting a community outreach visit. A series of images depicting a CHW delivering care in the community on a home visit observed by their peer-supervisor. (A) Explaining the project to a community member; (B) Obtaining consent with a thumbprint on consent forms in English and Luganda; (C) Taking a history from the community member; (D) Performing otoscopy; (E) Performing a Whispered Hearing Test; (F) Instructing a family member how to administer olive oil drops for impacted wax.

All of this information regarding the clinical assessment was recorded in the CHWs' record book, which had three identical carbon-copy sheets (*see Appendices, Appendix Figure 18:414*). One copy remained in the record book with the CHW, one copy was submitted to the health centre for the project team to collect, and one copy was given to the patient.

Some CHWs also created informal groups where they would meet in groups of two or three and visit a patient's home, observing each other's practice. Initially, the nature, frequency and type of supervision was not dictated to the CHWs, but were left to unfold naturally as the project evolved.

(b) mHealth facilitated supervision

Two groups were established on the WhatsApp platform. All of the CHWs were part of the groups and they were moderated by the project facilitators (*David and Jane*). The two WhatsApp groups had different purposes, outlined here:

Group A was referred to as the 'Logistics Group'. The primary purpose of this group was to share logistical information (*for example, coordinating meetings and informing CHWs of training sessions*) sending greetings, and any other miscellaneous tasks.

Group B was referred to as the 'Case Study Group' and was specifically designed to share clinical cases on a bi-monthly basis. As such, it was initially intended to be a more formal learning space. The use of clinical cases to facilitate learning is termed "case-based learning" (McLean, 2016), and has been widely used in the field of medical education. The most commonly accepted definition of case-based-learning is:

> *"…to prepare [individuals] for clinical practice, through the use of authentic clinical cases. It links theory to practice, through the application of knowledge to the cases, using inquiry-based learning methods."* (Thistlethwaite et al., 2012)

During the mid-point of Phase Three, CHWs were asked to give their own definitions regarding the purposes of the 'Case Study Group' and one of the CHWs described it "*like a classroom where they [the study facilitators] get to ask us questions and we reply*." For a more detailed explanation of the 'Case Study Group' (including the content of cases), please refer to section 8.3 – pages 227-229.

***

Overall, Phase Two can be considered the "Act" phase of the PAR cycle. By the end of this phase I had collaboratively designed a training programme and established a supervisory initiative for the CHWs. This process involved drawing upon important findings from Phase One to help inform the design and proposed nature of the supervisory intervention. Overall, this phase of my project involved essential foundational work which had to be undertaken before evaluating the programme in Phase Three; the methodology of which I describe in Chapter 8 and the results in Chapter 9.

Chapter 8 – Methodology – Phase Three (February-July 2019)

8.1 Chapter Overview

Phase Three involved a longitudinal evaluation of the mobile-facilitated supervisory programme. The content of supervision was primarily centred around the detection and management of cases of ear disease and hearing loss in the community. During this phase I specifically sought to answer RQ2:

What are the effects of using an mHealth intervention, as part of a blended supervision programme, on the nature of CHW supervision?

In terms of the overall project, Phase Three was a period of 'Evaluation' and 'Modification' of the supervisory programme, with multiple iterative-phases informing implementation which was in keeping with the general action research philosophy underpinning the project (Figure 38). In this chapter I describe the methodology of this phase.

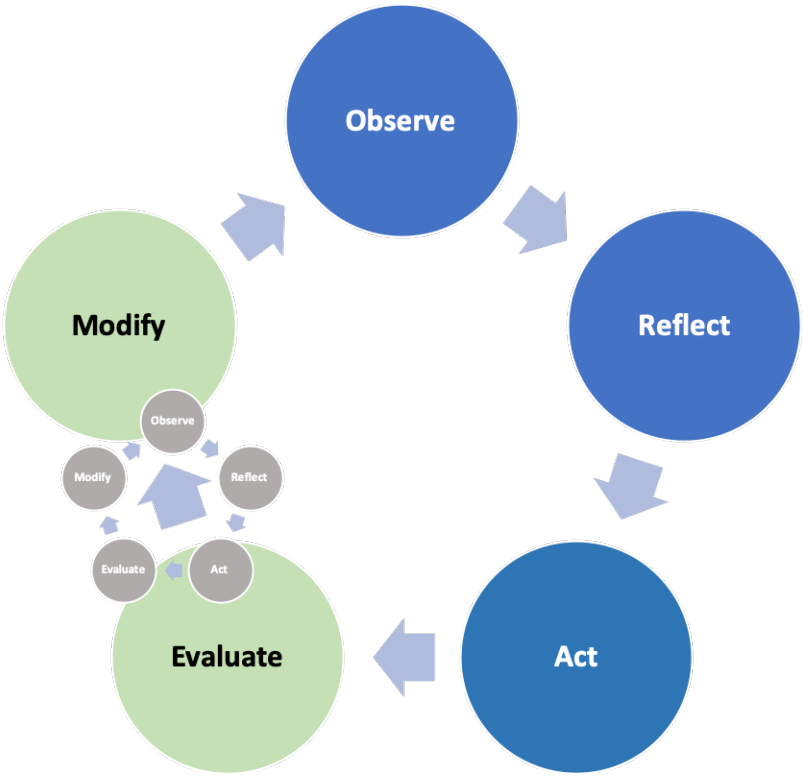


Figure 38 - The positioning of Phase Three within the Action Research Cycle.

8.2 Participants and dates

This stage involved 13 CHWs as primary participants and took place over six months between 1st of February and 12th of July 2019. Unfortunately Tayo (CHW 10) was arrested in January 2019 and held at Mukono jail for several months and was therefore unable to take part in this phase of the study.

8.3 Format of mHealth facilitated supervision during Phase Three

A total of nine 'learning cases' related to ear disease and hearing loss were released via WhatsApp on the 'Case Study Group' over a six-month period, on a bi-monthly basis. There were also three additional cases developed based on direct requests elicited from the CHWs, which focussed on malaria, diarrhoea, and malnutrition. In keeping with the participatory nature of the project, these cases were selected based on issues CHWs commonly encountered in the community and those on which they requested to receive more training. For a full list of cases released over the six-month duration of Phase Three, please refer to Table 6 below.

Month	Case A	Case B
February 2019	**Chronic Suppurative Otitis Media (CSOM)** Based on core cases in WHO manual	**Cholesteatoma** Based on a request from CHWs
March 2019	**Wax** Based on data collected	**Hearing loss** Based on a request from CHWs
April 2019	**Itching ears** Based on a request from CHWs	**Photo cases, including: post-auricular fistula, otitis externa, microtia and skin tags, pre-auricular sinus** Based on data collected
May 2019	**General case unrelated to ear or hearing care** Malaria	**Acute Otitis Media and Mastoiditis** Based on core cases in WHO manual

June 2019	**General case unrelated to ear or hearing care** Diarrhoea	**General case unrelated to ear or hearing care** Malnutrition
July 2019	**Infected pre-auricular sinus** Based on data collected	**Fungal ear infection** Based on data collected

Table 6 - Cases for bi-monthly supervision via the WhatsApp group.

Content for the case studies was developed through a combination of utilising the data collected in the community by the CHWs (to ensure all common cases were covered), obtaining feedback from the CHWs regarding areas about which they wished to learn more, and 'red flag' cases deemed important for recognition and safe management e.g. cholesteatoma or mastoiditis.

The theoretical aspects of the cases were developed using the WHO Primary Ear Care Training Manuals (World Health Organization Prevention of Blindness and Deafness, 2020). They were checked by two medically qualified professionals for accuracy prior to release.

The cases lasted from Monday through to Friday and was typically divided into five sections. The case vignette and question were released at 7am in the morning and CHWs were given 24 hours to provide their answer. The following morning one of the RAs (Jane) released the second part of the case and provided individual feedback to each CHW regarding their answer.

Allowing 24 hours for the CHWs to respond to the case was important since many CHWs were busy with work during the day and would typically reply to the case in the evening.

The frequency and duration of case studies was determined following a group meeting at the start of the programme. CHWs were also consulted throughout the project regarding the frequency of messaging and as a group voted to keep the bi-monthly format due to risk of information overload.

The messages were sent in text format in the local language. The majority of CHWs preferred to reply using the voice message feature rather than text, for reasons which I will explain in detail in Chapter 9.

Over the course of Phase Three, CHWs also continued to use Group A (the Logistics Group) to exchange messages of a logistical nature.

8.4 Evaluation of Phase Three

In order to understand how the use of mobile technologies within the blended approach impacted on the nature of CHW supervision, I used the following methods to evaluate Phase Three:

(i) Mid-phase FGDs
(ii) An evaluation of the WhatsApp supervisory platform
(iii) Individual interviews with CHWs

In the following sections, I outline the reasons for selecting each of these methods, as well as the method itself and data analysis techniques.

8.4.1 Mid-point FGDs

i. Background to selection of FGDs

A CBPR approach towards research emphasises that participants should be involved at every stage of the research process (Spears Johnson et al., 2016). FGDs were initially deployed in the 1920s with the aim of moving away from an interview-dominated research approach and are thus well suited to a more participatory approach (Ratnapalan and Hilliard, 2002). Characteristics of FGDs involve bringing together multiple people in a moderated group to explore their attitudes around the central focus of an idea, product or topic (Leung and

Savithiri, 2009). Unlike in group interviews, the person undertaking the role of moderator does not ask direct questions to each participant in turn, but rather encourages the participants to interact with each other regarding a topic of interest (Wilkinson, 2016). These participant interactions are an integral characteristic of FGDs.

FGDs have been used in previous studies exploring community health promotion, either as part of the process in developing interventions, or to help guide different approaches (Bogart and Uyeda, 2009, Cristancho et al., 2008). In the context of my research, I felt they were an appropriate technique to use at this stage in the study since I wanted to gain a better understanding of CHWs' collective experiences of the mobile technology facilitated supervisory programme and understand how the design of the programmes could be modified to enhance the CHWs' experience of supervision. I hypothesised that the interactive nature of discussions would mean participants would build on each other's answers and responses, allowing me to gain a deeper understanding of their perceptions. At this point in the project the CHWs had also been working together on the project for over seven months and were more familiar with the research team. I therefore hypothesised that this group method might be more likely to yield important insights, compared to at the beginning of the study (e.g. during Phase One) when there may have been greater levels of distrust and an unwillingness to speak openly in a group setting.

I was also aware however, that FGDs are not without their challenges and limitations. For example, it is important that all participants have an equal opportunity to speak so that the voices and viewpoints of certain individuals are not prioritised over others. Similarly, the richness of information from a FGD is often dependent on the ability of the moderator to facilitate a group discussion in an open and exploratory manner. For these reasons it was important that I designed the FGD in a way that explicitly aimed to address these potential

concerns. I also supplemented the findings from the FGD with individual interviews, which I will describe in a subsequent section of this chapter.

ii. FGD design and structure

CHWs were notified about the FGDs via WhatsApp and were given three potential dates on which the FGDs could take place. As a group, they were asked to come to a decision on a date that all CHWs were able to attend, which was then relayed to the research team by one of the CHW peer-supervisors. Once a date had been fixed (*2nd of May 2019*), I contacted the manager of Health Centre III A to notify her that we would be holding FGDs at the Youth Corner of the health centre. This date represented the approximate midpoint of the study and was therefore deemed to be a good time to conduct a formal reflective exercise, in order to make any necessary modifications to the programme based on CHW feedback.

Based on previous recommendations from the literature, we divided CHWs into groups of between four and five CHWs (Morgan, 1988, Kitzinger, 1995). The CHWs were assigned to groups based on my and the RA's knowledge of the interpersonal relationships between the CHWs (in order to avoid tensions between CHWs), to encourage a mixture of personalities, and to avoid having a CHW peer-supervisor in the same group as the CHWs they supervised, so that CHWs felt able to speak openly about their experiences of supervision thus far.

All of the focus groups took place on the same day and two hours were allocated to each group. The purpose of the FGDs was explained prior to commencing the discussion. I created a FGD guide in partnership with David and Jane, which had been amended in an iterative fashion through a series of discussions held a week prior to the FGDs. This was in keeping with the participatory approach towards my work and the inclusive nature of data-collection tool design.

Audio recordings of the FGDs were made using a digital voice recorder, as well as a back-up recording on one of the RA's smartphones in case any subsequent faults or issues transpired with the digital recorder (Figure 39). CHWs were provided with a transport refund of 3000 UGX (≅ £0.65 GBP) and a small cake and drink as refreshment. I was not present during the FGDs since I was aware that my presence might result in CHWs feeling obliged to give answers they thought I might want to hear (Mwambari, 2019).



Figure 39 – A FGD at Health Centre III A. A group of CHWs at the Youth Development Corner taking part in a mid-point evaluation FGD, led by David and Jane.

iii. Analysis of FGD data

Within 48 hours of completing the FGDs, the audio-recordings were translated and transcribed by Jane into a Microsoft Word document. The transcripts were then checked against the original recording by David to check for accuracy of translation and to ensure no meanings had been lost in this process. I then reviewed the final transcript. For any areas of

ambiguity, I consulted David or Jane in the first instance; however, where they were not able to clarify the information, or in instances where I felt it lacked detail, I made a note on the transcript and Jane clarified the point with the CHW in a follow up meeting. Final transcripts were loaded into NVivo and I conducted a thematic analysis based on the justifications already articulated in Chapter 4 (*see Section 4.4.5 – 'Data Analysis':130*).

The findings of these FGDs helped to inform the modification of the programme for the remaining three months of evaluation.

8.4.2 WhatsApp Messages

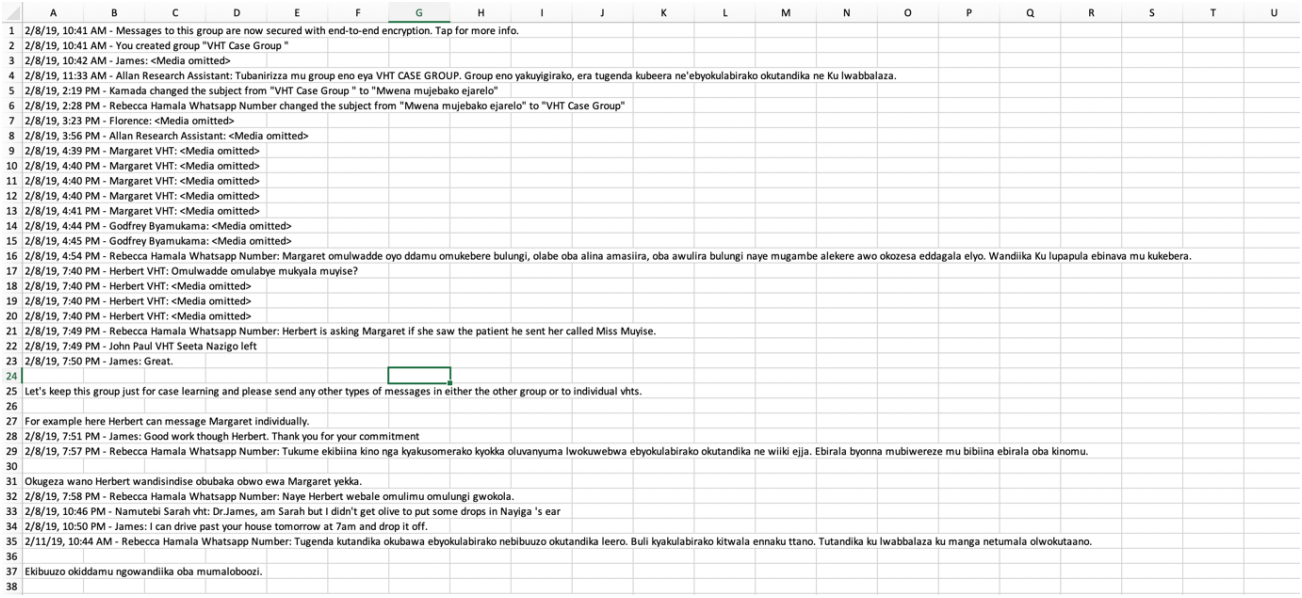
In order to answer RQ2, *"What are the effects of using an mHealth intervention, as part of a blended supervision programme, on the nature of CHW supervision?"* I conducted an analysis of message exchanges between CHWs and their supervisors on a WhatsApp platform.

i. Justification

Previous work by Vu Henry et al. (2016) and Pimmer et al. (2017) has explored the use of WhatsApp to facilitate supportive supervision amongst CHWs in Kenya and Malawi (Pimmer et al., 2017, Vu Henry et al., 2016). However, this work has only conducted relatively simplistic analyses of messages; for example, analysing the frequency of messages or exploring the basic content of messages. What has not been explored in the literature to date is a detailed analysis of messages within mobile-based instant message groups based on the nature of supervisory messages, the participants in message exchanges, and a pedagogical analysis of messages in order to better understand the *nature* of supervision that mHealth interventions help to facilitate. I therefore wanted to address this gap in the existing literature.

ii. Sorting and organising of messages

At the end of each week I downloaded the WhatsApp messages to my computer from my phone by creating a .txt file. I then exported this file via email to my laptop and opened it in a Microsoft Excel document. Messages would appear in one single column (Figure 40).



	A
1	2/8/19, 10:41 AM - Messages to this group are now secured with end-to-end encryption. Tap for more info.
2	2/8/19, 10:41 AM - You created group "VHT Case Group "
3	2/8/19, 10:42 AM - James: <Media omitted>
4	2/8/19, 11:33 AM - Allan Research Assistant: Tubanirizza mu group eno eya VHT CASE GROUP. Group eno yakuyigirako, era tugenda kubeera ne'ebyokulabirako okutandika ne Ku lwabbalaza.
5	2/8/19, 2:19 PM - Kamada changed the subject from "VHT Case Group " to "Mwena mujebako ejarelo"
6	2/8/19, 2:28 PM - Rebecca Hamala Whatsapp Number changed the subject from "Mwena mujebako ejarelo" to "VHT Case Group"
7	2/8/19, 3:23 PM - Florence: <Media omitted>
8	2/8/19, 3:56 PM - Allan Research Assistant: <Media omitted>
9	2/8/19, 4:39 PM - Margaret VHT: <Media omitted>
10	2/8/19, 4:40 PM - Margaret VHT: <Media omitted>
11	2/8/19, 4:40 PM - Margaret VHT: <Media omitted>
12	2/8/19, 4:40 PM - Margaret VHT: <Media omitted>
13	2/8/19, 4:41 PM - Margaret VHT: <Media omitted>
14	2/8/19, 4:44 PM - Godfrey Byamukama: <Media omitted>
15	2/8/19, 4:45 PM - Godfrey Byamukama: <Media omitted>
16	2/8/19, 4:54 PM - Rebecca Hamala Whatsapp Number: Margaret omulwadde oyo ddamu omukebere bulungi, olabe oba alina amasiira, oba awulira bulungi naye mugambe alekere awo okozesa eddagala elyo. Wandiika Ku lupapula ebinava mu kukebera.
17	2/8/19, 7:40 PM - Herbert VHT: Omulwadde omulabye mukyala muyise?
18	2/8/19, 7:40 PM - Herbert VHT: <Media omitted>
19	2/8/19, 7:40 PM - Herbert VHT: <Media omitted>
20	2/8/19, 7:40 PM - Herbert VHT: <Media omitted>
21	2/8/19, 7:49 PM - Rebecca Hamala Whatsapp Number: Herbert is asking Margaret if she saw the patient he sent her called Miss Muyise.
22	2/8/19, 7:49 PM - John Paul VHT Seeta Nazigo left
23	2/8/19, 7:50 PM - James: Great.
24	
25	Let's keep this group just for case learning and please send any other types of messages in either the other group or to individual vhts.
26	
27	For example here Herbert can message Margaret individually.
28	2/8/19, 7:51 PM - James: Good work though Herbert. Thank you for your commitment
29	2/8/19, 7:57 PM - Rebecca Hamala Whatsapp Number: Tukume ekibiina kino nga kyakusomerako kyokka oluvanyuma lwokuwebwa ebyokulabirako okutandika ne wiiki ejja. Ebirala byonna mubiwereze mu bibiina ebirala oba kinomu.
30	
31	Okugeza wano Herbert wandisindise obubaka obwo ewa Margaret yekka.
32	2/8/19, 7:58 PM - Rebecca Hamala Whatsapp Number: Naye Herbert webale omulimu omulungi gwokola.
33	2/8/19, 10:46 PM - Namutebi Sarah vht: Dr.James, am Sarah but I didn't get olive to put some drops in Nayiga 's ear
34	2/8/19, 10:50 PM - James: I can drive past your house tomorrow at 7am and drop it off.
35	2/11/19, 10:44 AM - Rebecca Hamala Whatsapp Number: Tugenda kutandika okubawa ebyokulabirako nebibuuzo okutandika leero. Buli kyakulabirako kitwala ennaku ttano. Tutandika ku lwabbalaza ku manga netumala olwokutaano.
36	
37	Ekibuuzo okiddamu ngowandiika oba mumaloboozi.
38	

Figure 40 - Unsorted WhatsApp data file in Microsoft Excel.

I began by manually arranging the messages into columns, based on the date and time they were sent, the sender, the target recipient, the message file type and the message itself. Unfortunately, where the file type was a media file (e.g. a photograph, a voice-note, or a video) this was not specified and simply appeared as '<*Media Omitted*>'. I therefore manually coded each message for file type in turn (e.g. text/photograph/video/voice note etc.) by referring back to the original WhatsApp group.

Each message was read in turn. Where messages contained personal identifiers (e.g. names of individuals), these were modified to preserve anonymity and each sender was given a unique identifier tag e.g. CHW 1/CHW 2/ CHW 3 etc.

For message files that were voice notes, I worked with David to carry out an initial translation for each message. David and I sat down each evening to translate the messages from that day. The following morning, I would repeat this process with Jane to ensure

accuracy of translation. This was not possible over the weekend periods, so on Monday mornings we would translate all of the messages that had been sent on Saturdays and Sundays.

At the end of this process I went through the entire file to ensure the entries in the 'sender' column were accurate. I then attached a unique tag to each message based on the person who sent the message. For example, if the message was sent by Susan, one of the CHW peer-supervisors, I would tag this as 'CHW Peer-Supervisor 1'. Similarly, if the message had been sent by Luke, a CHW, I would tag this as 'CHW 7'. I did this for each message until all messages had a sender tag assigned. I then took a random sample of 10% of the messages from the Excel spreadsheet and referred back to the original WhatsApp group to ensure the correct tag had been assigned.

I then re-read the messages in turn in order to add a 'receiver' column. For this, I read the initial message and the subsequent messages to work out who the message was being directed at. Sometimes, the sender of the message would direct it at an individual. For example, if the message read, *"Jane, can you remind me what time we need to meet?"* I would assign the receiver as 'Facilitator 3' which was the tag for Jane. At other times, the messages would be specifically directed at the entire group. For example, if the message read, *"Good morning fellow CHWs"* I would assign the receiver as 'Group' which was the tag for a message directed at the entire group of CHWs.

Where the intended recipient of the message was not directly named, I would read the full message thread to work out who, if any, the intended recipient was. For example, several of the answers to the learning cases were general answers. Where it was unclear or a recipient was not specified I also assigned 'Group' as the recipient tag.

iii. Coding of messages

Before beginning the formal coding process, I read each message in turn in relation to the entire data set in order to get a general feel for the type of messages being exchanged. I then coded messages in groups of 50 to 75 in the following manner:

1. **Supervisory objective**

Given that the primary objective of my DPhil focuses on CHW supervision, I first coded each message based on its perceived supervisory objective. For this I used a deductive approach by drawing upon an existing framework published by Vu Henry et al. (2016) (Vu Henry et al., 2016), which was based on initial work undertaken by Crigler et al. (2013) to investigate how supportive supervision of CHWs contributes to health systems strengthening (Crigler et al., 2013).

In this framework, there are three main categories of supervision:

(1) Quality Assurance;

(2) Communication and Information, and

(3) Supportive Environment (Crigler et al., 2013):

I read each message individually and assigned a code based on the above supervisory objectives. This was done in a hierarchical fashion given that sometimes messages contained multiple supervisory objectives and so I also assigned primary, secondary and/or tertiary codes where necessary. For example, if a message read, *"Good morning CHWs! Have a great day! Let me know if there is anything I can do to help you!",* I would assign the primary supervisory objective as 'Supportive Environment'. However, in contrast a message might state, *"Good morning CHWs! Have a great day! Let me know if there is anything I can do to help you. Remember we are meeting today at 4pm."* In this instance the primary supervisory objective would still be 'Supportive Environment', however there would also be a secondary supervisory objective of 'Communication and Information'.

The coding framework for the supervisory objective category can be found in Table 8 below.

Supervisory Objective	**Sub-category**
Supportive Environment	Apology
	Encouragement and praise
	Moral support
	Mutual learning
	Greetings
	Thanks
	Religion
	Inspiration
Communication and information	Evidence
	Logistics and Planning
	Reporting
	Giving information
	Requesting information
	Responding to a request
	Training
	Giving opinion
	Clarifying information
	Making a request
	Acknowledgement
Quality assurance	Follow up
	Health Education
	Household visits
	Reprimand
	Record keeping
	Consent taking
	Outreach work
	Patient management
	Referral

Table 7 - Supervisory objectives and sub-categories; adapted from Vu Henry et al. (2018).

2. Supervisory behavioural interaction category

Next, I coded the messages based on the supervisory interactions. Again, this was done in a deductive manner using a previously published framework from a study by Li et al. (2019) (Li et al., 2019). This framework has eight categories for the supervisor (i.e. a peer-CHW supervisor, a project facilitator, or a healthcare worker), and eight categories for the

supervisee (i.e. a CHW) and is a modified version of Blumberg's System for Analyzing Supervisor-Teacher Interactions (Blumberg, 1970).

For both the supervisor and supervisee, there are three broad clusters of categories into which interactions can be catagorised: (a) information-based questions or answers (Categories 2, 3, 10 and 11), (b) opinion-oriented questions or answers (Categories 4, 5, 12 and 13) and (c) social emotional behaviors, positive or negative (Categories 6, 7, 14 and 15). The use of this framework helped me to understand the underlying semantics behind the messages exchanged between participants. Each message was assigned a primary, secondary, and/or tertiary code according to this taxonomy. Where the message had more than one supervisory interaction, the message was read in full and a ranking was assigned to the coding process. For example, if the main focus of the message appeared to be *'asking for information,'* this was assigned as the primary interaction code, and if the secondary element of the message was *'positive social emotional behaviour,'* this was assigned as the secondary interaction code. The table outlining the coding framework for the behavioural interaction category can be found in Table 9.

Role	**#**	**Behavioural Category**	**Operational Definitions**
Supervisor	1	Minimal encourager	'Yes,' 'I'm with you,' 'Okay,' 'I see what you mean,' 'Umm,' 'Uh-huh', silence, a quick repetition of the supervisee's words or phrases
	2	Asks for information	Asking for/clarifying factual information (not inferential)
	3	Gives information	Giving/clarifying/orienting factual information (not inferential)
	4	Asks for opinions	Asking for analysis, evaluation or opinions of counselling or supervision. Asking for alternative case conceptualizations or interventions. Asking for suggestions (further steps or directions to take)
	5	Gives opinions	Giving analysis, evaluation or opinions of counselling or supervision. Giving alternative case

			conceptualizations or interventions. Giving suggestions (further steps or directions to take)
	6	Positive social emotional behaviour (support-inducing communications behaviour)	Self-disclosure Empathy/reflection of feeling/Accepting/using/building upon or further developing the supervisee's ideas or suggestions. Praise/humour/laugh/claps
	7	Negative social emotional behaviour	Being defensive or critical (e.g. negative value judgments of the supervisee) Tension-provoking behaviour (e.g. confrontation), tension-charged behaviour (e.g. apology, complaint, anger, awkwardness), interruption
	8	Other	Role playing, anything unclear or unidentifiable, multi-media messages
Supervisee	9	Minimal encourager	'Yes,' 'I'm with you,' 'Okay,' 'I see what you mean,' 'Umm,' 'Uh-huh', silence, a quick repetition of the supervisor's words or phrases
	10	Asks for information	Asking for/clarifying factual information (not inferential)
	11	Gives information	Giving/clarifying/orienting factual information (not inferential)
	12	Asks for opinions	Asking for analysis, evaluation or opinions of counselling or supervision. Asking for alternative case conceptualizations or interventions. Asking for suggestions (further steps or directions to take)
	13	Gives opinions	Giving analysis, evaluation or opinions of counselling or supervision. Giving alternative case conceptualizations or interventions. Giving suggestions (further steps or directions to take)
	14	Positive social emotional behaviour	Self-disclosure. Empathy/reflection of feeling. Accepting/using/building upon or further developing the supervisor's ideas or suggestions. Praise/humour/laugh/claps
	15	Negative social emotional behaviour	Defensiveness. Tension-provoking behaviour (e.g. confrontation), tension-charged behaviour (e.g. apology, complaint, anger, awkwardness), interruption
	16	Other	Role playing, anything unclear or unidentifiable, multimedia messages

Table 8 - Supervisory interaction categories – adapted from Li et al. (2019).

3. Peer-to-peer exchanges

Messages were coded on a *Yes* or *No* basis as to whether or not they were part of a peer-to-peer exchange. In order to be categorised as a peer-to-peer exchange, messages had to be sent either between CHWs, or CHWs and peer-CHW supervisors. Messages sent by the supervisors to the CHWs were not categorised as peer-to-peer exchanges.

iv. WhatsApp message analysis

I coded and analysed the messages in SPSS in order to obtain descriptive statistics, including the total number of messages exchanged, the message file type (e.g text, voice, photo, .gif, video etc.), a breakdown of messages by sender (e.g. CHW, peer-supervisor, facilitator, ENT surgeon), the frequency of messages based on supervisory category, supervisory interaction and whether they were peer-to-peer interactions. This was in order to gain a broad understanding of the general use of WhatsApp as a means to facilitate supervision.

I also used my knowledge of the individuals within the WhatsApp groups to explain why certain phenomena were observed, which helped to add a richness to the analysis of the data set that would otherwise be decontextualised. I was able to do this by returning to the original messages and using my knowledge of the individuals sending the messages and the local setting and context to help interpret the exchange.

I also selected representative vignettes to enrich to the analysis. A vignette has been described as "a focused description of a series of events taken to be representative, typical or emblematic in the case" (Miles and Huberman, 1994:81). These illustrative examples help to demonstrate observations regarding the nature of supervision over the six-month duration of Phase Three.

v. Inter-coder reliability

Finally, I calculated inter-coder reliability across the WhatsApp data sets. To do this I initially coded the data sets in full by myself. I then went back over the data sets after two months and checked that I agreed with the initial coding system I had used. Where necessary, modifications were made and messages were re-coded a second time. This process took approximately six weeks.

I then sent the data files and code books to a second coder (MM) who independently coded and generated new codes where appropriate. MM was a programme coordinator at NGO A and had a strong understanding of the local context and knew the individuals involved in the WhatsApp groups. Both MM and I met virtually on the online video conferencing platform Skype over a four-week period to discuss the full data set. We discussed each message in turn (usually 75-100 messages in one sitting) and came to a unified agreement as to the final coding system before completing the final analysis on SPSS.

A Krippendorffs Inter-Coder Reliability and observed percentage agreement was then calculated for each section of the coded data-set using an open-access reliability calculator (Freelon, 2020). These tests were decided upon after consulting the literature on inter-coder reliability methods in information systems research (Nili et al., 2017).

Inter-coder reliability was calculated for the following coding categories of both WhatsApp groups:

- Content code;
- Supervisory category;
- Interaction code;
- Peer-to-peer exchange.

The Krippendorffs Alpha values were all within the limits of acceptable inter-coder agreement (i.e. >0.667) (Krippendorff, 2004). Additionally, the observed percentage agreement for all categories in both WhatsApp groups was "almost perfect agreement" (>80%) (McHugh, 2012) (Table 10).

		Logistics Group		Case Study Group	
Category		**Krippendorffs α**	**Observed percentage agreement (%)**	**Krippendorffs α**	**Observed percentage agreement (%)**
Content Code	*First order*	0.881	88.5	0.903	92.3
	Second order	0.672	76.5	0.797	86.1
	Third order	0.56	84	0.633	86.8
	Fourth order	0.45	92.8	0.459	94.4
	Fifth order	1	100	0.969	99.9
	Sixth order	1	100	1	100
	Mean	**0.761**	**90.3**	**0.794**	**93.3**
Supervisory category	*First order*	0.819	83.6	0.876	96.6
	Second order	0.624	73	0.838	89.1
	Third order	0.575	85	0.652	88.2
	Fourth order	0.466	93.6	0.444	95
	Fifth order	0.982	99.9	0.969	99.9
	Sixth order	0.982	99.9	0.969	99.9
	Mean	**0.738**	**89.2**	**0.791**	**94.1**
Interaction code	*First order*	0.926	93.8	0.763	80.6
	Second order	0.75	87.3	0.77	86.5
	Third order	0.538	97.1	0.547	95.8
	Mean	**0.738**	**92.7**	**0.693**	**87.6**
Peer-to-peer interaction		**0.917**	**95.9**	**0.806**	**94.5**

Table 9 - Inter-coder reliability scores for the Logistics and Case-Study groups.

8.4.3 Interviews

Finally, upon conclusion of Phase Three, I conducted individual interviews with the CHWs to explore their perceptions and experiences of the supervisory intervention. I also wanted to better understand whether or not their conceptualisation of supervision had changed as a result of their involvement in the study.

i. Dates

Post-intervention interviews took place between 14th and 30th of July 2019.

ii. Individual Interviews

I used semi-structured one-to-one interviews to explore CHWs perceptions of supervision over the duration of the project.

The interview questions were similar to those used in Phase One, so that I was able to compare CHWs' answers from the beginning of the project with those at the end. I hypothesised that this would allow me to explore any changes in opinion regarding the perceived nature of supervision over the course of the study.

Interviews were conducted at Health Centre III A and were carried out in Luganda by either David or Jane. Interviews were recorded using a digital audio-recorder and immediately transcribed into English for analysis by the same person who conducted the interview. The transcripts were then checked for accuracy and clarity by myself and the same RA to ensure no meanings had been lost during the translation process. Where necessary, participants were contacted to clarify any points of ambiguity in the transcript.

iii. Analysis of interview data

The analysis of the interview data took the same format as that in Phase One and the findings from the interview analysis are presented in Chapter 9. This analysis was an important part of the 'Reflect' stage in the iterative embedded PAR cycle.

***

I now present the findings from Phase Three in Chapter 9.

Chapter 9 - Evaluating the impact of an mHealth mediated programme on CHW supervision

> *"We receive messages from our supervisors instantly and at once since we have a common platform now. It is now more of a shared space, where we can learn from each other. Previously only one person would be called to inform the rest of the CHWs about supervision. If one person got feedback, the rest of us did not know what that was so we could not all learn."* Elizabeth, CHW 3.

9.1 Chapter Overview

In this chapter, I present the findings and analysis from Phase Three of the study (February-July 2019). I aim to understand how the implementation of a blended supervisory model, which combined in-person supervision with a mobile supervisory platform using WhatsApp, impacted on the nature of supervision in this setting in order to answer RQ2:

What are the effects of using an mHealth intervention, as part of a blended supervision programme, on the nature of CHW supervision?

Through a descriptive analysis and interpretation of the WhatsApp messages I aim to understand the activity of individual stakeholders and how the use of WhatsApp helped to support supervision, including the nature of messages exchanges viewed through the lens of supervision.

The descriptive analyses of WhatsApp messages are supplemented with qualitative findings from the FGDs and interviews, as well as anonymised sample exchanges taken directly from the WhatsApp groups. Through this detailed supplementary analysis, I hope to help the reader understand the benefits and challenges regarding the mobile aspect of the blended supervisory intervention from the perspectives of CHWs – something that has seldom been explored in the existing literature.

9.2 The evolving nature of supervision

Here I discuss the key findings relevant to how the implementation of a blended supervisory model, facilitated by the use of mobile technologies, impacted on the nature of CHW supervision.

Through an analysis of mid-point FGDs held in April 2019 and end-point individual interviews held in July 2019, the first perceived change in the nature of supervision was the way in which it was designed and delivered. Indeed, several of the CHWs commented that being part of this project led them to reflect more deeply on their prior experiences of supervision (described in Chapter 6) as demonstrated in the following quotes:

> *"Like I said, we didn't have supervisors before this project, so the whole concept of supervision is new to us…Before I was referring more to one-off sessions at the health centre, but this is now 'real' supervision"* **Alex, CHW 6**

> *"Before this project, I didn't know the names of some of my supervisors and would often forget their faces…Supervision before this project was that bad"* **Albert, CHW 8**

This raises the question, "*Is it possible for the nature of supervision to change, if it didn't occur before?*" What appears to have changed from the findings I discussed in Chapter 6, is CHWs understanding of what supervision meant to them. Whereas before supervision was perceived as a form of one-off training sessions or meetings at the health centre, the co-design of the supervisory intervention in Phase Two meant that it was purposefully structured and evaluated in such a manner that forced the CHWs to think more deeply about the process and nature of supervision. Indeed the very process of focussing so closely on supervision and evaluating it in a very participatory manner could have raised the CHWs consciousness around supervision, and caused them to give greater critical attention to what it meant to them, as well as a better understanding of 'supervision' vs 'ongoing training'.

Based on feedback obtained from CHWs during Phase Two, the supervisory intervention was co-designed to take a blended approach to delivery and combined in-person, with mobile-facilitated supervision. Indeed, the design decisions taken in Phase Two resulted in a major shift from the previous status quo in terms of the structure and delivery of supervision. Supervision now included regular accompanied home visits (*in contrast to one-off training sessions previously held at the health centre*), and a greater level of peer-to-peer supervision, facilitated through the use of the group WhatsApp platform, which is demonstrated in the following quotes:

> *"Before this project, supervision was only done at the health centre but now we are accompanied to home visits…We are only called at the health centre if we need to be supervised as a group or if we have a meeting."* **Elizabeth, CHW 3**

> *"[Previously] we were never accompanied to home visits or even given questions to attempt. Now with the mobile phones and WhatsApp, we have questions and constant feedback unlike before"* **Dina, CHW 9**

Several CHWs also cited that modifying the design of supervision and taking a blended approach was important for optimising the nature of feedback as part of the supervisory process. This is because certain aspects of supervision, including practical techniques such as the correct positioning of an otoscope, as well as non-technical skills such as feedback on communication and interpersonal skills, were better suited to in-person feedback, rather than virtual feedback via WhatsApp:

> *"…supervision in-person is good to correct us when we might be doing something wrong practically. Like (the technique of) washing out an ear or holding the otoscope wrongly or talking to the patient too harshly…"* **Dina, CHW 9**

Indeed, the existing literature suggests that augmenting digital supervision with face-to-face supervision is preferable to one modality in isolation, and that in-person contact can, in fact,

help strengthen the digital aspect of supervision through improved human contact (Martin et al., 2017a).

Finally, a strong emphasis was also placed on how supervisors had become more proactive and responsive in the time since the formal supervisory programme was initiated in February 2019. This was perhaps to be expected, given that those elected as supervisors received specific training in good supervisory practices during Phase Two, as well as regular feedback from myself and the RAs on their supervisory practices. Many of the CHWs mentioned how the frequency of communication with their peer-supervisors and project facilitators had increased over the course of the project, and that unlike before, supervisors now proactively reached out to them, as illustrated through the following quotes:

> *"Our previous supervisors would check on us every four months, but the ones in this project are always communicating with us. The longest we can take without hearing from them is one week"* **Dina, CHW 9**

> ***"****Before this project, we would only hear from our supervisors once a year… Our current supervisors dedicate so much of their time to supervising us. They are available anytime we need them"* **Rosetta, CHW 12**

Over the course of the project, the CHWs' conceptualisation of the purpose of supervision also changed. Although a strong emphasis was still placed on supervision as a way of monitoring their work, from the pre-intervention interviews to the post-intervention interviews, there was greater consensus that supervision was also a means of facilitating ongoing training and learning. Indeed, there was a particular emphasis placed on the use of the WhatsApp platform to facilitate problem-solving, and thus to improve work performance. This is illustrated in the following quotes:

> *"We now see supervision as a way to get feedback and learn new things, which enables us to improve our work performance since we get to know our strengths and weaknesses."* **Alex, CHW 6**

> *"When we encounter problems in our work, we report to our supervisors and they get solved immediately. Before this project our problems would never get solved however much we complained or reported."* **Susan, CHW peer-supervisor 1**

There was also a shift towards supervision being conceptualised as a means to offer holistic support to the CHWs i.e. there was an emphasis placed on the nurturing aspects of supervision, in addition to that which focussed on improving work performance:

> *"It [supervision] also helps us as individuals – it is our supervisors checking on us and asking how our lives are going. This is important because first, I am a mother and wife and a farmer. Next, I am a VHT [CHW]. So those aspects of my life are important."* **Elizabeth, CHW 3**

Given that CHW supervision has traditionally been conceptualised as a "hierarchical relationship of control, involving discipline and surveillance between supervisor and supervisee" (Assegaai and Schneider, 2019b:2) this was an important shift for some CHWs.

I suggest this move towards supervision being conceptualised as a more holistic model of support was facilitated partly by the re-design and re-structuring of supervision delivery, away from infrequent one-off meetings at the local health centre, where supervisors met with the CHWs, to a model which involved frequent in-person supervision in the community and real-time group supervision through the use of WhatsApp. Unlike previous models of supervision, where the supervisor would make a one-off visit to the health centre and instruct CHWs in a predominately unidirectional fashion, this style of supervision (facilitated by the WhatsApp shared space) promoted a more dialogical form of supervision which helped enable a supportive environment, the creation of communal ties and a greater level of peer-to-peer problem-solving.

In summary, the post-intervention interview findings appear to demonstrate that following the implementation of a blended supervisory programme, the CHWs conceptualisation of supervision changed from being viewed as a one-off encounter at the health centre, to a

process involving more frequent ongoing support and feedback. Moving forward, I suggest that CHW supervision can be opportunistic, however, it also needs to be structured and planned in order to ensure the CHWs are well supported. The nature of the intervention also allowed supervision to take place across multiple spaces (i.e. in the community, as well as remotely) and there was a greater emphasis placed on supervision as a way to support CHWs ongoing learning and to provide emotional support (in keeping with supportive models of supervision).

I now discuss the role WhatsApp had in facilitating this change in supervisory approach in Section 9.3.

9.3 WhatsApp Group characteristics

As previously stated in Chapter 7, there were two WhatsApp groups (*see Section 7.10 - Supervisory Design:218*). The first WhatsApp group (called the 'Logistics Group'), was established with the aim that it would facilitate the exchange of logistical information such as meeting times, places and sharing of personal messages. The second WhatsApp group (called the 'Case Study Group'), was established with the aim of facilitating the exchange of messages around bi-monthly structured cases to enable ongoing learning.

Both WhatsApp groups contained the same 19 members; 12 CHWs (n=12), two CHW peer-supervisors (n=2), two healthcare workers (n=2), and three project facilitators (n=3).

Messages deemed irrelevant to the topic of CHWs supervision were removed prior to final analysis. Full reasons for exclusion can be found in the Appendices (*see Appendix Figure 19: 415*), but included, for example, blank messages (n=32), general political messages (n=31), or non-sensical messages (n=21).

After cleaning the data sets, 2405 messages remained for analysis across the two groups; 1181 in the Logistics Group and 1224 in the Case Study Group.

i. Monthly message frequency

The highest frequency of messages exchanged across both WhatsApp groups was during the first month of the intervention (February) when 35.6% (n=855) of all messages were sent. Subsequently, there was a three-month period where the frequency of messages exchanges appeared to plateau (April-May), before a sharp decrease in the month of July when only 3% (n=73) of messages were exchanged. For a full break down of message frequency by month, please refer to Figure 41 below and Figure 20 in the Appendices (*see Appendix Figure 20: 415*).

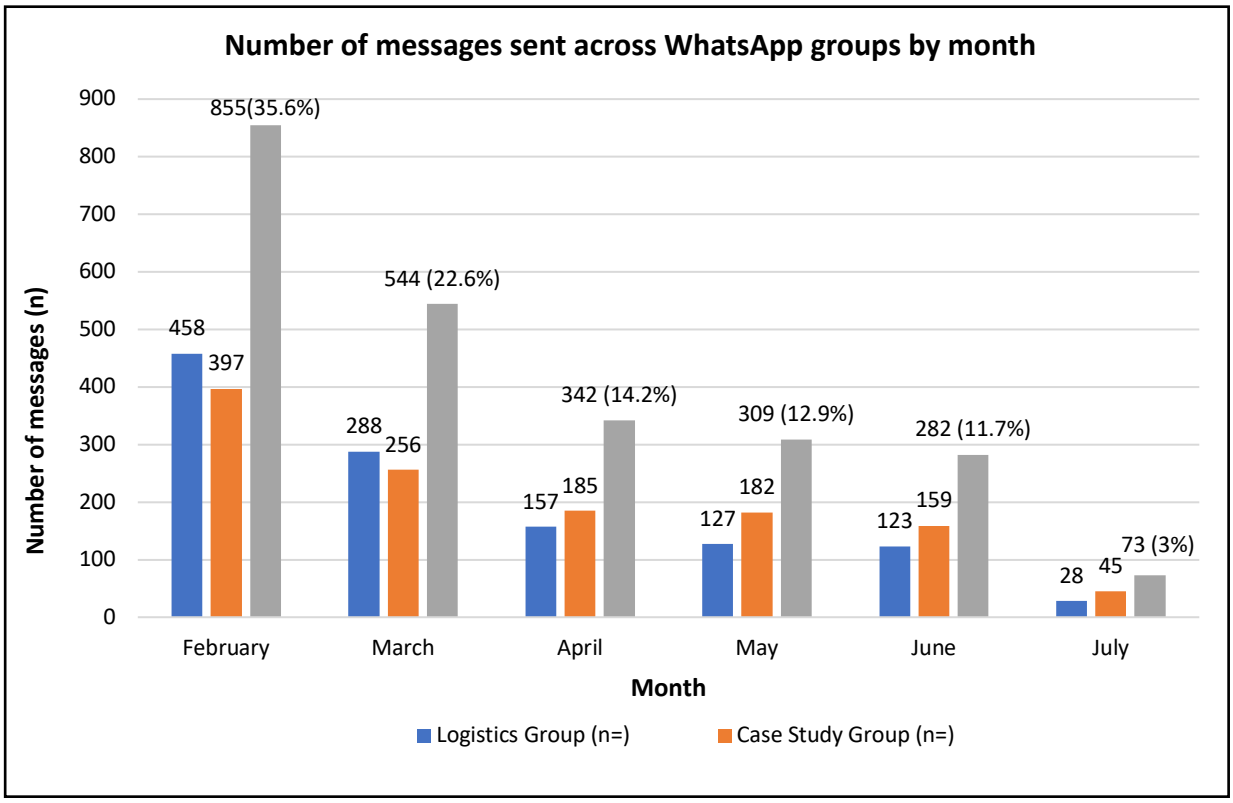


Figure 41 - Number of messages (n) sent across the WhatsApp groups disaggregated by month.

The reasons for the initially high number of messages sent in February and the subsequent decline could be due to multiple reasons. Firstly, there could have been initial user

enthusiasm resulting in high user engagement, reflected by a high overall number of messages exchanged in the first two months of the programme. I also know from the supplementary in-depth interviews and informal discussions, that in the first few months of the programme CHWs reprimanded each other for sending lots of messages rather than one longer message, which could help to explain the pattern observed. For example, early on in the project when a question was asked in the Case Study group, CHWs often sent several shorter voice notes, rather than one overall response to a question.

It is also important to note that although there appears to be a significant drop off in the number of messages exchanged in July, the official end date for the study in terms of data collection was July 12th. The data is therefore only representative for 12 days in the month of July, rather than the full month, thus helping to explain this trend. The CHWs were aware of the official end-date of the project from the outset of the study, however, they were informed that this simply meant the more rigorous evaluation would end on this date and that they could keep using the platform for as long as they wished since they were allowed to keep the phones and their quarterly data plans would continue.

This observed trend of an overall decrease in the number of messages exchanged over the six-month evaluation period raises the broader question around user-engagement and whether the use of mHealth as a supervisory platform it can be sustained over time. For example, Le Fevre et al. (2017) described how a mobile-based messaging service for postpartum women in Ghana showed a significant drop in user engagement over a 12-month period. In this study, pregnant women across five districts were enrolled in the study to receive pre-recorded audio or SMS messages containing educational information in the local language on important issues around pregnancy. It was noted that the number of women listening to or engaging with messages "dropped from 25% in the 1st trimester to 6% at 6–12 months postpartum" (LeFevre et al., 2017). It is therefore important that longitudinal behavioural studies are

conducted to explore the facilitators and barriers towards the adoption (*or non-adoption*) of mHealth facilitated supervisory interventions over a long period of time. I discuss this issue in relation to my study in the Strengths and Limitations section of this chapter (*see Section 9.7 – Strengths and Limitations:304-313*).

ii. Messages by sender category

Of the 2405 messages sent across both groups, approximately half were sent by CHWs (n=1172; 48.7%). Given that the CHWs were the largest individual group of stakeholders, this finding was to be expected. This was followed by facilitators (n=843; 35.1%), CHW peer-supervisors (n=364; 15.1%) and finally by healthcare professionals (n=26; 1.1%) (Figure 42).

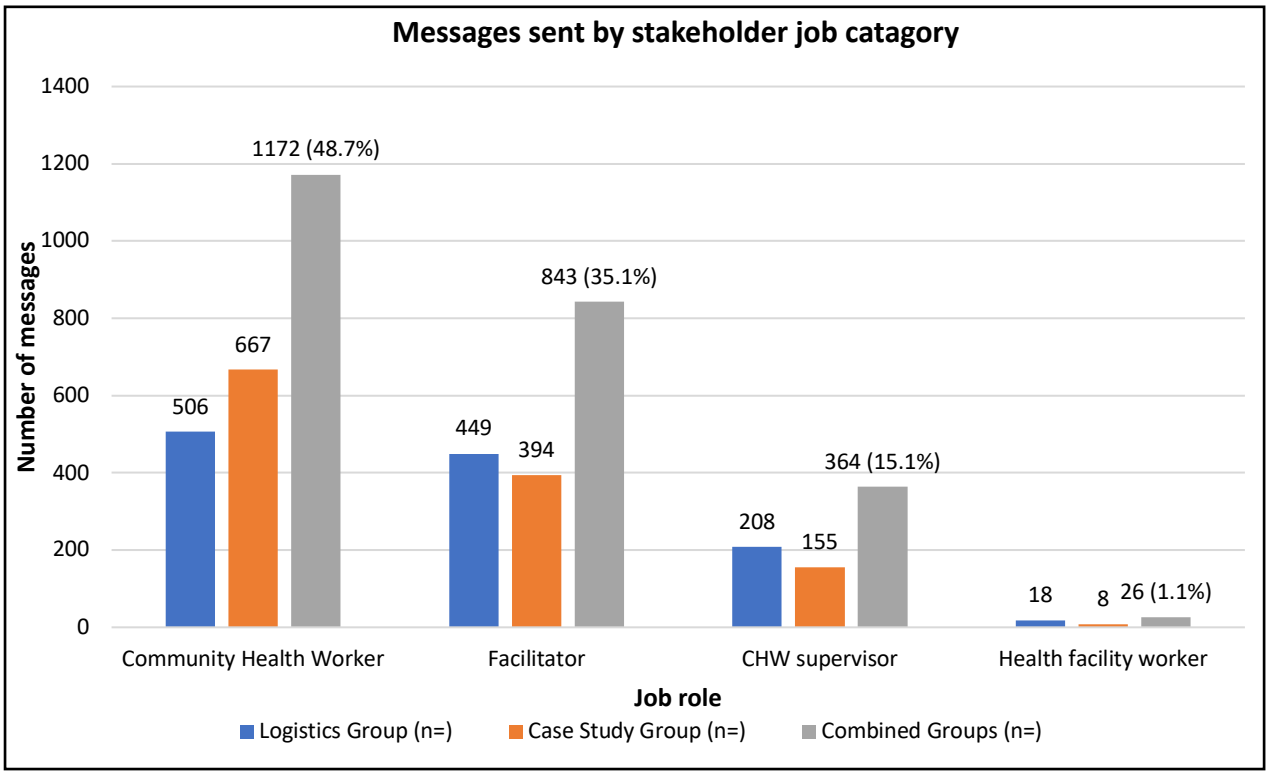


Figure 42 - Messages sent by stakeholder job category across the WhatsApp groups.

Within the stakeholder groups, there was significant variability in the activity of individual users. For example, in the Logistics Group there was a range of 100 messages between the most active CHW (CHW 7, n= 112; (9.5%)) and the least active CHW (CHW 11, n=12; (1%)). This was similar in the Case Study group, where there was a range of 103 messages between the most and least active CHWs (CHW 7, n=108; 8.8% vs. CHW 10, n=5; 0.4%). Similarly, between the individual facilitators, there was a significant range in the number of messages sent across both the Logistics Group (n=327) and the Case Study Group (n=185). In contrast, the peer-supervisors were relatively equal in terms of activity. Both played an active role across both groups with a lower range of messages exchanged (n=7-24). For a full summary of inter-stakeholder variance, please refer to Table 11 below.

	Logistics Group					Case Study Group				
	Total messages n; (%)	**Mean ±S.D.**	**Max**	**Min**	**Range**	**Total messages** n; (%)	**Mean ±S.D.**	**Max**	**Min**	**Range**
CHWs (n=12)	506; (42.8)	42.2 ±29.3	112	12	100	667; (54.5)	57.3 ±27.3	108	5	103
Facilitators (n=3)	449; (38)	149.7 ±178.1	354	27	327	394; (32.2)	131 ±98.3	203	19	185
Peer-supervisors (n=2)	208; (17.6)	104 ±17	116	92	24	155; (12.7)	77.5 ±4.9	81	74	7
Health Workers (n=2)	18; (1.5)	18 ±12.7	18	0	18	8; (0.7)	8 ±5.7	8	0	8

Table 10 - Variability and range of messages sent by users grouped by job category.

When messages were disaggregated by individual users, I was the most active individual across both groups (*Facilitator 1*), sending a combined total of 525 messages. This represented 21.8% of all messages exchanged over the six-month evaluation period. Jane, one of the other project facilitators (*Facilitator 3*), was the most active individual user in the Case Study group sending a total of 204 messages (16.7%).

My active role in the project was important so that I could gain a better understanding of the individuals involved in the study. However, this could also be problematic. For example, fewer messages may have been sent overall had I not actively been engaging with the CHWs and some CHWs may have felt more obligated to reply to me, given that I was viewed by some as the project leader and as a patron (*see Chapter 10, Section 10.2.1 – 'Relationships with key stakeholders – Community Health Workers':317-326*). This may have therefore artificially skewed results in terms of participant engagement. Furthermore, my active role as a project facilitator means that I could have inadvertently undermined the other supervisors (who were the local RAs – David and Jane) and stunted their position to take on supervisory roles. For example, for issues related to management of patients', questions were often directed to me, given that the CHWs knew I was a medical doctor and could offer technical advice on patient management. During the early stages of the project, this was justified because the topic of ear and hearing disease was new to many of the participants and so some of the supervisors did not have the technical expertise or know-how to address some of the challenges in a manner which ensured patient safety. Furthermore, McAteer suggests that collaborative action research can be:

> *"…an open and inclusive network in which the facilitator can be a contributing participant, albeit with particular knowledge or expertise that can be of help to the group. Moreover, at different times, different participants in some groups can and do take the facilitator role in relation to different parts of the action being undertaken"*(Denzin and Lincoln, 2008:319).

Therefore, as the project progressed and the other stakeholders became more confident and skilled in clinical diagnosis and management, I began to deflect some of these questions to the peer-supervisors, as well as David, Jane and the local ENT expert, so as to encourage local capacity building. Similarly, the group space was also a place where logistical information regarding the research process was exchanged. For example, CHWs might ask

where we needed to meet to conduct interviews. Given this was my responsibility, I often took the lead in replying to these questions which could also explain why I was so active.

The least active users in both groups appeared to be the healthcare professionals (*i.e. the ENT Doctor and Health Facility Worker*), who sent a combined total of 26 messages, representing just 1.1% of all messages exchanged. However, despite this apparent trend, it is important to note that the data presented is not fully representative of how supervision occurred in reality. Indeed, this represents a potential limitation of this method of evaluation. For example, although the data suggest that the healthcare professionals were some of the least active members of the WhatsApp groups, it is important to note that the ENT specialist was actually active within a private WhatsApp group with myself and Jane. Throughout the duration of Phase Three, we would ask the ENT specialist specific questions within this private chat and then relay the results back to the group, which could also help to explain why myself and Jane (*Facilitators 1 and 3*) appeared to be two of the more active users. It is therefore important that these findings are interpreted with this caveat in mind. Indeed, in this study, the ENT surgeon played an important role in quality assurance and provision of management advice in clinically challenging cases. Furthermore, having a link with the formal health system was important for streamlining referrals and approaching this intervention through a health system strengthening lens – something I discuss and detail in Section 9.6 of this chapter (*see Section 9.6 – Referral Pathway creation:298-303*). Finally, by having this local buy-in, it was more likely that the intervention would be sustained after I departed, given that the CHWs now had a local expert with whom they could consult.

For a full breakdown of messages sent by individual users across the two groups, please refer to the Appendices (*see Appendix Figure 21:415-416*).

iii. Messages by file type

Across the two WhatsApp groups, a total of eight different file types were exchanged, with the three most common being voice messages (n=1196; 49.7%), text messages (n=991; 41.2%) and photographic images (n=152; 6.3%). A summary of all file types exchanged across the groups can be found in Table 12 below.

File Type	Logistics Group **n; (%)**	Case-Study Group **n; (%)**	Combined groups **n; (%)**
Voice	554; (46.9)	642; (52.4)	1196; (49.7)
Text	521; (44.1)	470; (38.4)	991; (41.2)
Photo	68; (5.8)	84; (6.9)	152; (6.3)
Video	13; (1.1)	21; (1.7)	34; (1.4)
.GIF	15; (1.3)	2; (0.2)	17; (0.7)
Photo and caption	6; (0.5)	4; (0.3)	10; (0.4)
Text and emoji	3; (0.2)	0; (0.0)	3; (0.1)
Emoji	1; (0.1)	1; (0.1)	2; (0.1)
TOTAL	**1181**	**1224**	**2405**

Table 11 - File types sent across the WhatsApp groups *(N.B. Percentages may not total 100 due to rounding effect).*

File types were also disaggregated by sender category (*see Appendices, Appendix Figure 22: 417*). CHWs proportionally sent a greater number of voice messages (n=935; 79.7%) compared to other file types, such as text messages (n=140; 11.9%), photographs (n=69; 5.9%), and video files (n=12; 1%). The reasons for this were multifactorial and were revealed during the mid-point FGDs. For example, several CHWs stated that recording and sending voice messages was more efficient than typing text messages, as exemplified through the following quote:

> *"I prefer voice messages because they take less time. It may take someone 10 minutes to deliver a message through texting that only takes 1 minute when using voice message. That is why I say I prefer voice messages to text messages."* **Alex, CHW 6**

Similarly, other CHWs cited the speed of recording a voice message was particularly helpful in urgent situations, such as referring a sick patient, and also where the mobile network was unstable and the CHW had a limited time to send the message, as demonstrated through the following quotes:

> *"Also, if something is urgent (like referring a patient), the voice message is better."* **Albert, CHW 8**

> *"I use voice messages because with them I can speak very fast and send my message as soon as possible when the network is still stable."* **Rosetta, CHW 12**

Furthermore, some of the older CHWs found texting on the small smartphone screens to be challenging due to difficulties with their eyesight, meaning that they also preferred to send voice messages where they could simply hold down one button and record their message, rather than pressing multiple on-screen buttons. For example, two of the older CHWs stated:

> *"I prefer voice messages too and it is what I use most of the time. I tried texting once and found it so hard. I find it [sending voice messages] simple because I just press, say what I want and then send instead of pressing buttons which takes a lot of time."* **Albert, CHW 8**

> *"Texting takes so much time for me because my eyesight is not good. It involves pressing letters and sometimes I realise I have made mistakes."* **Rosetta, CHW 12**

Others were less comfortable with writing text messages due to difficulties with spelling, and also found the auto-correct feature on WhatsApp would change the words they intended to be sent in Luganda to English:

> *"WhatsApp has auto-correct. Sometimes we write the words correctly, but it changes them to something else. It is not because we are making mistakes, but because of autocorrect."* **Samantha, CHW 5**

Some CHWs who were less confident at writing in Luganda may have also preferred to have sent voice messages out of concern of being reprimanded by their fellow CHWs for incorrect spellings or incoherent messages. Indeed, early on in the programme there was an exchange

of messages between two CHWs reprimanding other CHWs for spelling messages incorrectly:

Message 146 – Voice Note, CHW 4, 14th February 2019, 1.06pm:

"Please fellow VHTs, before sending a message, please check what you have typed. Some of you have wrong spellings, yet we want to know exactly what you mean."

Message 147 – Voice note, CHW 3, 14th February 2019 at 1.08pm:

"Isabella, that point is so good about people being careful with what they are writing because their language is not correct."

Message 148 – Voice Note, CHW 4, 14th February 2019, 1.10pm:

"[Laughing] I thought it was just me that was seeing it. If you can't write Luganda just say it. Don't write it."

This mirrors findings from a study which explored the use of mHealth with CHWs in Uganda by Thondoo et al. (2015) and found that CHWs using basic feature phones often struggled to write text-messages in English given that this was not their first language (Thondoo et al., 2015). This preference - *of CHWs to record and send voice notes* - therefore justified the design decision in Phase Two to provide CHWs with smartphones, given the ability to easily record and send voice messages on WhatsApp which was not possible using a basic feature phone. This technological capability should be considered by others who wish to implement mHealth facilitated supervisory interventions in similar settings.

In addition to voice and text message files, there was also an exchange of multimedia messages such as photographs and videos across both groups. This became particularly prominent in the later months when photographic files were often exchanged as a way to evidence pathology that the CHWs encountered in the community, or to supplement case learning. For example, the following message exchange illustrates the detailed discussion

generated in response to a photograph sent by one of the study facilitators about a patient in the community with a pre-auricular sinus:



Message 813 – Text message, Facilitator 1, 26th April 2019 at 10.04am:

"Greetings VHTs. Please tell me what you see here, the name for it, how you would manage it?"

Message 814 – Voice note, CHW 7, 26th April 2019 at 10.29am:

"Greetings fellow members or workmates. I can see a hole outside the ear. I think if that hole is a problem to the person, they need to be referred to an ENT specialist. The ENT specialist knows what to do. Sometimes it's dangerous and at times the person was born like that. If it's dangerous I just refer the person to Mulago or Mbarara. That's my answer."

Message 816 – Voice note, CHW 1, 26th April 2019 at 10.39am

"Greetings fellow VHTs, Dr Andrew, Bryan* and Catherine*. Thanks for the work you're doing for us. When I see that picture, I see a hole. That hole in most cases is congenital but sometimes it's an infection with discharge coming out of it. If it's just like that with nothing coming out, I encourage the person and tell them there's no problem. But if it has any damage I refer the person to a specialist for further examination. That's my reply to the question."*

Message 818 – Voice note reply sent by CHW 8, 26th of April 2019 at 11.39am

"Greetings to you all our health workers, Mwebe, Dr. Andrew, Bryan*, Catherine* and thanks for what you're doing for us. I would like to thank all the VHTs and our supervisors for everything you're doing. I can see a picture of someone either a child or an adult plus an ear which I think is the left one. If the person was born with that hole which we call lukatu in Luganda, it poses no threat. But from what we have been told if it causes problems like swelling, the advice I can give to the person is to refer them to an ENT specialist for further examination. The biggest problem is what we copy like pricking ears with machines which makes the ear look like two in one. That's my view. Thanks so much. It's me Matthew*, VHT Makata."*

The first reply in this exchange (CHW 7) presents factual information around how the CHW would safely manage the patient *i.e. they state that they would make a referral to an ENT specialist*. The subsequent discussion then involves other CHWs, who discuss the differences between congenital and acquired fistulas and the name for a pre-auricular sinus in the local language. This particular exchange demonstrates the detailed discussion that could be prompted through the use of multimedia messages.

Several other CHWs stated that they liked receiving photo and video messages as they considered themselves to be 'visual learners'. They cited that part of the Buganda culture was learning through storytelling and that some of the picture and video exchanges reminded them of stories. The CHWs also found it helpful to refer back to the photographs on the WhatsApp group when they encountered similar cases during their work in the community and could also use the photographs as part of community-based education. The following quotes help to emphasise these points:

"They [photos and videos] are practical and help those of us who learn better by seeing pictures. That is also part of our culture – we like learning through stories. These cases are a bit like stories and the pictures and videos help with that. It is also much easier to visualise something that you tend to see in the field, rather than reading descriptions in the book. That is part of the recognition of patients with a particular problem. You can just go back to the photo in the group to refer to it and if you see it in the field you think "Aha! I have seen this before!" **Luke, CHW 7**

"We have shared some of those pictures with community members which helps them to understand too." **Albert, CHW 8**

Secondly, although they constituted a lower overall proportion of messages, the ability to send multimedia file types during the supervisory programme was also important given the nature of medical education. Much of diagnosis and subsequent management relies on an accurate visual diagnosis. For example, a pre-auricular sinus, which is a small hole usually located in front of the ear seen in the above WhatsApp exchange, can easily be identified by visual diagnosis.

More generally, the ability of CHWs to record and send voice messages and file types such as videos and photos helped to promote a social learning environment. The interactive nature of message exchange demonstrated in this study moves beyond the more traditional "information dissemination" models of learning that have predominated the existing literature on CHW training and supervision to date (Winters et al., 2019) which is an important finding. This builds upon Kearney et al.'s (2012) framework for mobile-facilitated learning, which promotes learning encounters that are collaborative in nature (Kearney et al., 2012). The ability of stakeholders to share such messages based on their own personal preferences also allowed personalisation of the supervisory experience, i.e. it allowed the user to exert a level of agency and customisation over their learning.

Similar to their CHW colleagues, the CHW peer-supervisors also appeared to prefer voice messages (n=219; 60.3%). However, they sent a greater number of text messages than their CHW counterparts (n=115; 31.7%). This pattern (of a high proportion of voice messages) was in contrast to the facilitators, who mainly sent text files. These represented 84.5% (n=712) of all files they shared. For a full breakdown of file types exchanged by sender category, please refer to Figure 22 in the Appendices.

***

In summary, this analysis suggests that the CHWs were able to use and willing to engage with WhatsApp as part of the supervisory intervention. This suggests that such an approach is a feasible way of supporting mHealth facilitated supervision in this context.

The nature of the WhatsApp intervention allowed a level of customisation (i.e. CHWs were able to send different file types based on their personal preferences) and also promoted collaboration through peer-to-peer exchanges and data sharing of real-world images relevant to their clinical practice in the community. This facilitated authentic and situated learning, which is in keeping with good pedagogical principles for mobile-facilitated learning.

However, it is also important to note there were varying levels of engagement between individual CHWs and that messaging frequency reduced over the six-month evaluation period. This suggests the need for understanding individual barriers to engagement as well as undertaking long-term evaluations to understand potential challenges with the sustainability of such an approach.

***

I will now present an in-depth analysis of the message exchanges in Section 9.4 in order to understand how the use of WhatsApp impacted on the nature of supervision.

9.4 An analysis of WhatsApp messages viewed through the lens of 'Supervision'

This section reports findings regarding the nature of supervisory exchanges facilitated by the WhatsApp platform. The methods underpinning this analysis have already been discussed in Chapter 8 (*see Chapter 8, Section 8.4.2 – 'WhatsApp Messages':231*).

i. Supervisory objectives

In terms of supervisory objectives, messages were most commonly exchanged under the category 'Communication and Information' (n=2148, 47.4%) followed by a 'Supportive Environment' (n=2057, 45.4%) and finally 'Quality Assurance' (n=323, 7.1%) (Figure 43).

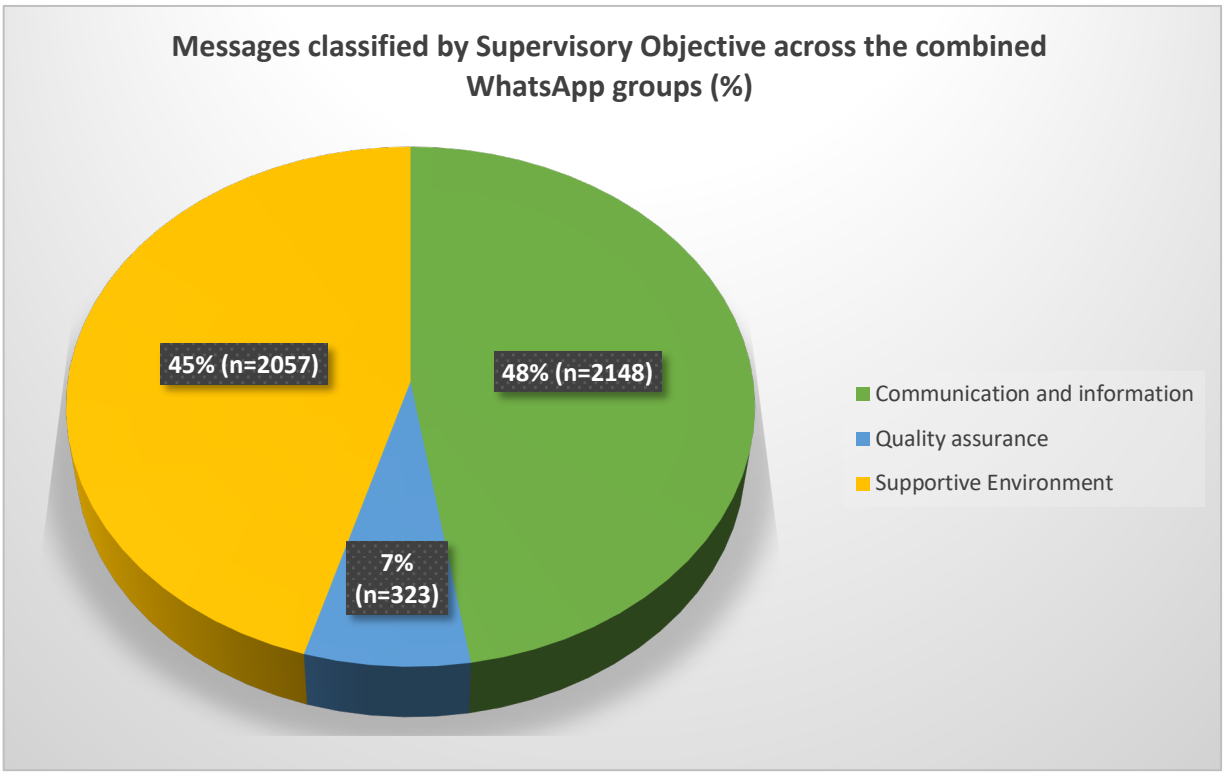


Figure 43 - A pie-chart summarising the total number of messages exchanged across the WhatsApp groups according to their supervisory objective.

Across both WhatsApp groups, the split of messages between the three Supervisory Objectives categories was relatively equal and a full summary can be found below in Table 13.

Supervisory Objective	Logistics Group n; (%)	Case-Study Group n, (%)	Combined groups n, (%)
Communication and information	1006; (43.7)	1142; (51.3)	2148; (47.4)
Supportive environment	1094; (47.5)	963; (43.3)	2057; (45.4)
Quality assurance	204; (8.8)	119; (5.4)	323; (7.1)
NA	*4782 (-)*	*5120 (-)*	*9902 (-)*

Table 12 - Total number (and percentage) of messages exchanged across the WhatsApp groups, classified by their supervisory objectives (N.B. Percentages may not total 100 due to rounding effect).

The major supervisory objectives of 'Communication and Information', 'Supportive Environment', and 'Quality Assurance' consisted of several sub-categories (Table 14).

Supervisory Objective	Sub-category	Logistics Group n; (%)	Case Study Group n; (%)	Combined groups n; (%)
Communication and information	***Acknowledgement***	109; (4.7)	45; (2)	154; (3.4)
	Clarifying information	106; (4.6)	42; (1.9)	148; (3.3)
	Evidence	81; (3.5)	21; (0.9)	102; (2.2)
	Giving Information	223; (9.7)	126; (5.7)	349; (7.7)
	Giving opinion	29; (1.3)	16; (0.7)	45; (1)
	Logistics and planning	293; (12.7)	58; (2.6)	351; (7.8)
	Making a request	81; (3.5)	28; (1.3)	109; (2.4)

	Reporting	3; (0.1)	0 (0)	3; (0.1)
	Requesting information	36; (1.6)	31; (1.4)	67; (1.5)
	Responding to a request	11; (0.5)	0; (0)	11; (0.2)
	Training	34; (1.5)	775; (34.8)	809; (17.9)
Supportive Environment	***Apology***	59; (2.6)	41; (1.8)	100; (2.2)
	Encouragement and Praise	219; (9.5)	156; (7)	375; (8.3)
	Greetings	295; (12.8)	331; (14.9)	626; (13.8)
	Moral Support	108; (4.7)	10; (0.4)	118; (2.6)
	Mutual Learning	27; (1.2)	58; (2.6)	85; (1.9)
	Religion	120; (5.2)	92; (4.1)	212; (4.7)
	Thanks	265; (11.5)	271; (12.2)	536; (11.8)
	Inspiration	1; (<0.1)	4; (0.2)	5; (0.1)
Quality assurance	***Consent taking***	3; (0.1)	2; (0.1)	5; (0.1)
	Follow up	1; (<0.1)	1; (>0.1)	2; (<0.1)
	Health Education	14; (0.6)	11; (0.5)	25; (0.6)
	Household Visits and Outreach Work	11; (0.5)	3; (0.1)	14; (0.3)
	Patient Management	101; (4.4)	86; (3.9)	187; (4.1)
	Record keeping	33; (1.4)	2; (0.1)	35; (0.8)
	Referral	16; (0.7)	5; (0.2)	21; (0.5)
	Reprimand	25 (1.1)	9; (0.4)	34; (0.7)

Table 13 - Messages exchanged by supervisory objective and sub-categories across the WhatsApp groups.

Across both WhatsApp groups, the most common reason for messages to be exchanged under the supervisory objective of **'Communication and Information'** was for training purposes (n=809; 17.9%). This was particularly common in the Case Study group, where 773 (34%) messages fell into this sub-category. Typically, these types of messages were sent as part of the bimonthly case-studies. Other common supervisory sub-categories falling under the objective of 'Communication and Information' included messages concerning 'logistics and planning' (n=351; 7.8%) and 'giving information' (n=349; 7.7%). Both of these sub-categories were more prevalent in the Logistics Group (12.7% and 9.7% respectively) than the Case Study group (2.6% and 5.7%).

Creating a **'Supportive Environment'** was also a major purpose of the WhatsApp groups and was the second most common supervisory objective under which messages were exchanged. Within this supervisory category messages classed as inferring 'greetings' (n=626; 13.8%), messages of 'thanks' (n=536; 11.8%) and messages of 'encouragement and praise' (n=375; 8.3%) helped to create a supportive supervisory environment.

Also under the objective of 'Supportive Environment' were religious messages which constituted 4.7% (n=212) of all messages exchanged. These messages were typically greetings around times of religious festivals such as Eid, Ramadan, or Easter, or messages of empathy containing religious connotations. Similarly, in the Logistics group, 108 messages were exchanged, aimed at providing 'moral support' which made up 4.7% of messages within this group. Illustrative examples of such messages can be found in Figure 44 below:

A

Message 838: Logistics Group – Voice message, CHW 4, 20th April 2019 at 7.42am:

Praise God. The most important thing for you is to believe in God and pray. You know Satan has so many plans but when you pray you win. The world has so many problems but we can overcome them through prayers. May He provide for you and bless you.

B

Message 847: Logistics Group – Voice message, CHW 4, 20th April 2019 at 3.19pm:

Nora, sorry about your sick child. We know God cares and good thing you took her to the health centre. Let's pray for you all. Francesca may God heal you. I wish you all a happy holiday and may God bless you.*

Figure 44 - A. An example of a 'religious' message. B. An example of a message consisting of 'moral support' and 'religion' sub-categories.

Although messages concerning **'Quality Assurance'** only comprised 7.1% (n=323) of all messages exchanged across the two groups, they often contained important messages relating to patient management. For example, the following message was sent in the Logistics group regarding a child with an ear infection; a case which one of the CHWs felt unable to manage by themselves and therefore they requested the assistance of their supervisors (see Figure 45).

Message 893: Logistics Group – Voice message, CHW 7, 29th April 2019 at 10.11am:

That child has a problem with the ear canal. Her ear canal has wounds on the sides and I would like some help like ear drops to apply to her ears. Mr. Bryan or Catherine* if you receive this please get back to me because I'll be at the health centre all day. I found her at Mwanyangiri and the health workers who came to Seeta Nazigo have ever worked on her. They gave her ear drops and the ear got well but now that she's having cough, it has started developing wounds discharging water but not pus.*

Figure 45 - A message categorised as 'Quality Assurance' which concerned the safe management of a patient.

Similarly, CHWs appeared to recognise their own limitations and used the groups to make referrals or request help or advice from the project facilitators, especially when encountering challenging clinical cases.

When my findings are compared to the small body of existing literature on the use of WhatsApp to support CHW supervision, there are some notable differences. For example, when compared to a previous study by Vu Henry et al. (2016), which explored the use of WhatsApp to support the supervision of CHWs in Kenya, the percentage of messages exchanged in the 'Communication and Information' category was proportionally higher, whereas the proportion of messages exchanged in both the 'Supportive Environment' and 'Quality Assurance' categories were much lower (see Table 15 below for comparative values).

	O'Donovan study	**Vu Henry et al. study**
Communication and Information	47.4% (↑)	33.4%
Supportive environment	45.4% (↓)	64.7%
Quality Assurance	7.1% (↓)	19%

Table 14 - A comparative breakdown of messages exchanged classified by supervisory category between my study and an earlier study by Vu Henry et al. (2016).

One potential reason why the CHWs in my study appeared to have exchanged a greater proportion of messages under the 'Communication and Information' category could be due to the nature of the WhatsApp groups'. For example, the Logistics group was specifically established to facilitate the transfer of messages concerning day-to-day planning. Under the supervisory objective category of 'Communication and Information' were several sub-categories, including 'training', 'logistics and planning' and 'reporting'. These types of messages were exchanged frequently and thus likely contributed to the high proportion of 'Communication and Information' messages. This is in keeping with findings from the study by Pimmer et al. (2017) from Malawi, where one of the primary uses of WhatsApp was to facilitate the exchange of messages between CHWs regarding planning and logistical

information about meetings, outreach work and training opportunities (Pimmer et al., 2017). This adds further evidence that one of the primary purposes of supervision in this setting is to support the administrative functions of the CHWs' jobs.

Furthermore, although the data suggest that few messages were exchanged under the supervisory objective of 'Quality Assurance' (7.1%), I was aware of informal discussions that occurred either in person, or through CHWs calling their peer-supervisors directly regarding patient management and referral. As a result, certain aspects of 'Quality Assurance' may not have been captured in this formal data analysis. Finally, although there were fewer messages shared under the 'Supportive Environment' category in comparison to the Vu Henry et al. (2016) study, almost half of all messages exchanged (45.4%) fell into this category, which still represents a significant proportion of messages sent. This suggests that the WhatsApp group played an important role in CHWs enacting supportive communal ties which help to create a supportive environment. As I suggested in Chapter Two, the ways in which features of supportive supervision are instantiated in practice are unclear within the existing literature, and so this provides important empirical evidence that a shared online group space can help to facilitate the more supportive aspects of supervision alongside the more technical and logistical facets. I explore the nature of these supportive communal ties in further detail in the following section of this chapter, where I analyse the 'Supervisory Interaction' codes for the underpinning sentiments of each message.

ii. Supervisory Interactions

The next component of the WhatsApp analysis focussed on understanding the nature of 'Supervisory Interactions'. Whereas the previous analysis of 'Supervisory Codes' focussed on the broad content of messages and the supervisory groups they fell into, this analysis placed more emphasis on understanding the sentiment underpinning each message. Importantly, this is one of the first studies to conduct a detailed exploration of the nature of

supervisory interactions occurring between individual stakeholders involved in CHW supervision. Coding for 'Supervisory Interactions' was performed deductively, using a modified version of a previously published coding framework for supervisory interactions adapted from Li et al. (2019), which I previously discussed in Chapter 8 (*see Section 8.4.2 – (iii) Coding of Messages:233 (Li et al., 2019)*.

Across the two WhatsApp groups, the majority of messages were either coded under the supervisory interaction category of 'Giving Information' (e.g. messages giving/clarifying/orienting factual information) (n=1354; 38.9%), or 'Positive Social Emotional Behaviour' (e.g. messages involving empathy/praise/thanks/positive greetings/moral support) (n=1048; 30.1%).

Conversely, the least common interaction codes across the two groups were "Minimal Encouragement" (e.g. short messages such as "Ok" or a quick repetition of the supervisor's words) which represented just 2.4% of all supervisory interactions (n=82), and "Negative Social Emotional Behaviour" (e.g. interactions where the sender was defensive, apologetic, or critical or where the message was tension-charged), which represented 3.3% of interactions (n=114).

When both groups were reviewed individually, this general observed trend regarding supervisory interactions remained constant. For a summary of messages coded by supervisory interactions, please refer to Figure 46 below.

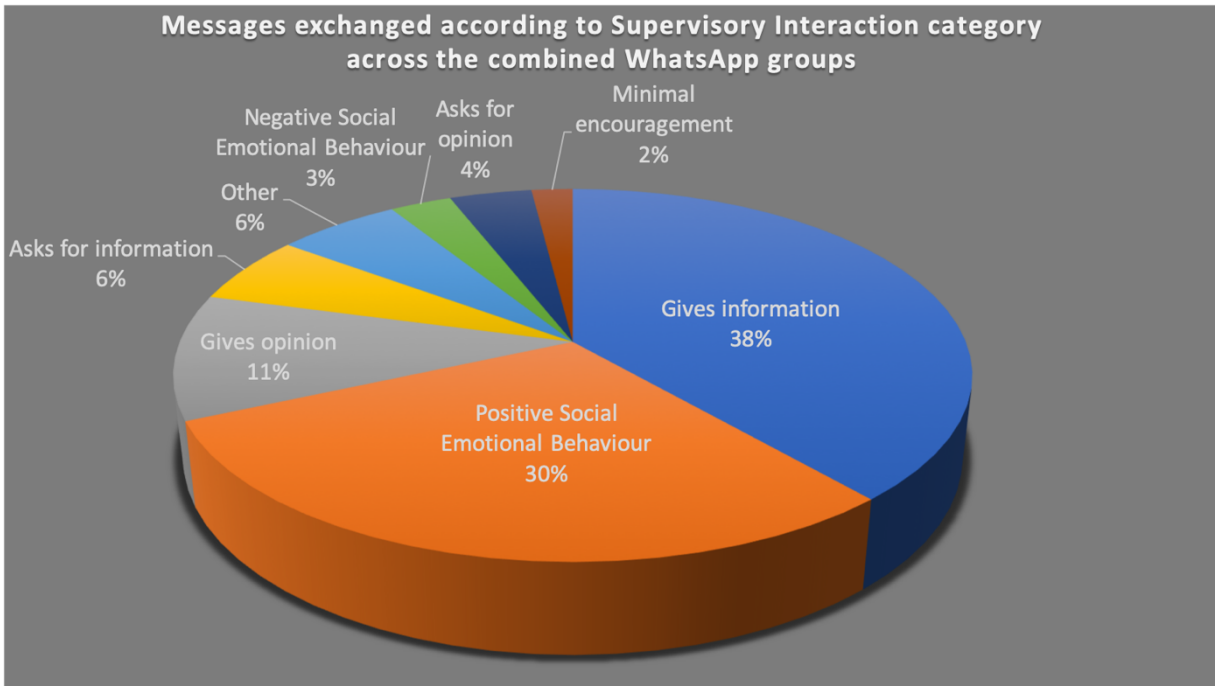


Figure 46 - A summary of messages according to Supervisory Interaction category.

This finding suggests that the vast majority of supervisory exchanges between individuals in the WhatsApp groups were positive in nature, rather than negative.

At a more nuanced level, messages involving 'Positive Social-Emotional Behaviour' were more likely to be embedded within a larger message. For example, the primary purpose of the message might have been to reply to a case study question. However, the sender may have also added on a greeting or message of praise within the same message. This is reflected by the fact that when the combined WhatsApp groups were analysed according to the level of interaction codes (i.e. primary, secondary or tertiary), 'Positive Social-Emotional Behaviour' messages comprised just 16.2% of Primary interaction codes, but 61.3% and 61.7% of secondary and tertiary interaction codes respectively. Similarly, 'Negative Social-Emotional behaviour' messages were more likely to be tertiary interaction codes (21.1%), than primary interaction codes (1.3%). For a full breakdown of messages by interaction code, please refer to Table 16 below.

	Minimal Encourager n; (%)	**Asks for Information** n; (%)	**Gives Information** n; (%)	**Asks for Opinions** n; (%)	**Gives Opinions** n; (%)	**Positive Social-Emotional Behaviour** n; (%)	**Negative Social-Emotional Behaviour** n; (%)	**Other** n; (%)
Logistics Group								
Primary interaction code	30; (2.5)	93; (7.9)	593; (50.2)	14; (1.2)	73; (6.2)	272; (23)	21; (1.8)	85; (7.2)
Secondary interaction code	16; (3.8)	30; (7.0)	60; (14.1)	16; (3.8)	23; (5.4)	247; (58)	34; (8.0)	0; (0)
Tertiary interaction code	1; (1.9)	1; (1.9)	4; (7.5)	0; (0)	0; (0)	33; (62.3)	14; (26.4)	0; (0)
TOTAL	**47; (2.8)**	**124; (7.5)**	**657; (39.6)**	**30; (1.8)**	**96; (5.8)**	**552; (33.3)**	**69; (4.2)**	**85; (5.1)**
Case-Study Group								
Primary interaction code	31; (2.5)	39; (3.2)	619; (50.6)	30; (2.5)	268; (21.9)	117; (9.6)	10; (0.8)	110; (9)
Secondary interaction code	4; (0.8)	36; (6.9)	72; (13.8)	24; (4.6)	26; (5)	333; (64)	22; (4.2)	3; (0.6)
Tertiary interaction code	0; (0)	5; (6.7)	6; (8)	4; (5.3)	0; (0)	46; (61.3)	13; (17.3)	1; (1.3)
TOTAL	**35; (1.9)**	**80; (4.4)**	**697; (38.3)**	**58; (3.2)**	**294; (16.2)**	**496; (27.3)**	**45; (2.5)**	**114; (6.3)**
Combined groups								
Primary interaction code	61; (2.5)	132; (5.5)	1212; (50.4)	44; (1.8)	341; (14.2)	389; (16.2)	31; (1.3)	195; (8.1)
Secondary interaction code	20; (2.1)	66; (7.0)	132; (14.0)	40; (4.2)	49; (5.2)	580; (61.3)	56; (5.9)	3; (0.3)
Tertiary interaction Code	1; (0.8)	6; (4.7)	10; (7.8)	4; (3.1)	0; (0)	79; (61.7)	27; (21.1)	1; (0.8)
TOTAL	**82; (2.4)**	**204; (5.9)**	**1354; (38.9)**	**88; (2.5)**	**390; (11.2)**	**1048; (30.1)**	**114; (3.3)**	**199; (5.7)**

Table 15 - Breakdown of Supervisory Interaction codes across the WhatsApp groups.

In terms of 'Supervisory Interactions' disaggregated by sender category, there were several notable trends.

Firstly, the Facilitators were proportionally more likely to send messages in the category of 'Giving Information' (n=509; 45%) than CHWs (n=656; 36.8%) or CHW peer-supervisors (n=182; 32.9%). This was true across both individual WhatsApp groups, but notably more so in the Logistics Group. Similarly, in the Case Study WhatsApp group, the Facilitators were proportionally more likely to send messages in the category 'Asks for Opinions' compared to their CHW supervisor counterparts (n=38; 6.6% vs. n=4; 1.9% respectively). These trends potentially reflect the overall role of the facilitators within this project, which was to coordinate the study as a whole, suggesting that they were more likely to be involved with these types of interactions.

Next, the proportion of messages categorised as 'Positive Social-Emotional Behaviour' sent by the Facilitators, CHWs and CHW-peer supervisors was relatively equal across the combined groups, and far greater in proportion than messages categorised as 'Negative Social-Emotional Behaviour'. Although there was no pre-intervention comparator, the results from this analysis suggest that the mobile-facilitated supervisory intervention facilitated largely positive-interactions between stakeholders.

This is important because one of the key elements of good supportive supervision, as outlined in Chapter 2, is the need to encompass elements of support through strengthening relationships in a holistic fashion. Similarly, we know from previous studies from Ethiopia, Kenya, Malawi, and Mozambique that supervision which places emphasis on fault-finding is one of the main demotivating factors for CHWs (Kok et al., 2018b) and so, in contrast, supervisory interactions that are positive in nature are likely to be important in improving

levels of motivation. This is particularly important in the context of Uganda, where CHWs are currently volunteers and attrition rates are high (Brunie et al., 2014). Ensuring that they remain motivated is therefore important in order to maximise chances of retention.

Next, it should be noted that the small proportion of messages categorised as 'Negative Social-Emotional Behaviour' were proportionally more likely to be sent by CHWs, rather than those in supervisory positions (i.e. CHW peer-supervisors, facilitators and healthcare professionals). This is important for two reasons. Firstly, the commonly held belief that supervisors are the ones sending negative, controlling messages is not always the case; when a supervisory network involving multiple stakeholders is established, negative exchanges sent by supervisees should be anticipated. Secondly, it highlights that supervisors may need to take on roles related to conflict mediation and should therefore receive specific training on this issue during initial supervisor training sessions.

In terms of positioning this analysis within the existing literature, little empirical data exists that explores the nature of supervisory interactions between CHWs and their supervisors, and so making direct comparisons is challenging. From the small body of literature that does exist, this study is different in that it attempts to explore the nature of supervisory interactions through a mixed-methods approach – combining quantitative analysis of the WhatsApp message patterns with qualitative analysis exploring the nature of the interactions. An existing study by Assegaai and Schneider (2019), which explored supervisory interactions between CHWs and their supervisors in South Africa, used a social network analysis (a quantitative method) to explore relationships (Assegaai and Schneider, 2019b). In this analysis, the presence and strength of relationships were calculated by using self-reported survey data to map interactions between key actors. In contrast, I used real-time exchanges

between stakeholders to conduct an analysis not only on the number of interactions shared on the digital supervisory platform but also the nature of these interactions.

For a full breakdown of messages coded by Supervisory Interaction and disaggregated by stakeholder category, please refer to Table 17 below.

	Minimal Encourager n; (%)	**Asks for Information** n; (%)	**Gives Information** n; (%)	**Asks for Opinions** n; (%)	**Gives Opinions** n; (%)	**Positive Social-Emotional Behaviour** n; (%)	**Negative Social-Emotional Behaviour** n; (%)	**Other** n; (%)
Logistics Group								
CHW	5; (0.7)	55; (7.2)	280; (36.6)	15; (2)	62; (8.1)	279; (36.5)	43; (5.6)	26; (3.4)
Facilitator	22; (3.9)	35; (6.3)	272; (48.7)	9; (1.6)	10; (1.8)	149; (26.7)	14; (2.5)	47; (8.4)
CHW peer supervisor	18; (5.7)	29; (9.1)	99; (31.2)	6; (1.9)	23; (7.3)	119; (37.5)	12; (3.8)	11; (3.5)
Health Worker	2; (10)	5; (25)	6; (30)	0; (0)	1; (5)	5; (25)	0; (0)	1; (5)
Case Study Group								
CHW	4; (0.4)	31; (3)	376; (36.9)	15; (1.5)	240; (23.5)	257; (25.2)	37; (3.6)	60; (5.9)
Facilitator	25; (4.4)	43; (7.5)	237; (41.4)	38; (6.6)	11; (1.9)	179; (31.2)	4; (0.7)	36; (6.3)
CHW peer supervisor	4; (1.9)	6; (2.8)	83; (38.4)	4; (1.9)	42; (19.4)	56; (25.9)	4; (1.9)	17; (7.9)
Health Worker	2; (22.2)	0; (0)	0; (0)	1; (11.1)	1; (11.1)	4; (44.4)	0; (0)	1; (11.1)
Combined groups								
CHW	9; (0.5)	86; (4.8)	656; (36.8)	30; (1.7)	302; (16.9)	536; (30)	80; (4.5)	86; (4.8)
Facilitator	47; (4.2)	78; (6.9)	509; (45)	47; (4.2)	21; (1.9)	328; (29)	18; (1.6)	83; (7.3)
CHW peer supervisor	22; (4)	35; (6.3)	182; (32.9)	10; (1.8)	65; (11.7)	175; (31.6)	16; (2.9)	28; (5.1)
Health Worker	4; (13.8)	5; (17.2)	6; (20.7)	1; (3.4)	2; (6.9)	9; (31)	0; (0)	2; (6.9)

Table 16 - Supervisory Interaction categories disaggregated by the sender job category.

Finally, when supervisory interactions were analysed longitudinally over the six-month study evaluation period, there were no clear trends observed across the WhatsApp groups suggesting a change in the nature of interaction categories over time (see Table 18 below) (i.e. over the course of the six-month evaluation period, the majority of messages sent across the WhatsApp groups each month were messages categorised as 'Giving Information' or 'Positive Social-Emotional Behaviour' and no major shifts in this trend were observed).

This leads me to critique the idea that change might indeed be expected to be observed over a longitudinal period of evaluation. Firstly, given the overall drop off in messages exchanged, I did not necessarily expect to observe any changes in supervisory interactions. Secondly, the lack of observed changes in behaviour could be due to the relatively short period of evaluation (*i.e. less than six months*). It also potentially demonstrates the complexity in facilitating change in practice, which cannot be expected to occur instantaneously (Dugas et al., 2020). The nature of the mobile intervention was complex and relied on multiple stakeholders interacting in a shared group around a topic (ear and hearing disease) that was relatively new to them. This is in contrast to more simplistic mobile health interventions, such as one-way messaging systems sending reminders or prompts to CHWs, where change in behaviour is less dependent on multiple dynamic factors. Such complex interventions should therefore be evaluated over a longer time period.

	Minimal Encourager n; (%)	**Asks for Information** n; (%)	**Gives Information** n; (%)	**Asks for Opinions** n; (%)	**Gives Opinions** n; (%)	**Positive Social-Emotional Behaviour** n; (%)	**Negative Social-Emotional Behaviour** n; (%)	**Other** n; (%)
Logistics Group								
February	18; (3)	56; (9.3)	249; (41.4)	15; (2.5)	33; (5.5)	173; (28.8)	20; (3.3)	37; (6.2)
March	12; (2.8)	37; (8.7)	171; (40.2)	9; (2.1)	27; (6.4)	142; (33.4)	10; (2.4)	17; (4.0)
April	5; (2.3)	10; (4.6)	68; (31.2)	2; (0.9)	19; (8.7)	86; (39.4)	16; (7.3)	12; (5.5)
May	9; (4.6)	12; (6.2)	91; (46.9)	2; (1)	3; (1.5)	60; (30.9)	12; (6.2)	5; (2.6)
June	3; (1.7)	8; (4.4)	65; (35.9)	2; (1.1)	11; (6.1)	76; (42.0)	10; (5.5)	6; (3.3)
July	0; (0)	1; (2.4)	13; (31.7)	0; (0.0)	3; (7.3)	15; (36.6)	1; (2.4)	8; (19.5)
Case Study Group								
February	9; (1.7)	40; (7.4)	235; (43.5)	13; (2.4)	77; (14.3)	128; (23.7)	20; (3.7)	18; (3.3)
March	5; (1.4)	12; (3.4)	132; (37.5)	3; (0.9)	50; (14.2)	89; (25.3)	4; (1.1)	57; (16.2)
April	16; (5.5)	5; (1.7)	60; (20.6)	22; (7.6)	90; (30.9)	84; (28.9)	5; (1.7)	9; (3.1)
May	2; (0.7)	13; (4.5)	116; (40.6)	9; (3.1)	46; (16.1)	81; (28.3)	10; (3.5)	9; (3.1)
June	3; (1.1)	7; (2.6)	119; (43.4)	8; (2.9)	27; (9.9)	92; (33.6)	5; (1.8)	13; (4.7)
July	0; (0)	3; (3.9)	34; (44.2)	3; (3.9)	6; (7.8)	22; (28.6)	1; (1.3)	8; (10.4)
Combined groups								
February	27; (2.4)	96; (8.4)	484; (42.4)	28; (2.5)	110; (9.6)	301; (26.4)	40; (3.5)	55; (4.8)
March	17; (2.2)	49; (6.3)	303; (39)	12; (1.5)	77; (9.9)	231; (29.7)	14; (1.8)	74; (9.5)
April	21; (4.1)	15; (2.9)	128; (25.1)	24; (4.7)	109; (21.4)	170; (33.4)	21; (4.1)	21; (4.1)
May	11; (2.3)	25; (5.2)	207; (43.1)	11; (2.3)	49; (10.2)	141; (29.4)	22; (4.6)	14; (2.9)
June	6; (1.3)	15; (3.3)	184; (40.4)	10; (2.2)	38; (8.4)	168; (36.9)	15; (3.3)	19; (4.2)
July	0; (0)	4; (3.4)	47; (39.8)	3; (2.5)	9; (7.6)	37; (31.4)	2; (1.7)	16; (13.6)

Table 17 - Supervisory Interaction categories disaggregated by month.

iii. Peer-to-peer exchanges

The final element of the WhatsApp analysis sought to understand the impact of the intervention on peer-to-peer exchanges. This was important because one of the suggested benefits of mobile group messaging spaces (*such as WhatsApp*) is the potential for peer interaction (Kearney et al., 2012). This is important because, according to Diane Laurillard who is a prominent digital education researcher, learners are more inclined to "improve their practice if they can share their outputs with peers; and will be motivated to improve their practice and augment their conceptual understanding if they can reflect on their experience by discussing their outputs with peers" (Laurillard, 2007:161).

Following an analysis of all 2405 messages, I found that a total of 729 peer-to-peer messages were sent across the two WhatsApp groups, representing 30.3% of all messages exchanged over the 6-month study period.

When this was disaggregated across the two groups, the proportion of peer-to-peer messages was approximately three times greater in the Logistics Group (n=529; 44.8%) than the Case Study Group (n=200; 16.3%) (Table 19).

Logistics Group		Case Study Group		Combined Groups	
Yes n; (%)	**No** n; (%)	**Yes** n; (%)	**No** n; (%)	**Yes** n; (%)	**No** n; (%)
529; (44.8)	652; (55.2)	200; (16.3)	1024; (83.7)	729; (30.3)	1676; (69.7)

Table 18 - Peer-to-peer exchanges across the WhatsApp groups.

The potential reasons for this observed trend could be due to several reasons. Firstly, the Case Study group contained more 'technical', structured, content primarily in the form of bi-monthly cases focussing on the diagnosis and management of patients with ear disease. The cases were designed and sent by the facilitators and required CHWs to suggest a diagnosis

and management plan for a hypothetical learning case. Given that it was primarily the facilitator who initiated and led the case discussion, it is possible that the CHWs felt it was not their role to provide peer feedback. This concept emerged during the FGDs. Similarly, given that some of the CHWs had not encountered this case in real life, they may have only covered the correct management plan during the initial training course in January. It is, therefore, possible that CHWs did not feel confident in suggesting alternative strategies to the case or correcting their fellow CHWs if they answered a case incorrectly. Indeed, the mid-point FGD held in April 2019 revealed that many of the CHWs felt uncomfortable in correcting their peers as it could be considered as a sign of disrespect (*a point which I discuss in more detail at a later stage in this chapter with illustrative quotes*).

When I then conducted a longitudinal analysis of messages based on their status as peer-to-peer exchanges, I noted that there were consistently fewer peer-to-peer exchanges in the Case Study group on a month-by-month basis between February and June, before a spike in peer-to-peer exchanges in July (Figure 47). In contrast, the number of peer-to-peer interactions in the Logistics Group was always comparatively higher than the Case Study group and although they fluctuated throughout the six-month evaluation period, the general trend was that peer-to-peer exchanges increased from the start of the project to the end *(see Appendices, Appendix Figure 23: X*).

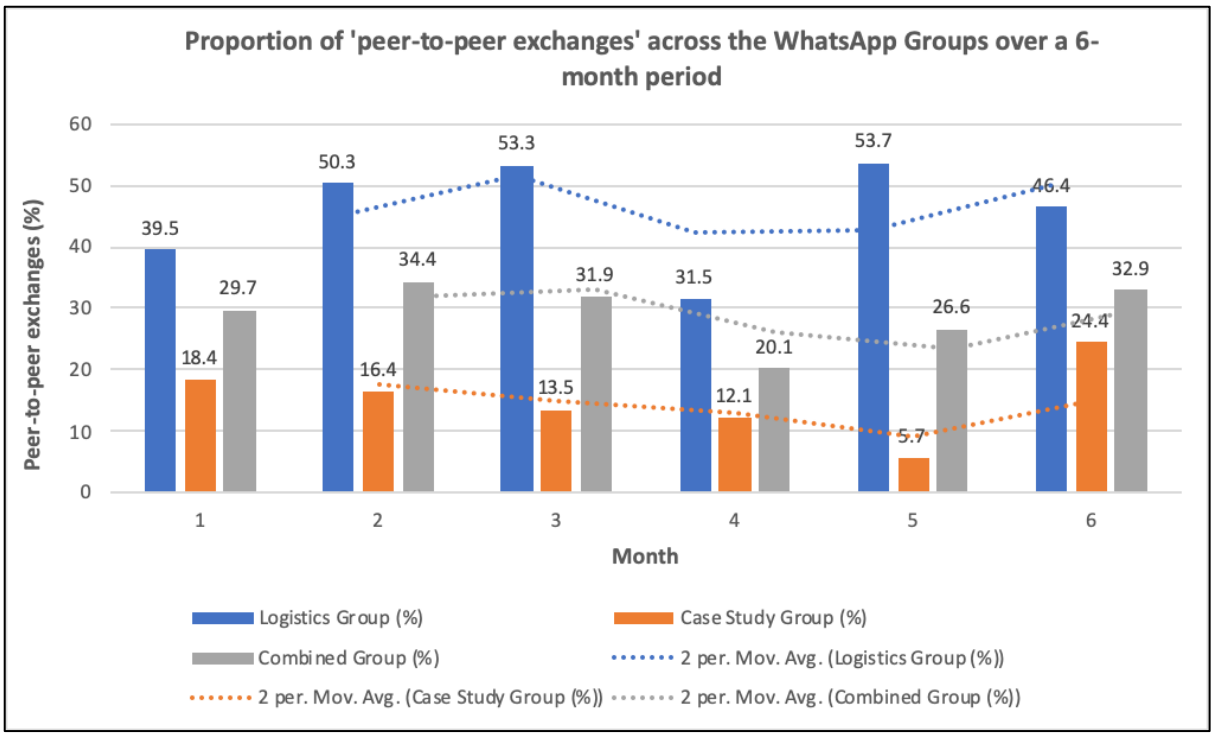


Figure 47 - A longitudinal analysis of peer-to-peer exchanges across the WhatsApp groups over a six month period.

The initially low rates of peer-to-peer exchanges in the Logistics Group could have been due to the prompt responses of the facilitators. For example, on the 8th of February 2019 a CHW peer-supervisor sent the following messages:

Message 6 – Photo message, CHW Peer Supervisor 1, 8th February 2019 at 4.40pm



Message 5 – Voice message, CHW Peer Supervisor 1, 8th February 2019 at 4.39pm:

"Now, I have just got a patient here. I gave her medicine but she still has pain in the right ear and some wax. This is the medicine that was given to her."

Message 7 – Voice message, CHW Peer Supervisor 1, 8th February 2019 at 4.40pm:

The medicine that is remaining is just for a day. What can I do for her? She is getting the treatment from Riubaga.

14 minutes later, a facilitator replied to the CHW peer-supervisor:

Message 8 – Text message, Facilitator 3, 8th February 2019 at 4.54pm:

Nora examine that patient again and see if she has pus or whether her hearing is good and ask her stop taking that medicine and then write your findings in the other book.*

In this exchange, the facilitator quickly responded to the CHWs question. However, it meant that the other CHWs did not give their opinions, and peer-to-peer learning was potentially hindered.

Similarly, in the mid-point FGD, CHWs explained that they felt less inclined to respond to their peers compared to a facilitator due to perceived hierarchies within the group, illustrated by the following quotes:

> *"The difference is if I ask I won't put Luke* [a fellow CHW] on tension. Whether he replies or not won't be a big concern to me. Now if I see a question from Dr. James, Jane* or David*, I will do everything I can to reply to it. I prefer it the way it is not to encourage laziness."* **Elizabeth, CHW 3**

> *We VHTs [CHWs] are almost equal to each other so we may minimise each other but when you our bosses ask something, we take it seriously".* **Alex, CHW 6**

Other CHWs were less inclined to give peer-to-peer feedback, even when they saw an incorrect answer to a case, as they felt this would be perceived negatively by their fellow CHWs (i.e. that they were criticising the incorrect answer, rather than providing constructive feedback) or that they felt they would be perceived as a "know it all":

> *"Also people are not easy. They may mistake correction for criticism that is why we just laugh and keep the answers to ourselves."* **Elizabeth, CHW 3**

> *"If we correct them (fellow CHW) they may think we are trying to minimize them or we feel we know it all. They always mistake correction for blame…"* **Alex, CHW 6**

> *"Truth about Baganda people is they don't want to be embarrassed. I want you to know that."* **Luke, CHW 7**

> *"The other reason why we don't correct them is after reading the question and giving our replies, we sit back and wait for the correct answer. After getting the right answer is when we go through people's replies to see who got it right and who didn't. We thought since Jane* gives us the correct answer at the end of the day, there's no need to correct the wrong ones."* **Isabelle, CHW 11**

As a result, during the mid-point FGD we found that many of the CHWs were exchanging private messages with their peers when it came to correcting each other. It is therefore likely that there were a significant number of peer-to-peer exchanges occurring 'offline', which I was unable to capture in my evaluation.

> *"…we go to their (private) inboxes and correct them. We are afraid of doing it from where everyone else can see because someone may get annoyed not knowing you were only trying to help."* **Julia, CHW 4**

At this point, it is essential to note that this element of my analysis was greatly enriched by drawing upon key examples of message exchanges from the WhatsApp groups, as well as my own understanding of what I saw emerging in the group over the six-month evaluation period. In this sense, the quantitative measures alone do not necessarily reflect the changes in practice I was observing and the increasing complexity of peer-to-peer exchanges.

For example, I noted that over time the CHWs began to create more of their own learning cases, which were based around issues they were identifying during their daily practice. For example, on the 8th of April 2019, one of the CHW peer-supervisors posted the following messages in the Case Study group:

Message 659 – Photo message, CHW Peer Supervisor 1, 8th April 2019 at 11.36am





Message 660 & 661 – Text messages, CHW Peer Supervisor 1, 8th April 2019 at 11.36am:

"The ear canal is painful and full of pus. What is the solution to the pinna?"

Importantly, through this messaging exchange, there are features suggesting a change in how supervision occurs. Firstly, instead of responding with an answer (which I may have done at an earlier stage in the study), I instead decided to mediate this exchange in order to encourage and prompt the CHWs to give their opinions on the case:

Message 662 – Text message, Facilitator 1, 8th April 2019 at 11.45am:

"I can assist with this and give a diagnosis but would be great to hear VHT's opinions first"

The other CHW peer-supervisor then responded with his ideas on how to manage the patient:

Message 663 – Text message, Peer Supervisor 2, 8th April 2019 at 11.56am:

As you can't do the ear wash out due to the pain, refer her to health centre to get the pain killer and then give antibiotics for a week. Apply 3 drops by 3 times a day.

It is also important to note that peer-to-peer exchanges extended beyond responding to the formal learning cases around ear disease and hearing loss. For example, in April in the Logistics Group, there was an exchange of messages around a video which was sent by one of the CHWs depicting domestic abuse against a child.

Message 770 Logistics Group – Voice message, CHW 4, 7th April 2019 at 8.18pm:

Edward, who sent you this video of a person who burnt the child's hands? Because we want to make a follow up as we the para social workers on children who suffer like this, Edward where did you get it from because it has really affected me.*

Message 771 Logistics Group – Voice message, Peer Supervisor 2, 7th April 2019 at 8.19pm:

Greetings Nalongo (Isabella), that video touched me so much but it is in Entebbe, I have a friend in Entebbe who sent it to me so I asked him whether it is a true story. He told me it is true, that lady they had reported her to police on several offences, but now she was arrested, someone captured her on camera and took the evidence to police now she is in prison.*

Message 772 Logistics Group – Voice message, Peer Supervisor 2, 7th April 2019 at 8.20pm:

I beg all the VHTs, whoever have seen the video, if you really have a heart and feel touched, we are not only on issues of diseases, but also issues concerning acts like this should be dealt with, if you know of such cases in your area, if you can't handle it alone, tell it to someone who can work on it to see how the condition can be. That's it.

Message 773 Logistics Group – Voice message, CHW 4, 7th April 2019 at 8.25pm:

Okay Edward, me too. I feel pain in my heart about it. We pray that the Government acts fairly, I also encourage the VHTs to bring up cases like this because we not only treat but we also work on cases like this especially on children because some of the VHTs we are para social workers who talk to parents, counselling and encouraging people, so if there are issues like this let's work together.*

This message exchange was initiated by the peer-supervisor and demonstrates an exchange of content including an important health education message in which the supervisor shares information, but also prompts the CHWs into thinking about what to do should they encounter a similar case in the future.

Over time, I also noticed that peer-to-peer exchanges began to become more detailed in nature and began to encapsulate topics of societal importance. For example, in July 2019 I noted a peer-to-peer exchange in the case-study group concerning the complex case of a young child in the community with malnutrition. The case was identified by one of the CHWs following the previous weeks 'formal learning case' which had focussed on malnutrition.

Message 1200 – Photo message, CHW 3, 8th July 2019 at 1.55pm



Message 1201 – Voice message, CHW 3, 8th July 2019 at 1.58pm:

Greetings fellow VHTs and thanks for the work you're doing. I found a malnourished child here that is carried by the mum in the photo above. He looks exactly as you see him in the photo. I am planning on checking him using the MUAC tape but have no one to help me shoot the video. I am home alone with my kids, and the mum to the patient doesn't know how to do it yet I cannot shoot it while checking. If there's any VHT around, please come help me. Also, I don't know why I am missing some VHTs' contacts like Nalongo Isabella, Karl* and others. I went to Karl's* place to seek for his help but didn't find him. Edward* is in Seeta so if there's any VHT around who can get to me in 40 minutes, please do because I need help. Catherine* or Bryan* if you're also able, please come help me and we check this child using the MUAC tape and also advise the mother on how to feed or treat her malnourished child. Thank you.*

Message 1215 – Text message, Facilitator 1, 14th July 2019 at 10.48am:

Hi VHTs - slight dilemma. We need your opinions on how to handle this matter. Harriet identified a malnourished child in Makata who had a red MUAC tape. The child is 10 months old. The mother has learning difficulties and has no money. She is not able to bring the child to the health centre where they will need to be for a few weeks while the child has the appropriate feed and medicine and is monitored. We have provided them with a referral letter but we want you to advise us on what you think should be done. Thank you.

In this exchange, one of the facilitators noted that there had been no replies to this case and therefore prompted the CHWs to respond to the message. Again, the facilitator did not intervene with their suggestions immediately, but rather encouraged the CHWs to submit their ideas. The subsequent message exchange highlights a peer-to-peer exchange focussed on problem solving. This involved a supportive environment of mutual learning, as well as quality assurance in the management of the patient. Furthermore, unlike previous exchanges, a greater number of stakeholders were involved in the discussion:

Message 1217 – Voice message, CHW 6, 14th July 2019 at 1.23pm:

This is my suggestion regarding the malnourished child that was found in Makata. We shouldn't deal with just the mum because she has mental issues. I know the child has a father though he's also not okay and a grandparent called Kigundu. I suggest VHTs within that area should explain to both the grandparent and father the situation at hand. They should tell them the child is malnourished and was referred to the health centre so that they also get involved. If they don't get involved, then a good samaritan will have to accompany them and stay with them in case they are admitted. If there's one, that's good but the child's relatives would have been the best. That's my opinion.*

Message 1218 – Voice message, CHW 2, 14th July 2019 at 3.10pm:

We heard about that child's situation and this is what happened. She was taken away from the mother by her maternal aunt when she was still very young. After failing to look after her, she brought her back malnourished. Her mother is not okay mentally but we have been advising her to take her to the health centre and to feed her on nutritious foods like soya and beans. Only challenge is both parents have mental issues. Andrew referred her to the health centre but she needs to go with someone. I heard like Francesca saying she would accompany her. Also, that child is not 10 months. She's about to make 2 years though she looks like she's below 1 year. We should encourage the father to get some money, and someone to accompany them to health centre IV in Mukono so that they get treatment. I think she mostly needs nutritious food and medicine as the health workers will prescribe. That's what I have to say but that child is way older than 10 months. We know when she was born.

Message 1219 – Voice message, Peer supervisor 1, 14th July 2019 at 3.35pm:

Greetings fellows. Since the one currently looking after the child has mental issues, there's a big problem. If Francesca said she will accompany them to the health centre, we appreciate it but we need to know their nearest VHT. We also need to know a relative who can get involved in this issue because we may dedicate ourselves to helping them and it becomes something else. We are all different. They may take it the wrong way and say we didn't involve them yet it appears they can no longer handle them. The VHT close to them should deal with their relatives who are not mentally ill to find a solution. In case they get treatment, the VHT has to monitor them to ensure they are being given food, medicine and that correct measurements are taken. This should be done with the help of the relative who should also accompany them to the health centre. That's my opinion.

Message 1220 – Voice message, CHW 1, 14th July 2019 at 3.54pm:

Greetings fellow VHTs and this is my suggestion about the child. It's true the child's father is around but is no better than the mum. The other relative is the paternal grandfather but he is 100+ years. I think much as the parents are not mentally okay, they have done something because the child looks better than she was when they had just brought her. I suggest if the child is given treatment, us VHTs don't stay very far from them and can check on them once in a while. The mother told me the problem is she doesn't take milk and only takes porridge after being forced. The other food she tries to eat is rice and posho. Also, she can hardly afford it but if she gets it, she's able to feed her. She's also capable of looking after her child since she's not that badly off mentally. I suggest if the child gets treatment, we can check on her every now and then to show her how to give it to her. That's my opinion.

Message 1221 – Voice message, CHW 3, 14th July 2019 at 4.04pm:

Greetings in the name of our Lord Jesus Christ. Thanks for all the work you're doing. About the issue at hand, I discovered the child. After discovering her, I was so touched because she's older than Jessi but see the way she is. Her mom came to see me after giving birth to Jessi* when she already had her four months ago. Jessi* was only one week and a half then. I found that child in a terrible condition and was able to talk to the father but he showed me he can't do anything about it. I was very touched and wanted to take away the child from them so she could stay with me, but then I would be having many children to look after. I already have Peter* and Jessi* and I am usually busy. Due to that, I decided to leave the child with her parents but this is what we agreed on. She brings the child to my place every morning and I prepare for her heavy breakfast that I feel would be helpful. Also, that child takes milk. She is sick therefore her appetite is quite low but I usually give her milk and pack some for her to take back home. I give her the amount I can afford since I don't have cattle. She eats everything we give her like matooke, rice and Irish potatoes. She always leaves my home at around 11am or midday. I also give her food to eat later on. I suggest that unless someone is going to accompany her to the health centre, she shouldn't go because she won't handle.*

Finally, the peer-to-peer exchanges that took place across the WhatsApp groups suggest that supervision should not be considered as a dyadic interaction between 'supervisor' and 'supervisee' but as a network of multiple interactions between many different stakeholders. This is a concept that has been reflected in other studies concerning CHW supervision and adds to the growing evidence base that CHW supervision should be reconceptualised. For example, Pimmer et al. (2017) described CHW supervisory interactions through a WhatsApp platform in Malawi as "multilateral and cross-hierarchical, involving both pull and push mechanisms" (Pimmer et al., 2017).

***

In conclusion this phase of analysis suggests that WhatsApp largely served as a way to support communication and information, and promote a supportive environment amongst the CHWs. Although it was used to a lesser extent for quality assurance purposes, this supervisory model did help to link CHWs at the village level with ENT specialists located remotely, which facilitated timely and accurate diagnosis. This could serve as an important model for supervision in other resource limited settings.

Next, I found that interactions were largely positive in nature, which suggests that a mobile facilitated form of supervision might help to promote some of the ideals of "supportive supervision". Finally, peer-to-peer interactions took place on the WhatsApp group and became more detailed and situated during the final month of the project. These types of interactions should be promoted and supported by the supervisors, since they represent an important opportunity for mHealth based supervision that is dialogical in nature and builds upon established pedagogical theories of socio-cultural learning.

I now discuss some of the challenges encountered by the CHWs when using the mobile supervisory platform in section 9.5.

9.5 The perceived challenges of the use of mHealth to support CHW supervision

In this section, I build upon the findings in Chapter 6, in which I explored the opinions of key stakeholders involved in CHW supervision regarding the hypothetical challenge of taking an mHealth approach towards CHW supervision (*see Chapter 6, Section 6.2.5 – The perceived roles and challenges of mobile technologies in facilitating supervision:186*). Here, I focus on the actual realised challenges of the mobile component of the blended supervisory intervention from the perspective of the CHWs.

The perils and pitfalls of mHealth initiatives to support healthcare professional are less well documented than the potential promises (Chib, 2013). However, understanding some of the barriers is important, not only for our understanding of supervision in this context, but also for other researchers aiming to undertake similar work in the future.

i. Technical challenges

The technical challenges of mobile-based interventions for health workers in LMIC settings, such as poor cellular connectivity, unreliable electricity supplies, and malfunctioning hardware, have been extensively documented in the existing literature (Feroz et al., 2020, Odendaal et al., 2020, Schoen et al., 2017, Thondoo et al., 2015) and this project was not an exception.

During the mid-point FGDs, it was noted that some CHWs were experiencing problems with their phones, ranging from technical issues (e.g. the poor performance of the phones), to operational issues (e.g. being unsure of how to maximise the use of the phone to its full

capacity) and broader infrastructural issues regarding the mobile network (e.g. poor reception in remote areas). This is illustrated in the following series of quotes:

> *"The only challenge is I have not yet mastered using most of the other apps and I will need help on that."* **Elizabeth, CHW 3**
>
> ***"**The difficulty I have is I don't know how to take pictures and share them..."* **Albert, CHW 8**
>
> *"When we received smartphones some people were already having them therefore conversant with their usage, but the ones we have now tend to become complicated. They slow down and one has to keep switching them on and off. The good thing we have people to help us each time we get problems with them"* **Susan, CHW Peer Supervisor 1**
>
> *"The problem I face is network where I stay. James once came and we looked for it in vain. We later on got it from one of my patients' households."* **Rosetta, CHW 12**

As a result, a refresher workshop was held to troubleshoot technical challenges. This was in keeping with the iterative nature of action research and was a form of 'reflection', 'action', and 'modification' based on participant feedback. The 'action' taken included distributing one new phone to a CHW whose phone was malfunctioning, as well as nominating two CHWs to act as peer-technical supporters. These were CHWs who were comfortable with the use of smartphones to help their fellow CHWs should they encounter any technical challenges.

It should be noted that even before nominating the peer-technical supporters, peer-to-peer problem solving was occurring informally. For example, the following exchange took place in the Logistics group early on in Phase Three (*February 2019*) when one of the CHWs had a problem with his phone:

Message 185 – Voice message, CHW 1, 13th February 2019 at 2.53pm:

Luke did you get any message from Gordon*. He is saying his phone has a problem. It is like the messages are not coming. Since morning he's not got a message.*

Message 186 – Voice message, CHW 7, 13th February 2019 at 2.54pm:

Gordon - his messages are not in the group. Let him go to the group which has a profile picture of VHTs. Now here you are using this big group. You need to use an alternative group. I have told him to use that other group. Any problems just let me know. I can help others. If there are problems tell him to come to me and I will help him.*

Message 187 – Voice message, Peer Supervisor 1, 13th February 2019 at 2.57pm:

Francesca - tell Gordon* to switch off his phone, for 2 minutes. Then let him switch it on again. It will work again.*

Similarly, the following comment was made by another CHW during the FGDs:

> *"I didn't know how to take pictures to share with you but now one VHT [CHW] has taught me how to do so and I am going to begin taking them."* **Dina, CHW 9**

Other CHWs resorted to asking family members (such as their children) to help them, as evidenced through the following quotes:

> *"…if I want to learn something new, I make use of my children and grandchildren. They are good at it because they own smartphones"* **Alex, CHW 6**

> *"I have a girl at my home who completed university. You know they are usually way better than us in using them [smartphones]. They save their money without our knowledge and get themselves smartphones. It may not necessarily be a problem, but I may want to know how to text faster. She actually told me about the options of words that are given below before one completes typing the whole word. I didn't know about that."* **Susan, CHW Peer Supervisor 1**

Yet, despite these efforts to address some of the technical challenges, CHWs and peer-supervisors unanimously stated in the post-intervention interviews that some of the major challenges they still faced were technical issues. These ranged from poor network connections (*especially in remote and rural regions*), to a lack of reliable mains electricity

to charge their phones (*although the provision of portable solar chargers appeared beneficial in alleviating this challenge*).

> *"Our biggest challenge with mobile phones is the network and I speak for most of us when I say that. There are times when we would like to communicate with our supervisors but cannot because of network issues. Sometimes I send voice messages and they fail to get delivered due to poor network. My supervisor is always asking why I don't reply to questions in the case group but it is the reason why. At times they get delivered a day after the question is asked."* **Rosetta, CHW 12 (*post-intervention interview*)**

> *"I don't see any challenges besides network issues. Also, the battery for smart mobile phones runs low really fast so we have to constantly charge them yet some of us have no electricity in our homes…but because we have the power bank this isn't so much of a problem."* **Josephine, CHW 1 (*post-intervention interview*)**

Importantly, it should be noted that unlike in the mid-point FGDs, in the post-intervention interviews no CHW raised the issue of 'digital literacy' as a challenge or barrier to using the mobile platform for supervisory purposes, potentially suggesting that the election of peer-technical supporters helped to address this challenge and that they became more comfortable using the phones over the duration of the project.

These technical challenges could also help to explain the significant range of messages exchanged amongst the CHW stakeholders. For example, CHW 12 sent 62 messages across the two groups, compared with the combined group average of 97.8 (±53.6); however, following in-depth interviews it was revealed that she struggled to connect to the internet. She lived in one of the most rural areas with poor connectivity and when I visited her we had to find a local 'hotspot' 200 meters from her home on a hill, where she could go once or twice a day to send and receive messages. This was clearly not ideal, but was a pragmatic solution at the time which allowed her to still participate the project (*albeit in a more limited fashion*). These technical barriers mean that the voices of the more active CHWs could dominate interactions across the groups, and thus potentially marginalise other less vocal

CHWs. To try and address this challenge, facilitators must take an active role in encouraging equal participation where possible. Although I actively tried to address this in the study, by encouraging seemingly less active CHWs and reminding the other facilitators to do the same, it became apparent that some of the seemingly less active CHWs had technical challenges that presented a barrier to equal participation.

ii. Challenges with shared learning spaces

Beyond the technical challenges, another theme noted from the post-intervention interview analysis concerned challenges related to a shared learning space. Although the majority of CHWs were happy with a group approach towards supervision, this was not always the case. For example, a small number of CHWs felt uncomfortable correcting their peers in a public forum, since they felt that their feedback would be interpreted as critical in nature (*rather than constructive*) as demonstrated through the following quote:

> *"Also…sometimes if people give a wrong answer, then I sometimes do not want to correct them in the shared group as otherwise I might be accused of being a wise-acre. In our culture it is not good to correct others, especially adults, in front of the others even if you know they are wrong. However, over time this project has taught us it is ok for us to be wrong so that has improved slowly. I think that is why at first we were seeing lots of wrong answers."* **Elizabeth, CHW 3**

This challenge - of CHWs feeling uncomfortable with providing peer-to-peer feedback on the case-studies - was not limited to the mHealth component of the blended supervisory model and was mirrored in some instances during in-person household visits. Some CHWs stated that they did not like to receive peer-feedback in front of other people in the community, since this was outside of accepted social norms:

> *"I feel like they (CHW peer-supervisors) are crossing the line which upsets us. The reason I am saying that is because they feel like they are better than the rest of us in this project, which is not the case because we received the same training. I don't like it when they accompany us to home visits and act like they are better than us in examining and diagnosing in front of the patients."* **Elizabeth, CHW 3**

This finding contrasts with previously published literature, which encourages group approaches to CHW supervision. Indeed, in a study by Strachan et al. (2012), key stakeholders involved in CHW supervision planning were interviewed and proposed that group supervision approaches can help with "feeling part of a team and creates a less intimidating learning environment [and] is motivating for CHWs" (Strachan et al., 2012:114). It is therefore important to note this important counter-narrative and that this approach may not be appropriate in certain contexts. It also suggests that one of the benefits of having a diverse model of supervision is that learners can find supervisory styles that suit their style of learning. For example, those CHWs who prefer to engage in group discussions can play an active role in this element of supervision. In contrast, those who prefer to have one-to-one support could potentially engage in private individual discussions with their supervisors away from the shared learning space. It is also important to add that this finding only emerged during the post-intervention discussions. Despite undertaking an in-depth period of exploratory work in Phase One, where key stakeholders were asked about the potential challenges of adopting a mobile-based approach to supervision, this was not raised. This demonstrates that despite the participatory approach being extremely important and helping to alleviate many of the potential challenges, it cannot be viewed as a way to foresee every issue that might arise.

It is also possible that some CHWs did not feel comfortable sending messages within the shared learning space, which is commonly referred to as "silence of participants" in the field of online learning (Xin and Feenberg, 2007). Equally, the style of the WhatsApp messaging platform often made it challenging to easily understand who was active and who was not, given that the messages simply appeared in a group chat. Features could therefore be added to platforms such as WhatsApp in the future with the specific focus of understanding

individual user activity. Automated or customisable prompts could be built into the platform, encouraging less active CHWs to submit their responses.

The second issue with a shared supervisory platform concerned privacy issues – an issue which had been raised as a potential challenge in the pre-intervention interviews (*see Chapter 6*). Specifically, it was revealed that some CHWs had gathered members of the community (who were not part of the project) to listen to 'incorrect' responses to the case study questions sent by other CHWs:

> *"It is about us CHWs conduct. Some people gather community members that are not even a part of the project and begin discussing our answers from the case group, mocking and laughing at them. It makes us lose the little respect we had gained from them because they see us as incompetent or stupid and even refuse us to treat them. I think we deserve some privacy. I suggest you do something about it otherwise I am afraid people will lose morale and drop out of the project…"* **Susan, CHW Supervisor 1**

This raises several important issues. Firstly, it brings into focus the culture of the online learning space, which has been referred to in the wider education literature as "the culture of the classroom" (Bantwini, 2019:216). In this context, culture can be defined as "the dominant values and beliefs that influence decision-making" (Bates, 2018a). Bates suggests that the underlying culture of a classroom influences all other elements within it and understanding it is critical for effective online learning (Bates, 2018b). In the context of the WhatsApp group as a space for learning, this issue raises questions around whether or not CHWs would feel able to respond openly to answers without fear of being judged, given that their answers were not being kept confidential. Secondly, it raises concerns around how this might have negatively impacted community members' perceptions of the project, given that post-intervention interviews suggested certain members of the community were already resistant to the CHWs inspecting their ears, out of fear they were not properly trained and could cause them harm. If the CHWs instigating this negative behaviour were dominant members of the

group (*for example, CHW peer-supervisors who were elected by their peers*) changing this culture might prove to be particularly challenging. This further strengthens the need to have supervisors who are aware of the underlying cultural context and supervisors who are trained and able to mediate these tensions in order to facilitate an environment conducive to supportive supervision.

I was, unfortunately, unable to explore these two points in more detail, since this issue was raised in the post-intervention interviews at the end of my fieldwork. However, it would be valuable to explore how this impacted on participation (both from the CHWs and community members perspectives), and this is something that could potentially form the basis of post-doctoral work. Thirdly, it raises the broader question around protecting patient data from being shared. It is important to note that although I am unaware of CHWs discussing patient information with members of the community, this is a hypothetical challenge which should be considered in future work, especially when using a shared online space.

This challenge, around data security and privacy, has been critiqued in the literature on mHealth interventions (Arora et al., 2014). Given the potentially sensitive and personal information that is being shared about patients, this presents a further added challenge to the use of mHealth as a means to facilitate supervision. One of the specific challenges in this study was striking a balance between the use of 'real-life' data to help supplement contextualised learning, and the risks of putting participants at risk if sensitive information was shared inadvertently. Although I tried to minimise this risk through technical factors, such as password-protected phones, and through behavioural interventions, such as encouraging the CHWs not to share identifiable patient information, these isolated incidences suggest the use of mHealth is not without challenges. At a macro-level, there is currently a lack of guidance and regulation around the data security and privacy elements

of mHealth interventions for training and supervision, and greater attention must be placed not only on developing these, but implementing them in practice at scale.

iii. Technology overload

The final challenge concerning the use of mHealth to facilitate supervision was the concept of 'technology overload'. Over the course of the project some of the CHWs began to take on paid work for other NGOs alongside their volunteer work. Some of these other organisations provided them with additional equipment, such as SIM cards and mobile phones. One of the CHWs commented on how she found this dual responsibility to be challenging.

> *"The challenge I faced was with my two SIM cards. I now work for another organisation alongside this project and I use the MTN line for their work, so I didn't want to mix them up with the line for this project. The AirTel line that I use for this project was giving me issues though and making work hard for me because I was missing many updates. I kept switching the SIM cards between my phone to get various updates…that was confusing and frustrating."* **CHW 4**

With the increasing number of NGOs involved in the training and supervision of CHWs in Uganda (Agarwal et al., 2019a) and the growing use of mobile technologies to support them, this is a challenge which is potentially set to become increasingly prevalent. For example, by the end of the study, one of the CHWs was working for three different NGOs (*NGO A, Healthy Entrepreneurs and Living Goods*) and was given three different phones and tasked with multiple different responsibilities by each NGO. There was not only an increasing burden being placed upon her time, but also a growing sense of "digital burden" where she became busy replying to messages and tasks from each individual NGO she worked for. This problem was partly caused by the lack of communication between the different NGOs in the district. There is therefore a potential danger that mobile interventions begin to become

burdensome and add to the complexity, rather than play a facilitative role in the CHWs work responsibilities.

9.6 Referral pathway creation

One of the other important findings to emerge from Phase Three was the creation of local referral pathways to manage the cases of ear disease which were detected in the community. This represents an important finding given the emphasis placed on the health systems strengthening component of my work.

When the CHWs found a case in the community that they were unable to manage, or needed a second opinion on, they had a number of potential referral routes available to them. I describe these routes here:

1. ***Local referral***

The first option was for the CHW to make a local referral to Health Centre III A, where the patient would be seen by one of the RAs or the clinical officer. One of these individuals would review the patient history obtained by the CHW to confirm that it was accurate. They would then use a digital otoscope to examine both ears, capturing still or video images of the affected ear(s) on their mobile phone. If the diagnosis was straightforward and clear, the case would then be managed locally (e.g. if only antibiotic drops needed to be applied, this was done locally).

Where the diagnosis or management plan was less certain, the images captured on the digital otoscope, along with a brief clinical history, would be sent to the team of Ugandan ENT specialists via WhatsApp in a closed group. The ENT specialists would review the image (which was accompanied by a brief clinical vignette stating anonymised demographic details and key symptoms) and examination findings and relay a plan to the local project team.

ENT specialist referral

For those patients with complex conditions or cases where a definitive decision could not be reached by the CHW or the local referral team, an in-person ENT specialist review was arranged by the research team. A community-based ear camp was organised every two months during Phase Three at Health Centre III A by the research team. One of the Ugandan ENT specialists involved in the project would travel to the health centre from MRRH to host the ear camp. This model was designed based on feedback from Phase One, which highlighted that many patients were reluctant to travel to Mulago National Referral Hospital in Kampala due to a lack of transport, negative past experiences and inability to pay clinicians. We therefore tried to minimise barriers to accessing specialist services by providing a community-based ENT review service. Although the health centre did not have the necessary facilities for the ENT surgeon to perform surgeries, the ENT specialist was still able to use basic portable equipment to perform diagnosis and simple non-surgical management. This included removing ear wax or foreign bodies, performing washouts of the ear and instillation of antibiotic drops for patients with CSOM, in addition to making onward referral plans. The ENT specialist undertook this role in a voluntary capacity; however, their transport, meals and accommodation were covered by the project budget.

A day before the community ear camp, a CHW would travel to the local villages involved in the project on a boda-boda and would use a loudspeaker to inform community members that an ENT specialist would be present the next day at Health Centre III A to review and treat patients (Figure 48).



Figure 48 - Informing residents of an upcoming ear camp. A CHW with a loudspeaker sits on the back of a boda-boda informing residents of Seeta Nazigo Parish of an upcoming ear camp.

On the day of the ear camp, patients would arrive at the Outpatient Department Health Centre III A from 8am onwards. Each patient was then reviewed in turn by the ENT surgeon who would obtain a short clinical history and examine the ears (Figure 49). The consultation was done in the presence of the two RAs and, where possible, the CHW who referred the patient. This was so that the ENT surgeon could demonstrate and talk through their findings to the CHW in person (Figure 50).

One RA would document the findings of the clinical review on a data charting form. This would include details such as the patient's demographics, the CHW responsible for their care (in case they required follow up), the diagnosis, and the management plan. The second RA

would assist the ENT surgeon by preparing equipment (for example, washout solution if the patient required an ear washout).



Figure 49 - An ENT surgeon reviews a community member at the ear camp. Dr Nyanzi (ENT specialist, MRRH) consults a community member at the ear camp held in May 2019.



Figure 50 - In-person training at the ear camp. Dr Nyanzi (ENT specialist, MRRH) observes David (RA, NGO A) conducting a digital otoscopic examination of a patient and explains to Elizabeth (CHW, Kavule village) what he is seeing on the screen.

For any ambiguous images where the ENT surgeon required a second opinion from a colleague, the image of the tympanic membrane would be captured on the digital otoscope. This was subsequently forwarded to a WhatsApp group where the other ENT experts involved in the project could give their opinions on the diagnosis and management plan.

Where necessary, for cases which required surgical input (e.g. cholesteatoma[41]), or for more general head and neck cases (e.g. patients with a suspected head or neck cancer), a HMIS 032 referral form was completed by the ENT specialist for the individual to attend a specialist hospital for further investigations and assessments that were not possible at the community ear camp (Figure 51).



Figure 51 - Completing a referral form. Dr Nyanzi completes a HMIS 032 referral form for a patient with suspected nasopharyngeal carcinoma.

[41] A cholesteatoma is uncommon, but potentially life-threatening condition. It is a skin cyst which grows into the middle ear and mastoid (the bony air-filled structure just behind the ear). Over time this can erode tissue and cause destruction of the ear. In severe cases, it can also lead to severe infections such as mastoiditis or meningitis and is therefore an important condition to recognise.

Over a six month period, 312 individuals were reviewed in the community by the CHWs. Of these 298 (95.5%) were classified as having an abnormality with their hearing or ears following the process of taking a history and conducting an otoscopic examination and whispered hearing test. 167 patients were managed directly in the community by the CHWs, however 131 patients who could not be managed in the community, or those who required a specialist opinion, were invited to attend one of the ear camps.

In total, 78 individuals attended the three ear camps held in March, May and June of 2019. Of these 51 had been directly referred by the CHWs, representing a 38.9% attendance rate of all CHW referrals (n=51/131). For those individuals who did not attend the ear camp, but who had been referred for ENT assessment, CHWs were advised to follow up these patients directly in the community[42]. A further 27 individuals self-presented to the ear camps having heard about the project in their community, but who had not been assessed in the community by the CHWs. For equity purposes and ethical reasons all patients were assessed at the camp regardless of whether they had been referred by a CHW or self-presented.

To assess the diagnostic accuracy of the CHWs, we compared their diagnosis with that of the ENT specialist for each of the 51 patients who they referred to the ear camps. There was exact agreement on diagnosis in 39.2% of cases (n=20), partial agreement in 17.6% of cases (n=9) and no agreement in 43.1% of cases (n=22). Despite the precise diagnostic agreement being 39.2%, 98% of the 51 referrals were deemed as "appropriate" by the ENT specialist (n=50). This suggests that CHWs are able to recognise cases which need an onward referral and specialist review. This means that where ENT specialist services are available, CHWs

[42] Specific reasons for non-attendance are beyond the scope of this study; however, they represent an important area for future work – in particular exploring the barriers to accessing ear and hearing care services in the community.

could serve as an important means of not only managing basic disease in the community, but also as an important triage service.

I have written up these clinical findings in detail in a paper which I have submitted to BMJ Global Health and which is currently under review.

9.7 Strengths and Limitations

In this section of Chapter 9, I discuss the general strengths and limitations from this phase of the study.

Study Strengths

This study adds to the relative paucity of literature exploring the use of mHealth to support the supervision of CHWs. In particular, this study addresses the absence of mHealth supervisory programmes for CHWs focussed on ear and hearing health– a neglected area of societal concern globally, especially in LMICs (O'Donovan et al., 2019b, Winters et al., 2018a).

I have built upon two seminal studies by Vu Henry et al. (2016), and Pimmer et al. (2017), both of which described the use of WhatsApp to facilitate the supervision of CHWs in Kenya and Malawi respectively (Pimmer et al., 2017, Vu Henry et al., 2016). Through this in-depth analysis, focussing on the nature of supervision through a pedagogical lens, I have attempted to address one of the primary critiques levelled at mHealth (*and indeed digital learning interventions more broadly*) which is that evaluation of such programmes traditionally places significant emphasis on the technical aspects, rather than the "organisational, social, and pedagogical aspects that are necessary for effective e-learning programmes in the workplace" (Wang, 2011:193). Through this in-depth, mixed-methods analysis exploring the

complexities of a digitally facilitated supervisory intervention, I have attempted to move beyond the common rhetoric of "*Did the intervention work?*", to exploring "*how and why*" it worked (Oliver, 2011).

Secondly, despite the suggestion that user engagement on the WhatsApp platforms decreased over time, one of the positive aspects to emerge from this programme has been the continued use of the mobile platform more than 12 months after the formal evaluation period ended. The WhatsApp groups continue to be moderated by David and Jane, and messages continue to be exchanged regularly. These messages concern the appropriate management of patients, logistical information, or are a way of encouraging each other - examples of which can be found below in Figure 52. This continued use of the WhatsApp platform is further proof that the use of mHealth to support supervision is both generally acceptable and feasible in this setting, and formal strengthening and expansion of this programme should be explored. I also continue to remain an active part of the WhatsApp groups and offer technical advice when asked and provide moral support on a regular ongoing basis. I now feel deeply connected to this community and so this ongoing collaboration has been important to me.

Fri 17 Jul

Margaret VHT

On paracetamol send us the dosage for children from 6months to 10 yrs 07:05

Margaret VHT

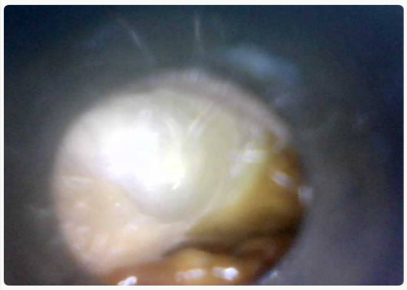


Hi doctor we got that package from the health center but we didn't get someone to teach us on how we can use them so I request you to send us some short video showing how we can use them so that we do not make mistakes 07:05

Hi Margaret 07:28

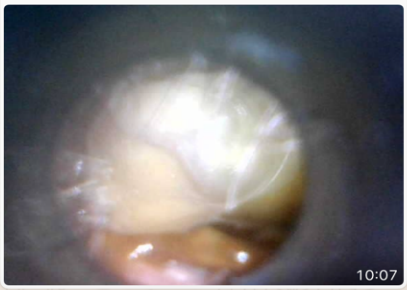
3 to 6 months	2.5ml	Max 4 times in 24 hours
6 to 24 months	5ml	Max 4 times in 24 hours
2 to 4 years	7.5ml	Max 4 times in 24 hours
4 to 6 years	10ml	Max 4 times in 24

Allan



This is the ear of the lady we just examined now. She has had several ear discharges in her right ear. 10:07

Allan

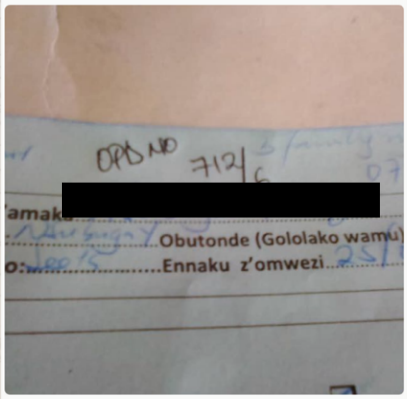


Allan



Thu 25 Jun

Margaret VHT



That's the number given to every ear patient in the opd register and it responsibility to make sure they get coz that's how the district or ministry will get to know that we are working. 17:48

Allan

Margaret VHT

That's the number given to every ear patient in the opd register and it responsibility to make sure they get coz that's h...

Wow, thank you Margaret! 17:49

Rebecca Hamala

Margaret VHT

That's the number given to every ear

You

Hello how did the camp go ?

The ear camp is doing well. We have another one tomorrow. Thursdays at Seeta Nazigo 11:28

I'm good ! 11:57

Oh well done guys 11:57

If you have any problems with patients please just reach out to me and I can help you all 11:57

Allan

Okay please, thank you. 15:08

Thu 16 Jul

Rebecca Hamala



At the health centre now seeing patients 09:53

Well done !!!! 09:57

Figure 52 - An example of messages exchanged after the formal evaluation period ended focussing on Quality Assurance aspects of supervision. Exchange (a) concerns safe medication dosage and exchange (b) concerns the diagnosis and management of a patient. (c) Messages concerning Quality Assurance i.e. patient follow up and (d) Communication and information e.g. logistics, planning and providing evidence of work.

Indeed, the continued use of this programme is particularly important given that one of the major challenges facing mHealth interventions in the context of 'global health' is short-term interventions, which cease to function or remain active after the formal evaluation period ends – a concept that has been termed 'pilotitis' (Huang et al., 2017). Such short-term interventions, which have a finite duration, have been suggested to not only cause distress to the households served by the CHWs, but also the CHWs themselves, who fear abandonment of their duties (Busza et al., 2018). It is possible that by taking a participatory approach to the original design of the programme and involving local stakeholders in the running and subsequent management helped to alleviate this risk.

This is also one of the first empirical studies to document a blended approach towards CHW supervision underpinned by a participatory approach. In terms of adaptability and transferability, a blended learning model, combining remote, real-time mobile-facilitated supervision with in-person supervision, may be a particularly useful approach in human-resource limited setting i.e. where there is a shortage of trained specialists to act as supervisors. This is not only true in LMIC settings, but also in remote and/or rural settings in HICs. Indeed, the challenges surrounding clinical supervision in non-metropolitan areas of the USA have been widely documented in the existing literature (Ducat and Kumar, 2015, Kumar, 2013).

One of the other positive aspects of this intervention was the tailored nature of cases, based on real-world data collected by the CHWs, to suit their specific learning needs in a contextually relevant manner. To my knowledge this is one of the first times this has been

attempted in the literature. In this particular study, the focus of the cases was on ear-disease and MNCH issues, but this focus could naturally be adapted as appropriate. This method, of tailoring learning to be reflective of issues that the CHWs are encountering in their daily practice, has the potential to ensure that they are better able to "adapt their practices to local concerns" (Bates et al., 2019:16).

Study Limitations

This phase of my study was not without limitations. The first was the limited time frame over which this intervention was evaluated. However, given the time constraints of my DPhil I was only able to designate a six month period to evaluate this phase of the study and deemed this sufficient based on previous similar studies (Pimmer et al., 2017, Vu Henry et al., 2016). Despite the CHWs ongoing engagement with the WhatsApp platform, I am unable to make formally evidenced claims around long-term user engagement and the observed trend of decreasing message frequency over the six month period warrants further exploration. I therefore plan to conduct post-doctoral work which assesses the long-term impact of this supervisory intervention.

Furthermore, not all supervisory interactions were captured. Informal supervisory interactions that take place in person have also been documented in the wider literature on CHW supervision (Assegaai and Schneider, 2019a), which makes capturing the exact nature of supervisory interactions as they occur in practice challenging, particularly with limited resources. For example, I was aware that some CHWs sent direct messages to their peers regarding work-related issues. Since these interactions did not take place on the public WhatsApp group (but rather in private message exchanges), these types of supervisory exchanges are not reflected in my analysis. The reason for this was because I deemed it inappropriate to analyse CHW's private messages out of respect for their privacy. Similarly, I

am aware that my evaluation did not capture in-person supervisory interactions that occurred between the CHWs and their peer-supervisors. I felt that formally observing and recording in-person supervisory sessions may alter the way in which supervision occurred, as some of the CHWs and supervisors may have inadvertently altered their practices as a result of being observed. Secondly, the primary purpose of my analysis was to specifically explore the use of mHealth to facilitate supervision. Given that I had limited time and resources, I decided to concentrate my efforts on analysing this component of the blended supervisory model, rather than the in-person component. Had I been fortunate enough to have more resources, then I would have formally analysed this component of the programme.

A further limitation of my evaluation is that I did not explore the effects of this intervention on community members served by the CHWs. This was cited as a limitation by one of the project facilitators, as demonstrated through the following quote.

> *"Much as they [the CHWs] were the main target considering the objectives of the project and all the interviews were meant for them, I hoped there was a way we could have involved some of the households that they are attached to. I would have loved to hear from them and probably find out their relationship with their VHTs or any other information about the subject that could help improve the project."* **Jane, RA**

For example, by equipping CHWs with smartphones and formally evaluating their practice in a publicly visible manner, I wondered how did this impact their relationship with community members? In one study in India, in which CHWs used a mobile-based supervisory platform, one community member commented that the Aganwadi Worker (*the Indian term for CHW*) only visited her home when she was being watched by supervisors (who they referred to as "Madam"), and that whilst the mHealth intervention appeared to be well received by the CHWs and positively benefitted their status in the community, community members perceived it less positively (Gopalakrishnan et al., 2020). This is demonstrated through the following exchange:

> *"Interviewer*: *Ok so how is your relation/ terms with Anganwadi worker (AWW)*?
>
> *Respondent*: *She talks nicely but never visited my house until or unless madam does not tell her or when madam with her then only she comes*.
>
> *Interviewer*: *Ok*
>
> *Respondent*: *When other officers visit our home then only she comes along with them otherwise not" (Mother*, *Bihar*, *Age 28*, *no schooling)"* (Gopalakrishnan et al., 2020).

In the context of my study, I am unable to comment on how community members perceived the mHealth intervention, since I did not interview them; however, given the complex social relationships and community networks this is an important area to explore in future work.

There are also potential limitations for other researchers conducting independent explorations of my WhatsApp datasets, given that interpretation of the data set required me to have a rich understanding of the participants and how they interacted with each other. As a result, alternative methods of data analysis, such as the use of machine learning to analyse message semantics, which has been done in previous studies (Blasi et al., 2020), may not capture the nuances of the exchanges between CHWs.

Similarly, if the service delivery component of my model were to be scaled (i.e. the training of CHWs to delivery primary ear care services), it would be important to consider the capacity of the organisation and/or health system in which it is being embedded. For example, in this study I was fortunate to have access to, and the support of, local health workers and ENT specialists to seek advice from who were willing to be part of the supervisory system and offer expert advice. Clearly, in certain regions where expert professionals are scarce, even these "task sharing" types of interventions would not work. For example, from a 2015 survey assessing ENT services in sub-Saharan Africa there were 35 reported ENT surgeons and 15 audiologists in Uganda, but just two and three in Malawi respectively (Mulwafu et al., 2017). Therefore, although certain aspects of supervision may

be amenable to "task shifting" (e.g. supportive and emotional elements), it is important to note that there are still elements which require an "expert" opinion for patient safety reasons, (e.g. specific clinical elements of supervision which require specialist diagnosis and subsequent management plans). It is therefore important to view supervision as having multiple purposes and multiple components, each of which may require different actors to fulfil these roles within a 'supervisory system'. Rather than supervision being viewed as a process between individual actors, it should be conceptualised as a process between multiple actors within a network. This was mentioned by the CHWs who felt that each of the individuals in a 'supervisory role' had specific purposes:

> *"What I would like to say about Doctor James' question of supervisors taking up some of his roles is, he is a well-trained doctor unlike us. Much as we were trained we don't have academic documents to show for it therefore doctor should keep doing his role and Margaret and Edward should do theirs too. There are some cases that can only be handled by doctors, even when the VHT supervisors fail."* **Tayo, CHW 10**

It is also important to caveat that simply involving health professionals in the supervisory network did not address some of the wider, "system level" challenges that I faced during the implementation of this intervention. For example, for the small portion of cases which required surgery, there were several barriers to access. A round-trip from Mukono to MRRH (which was where the ENT surgeons were based) would take over two days on public transport. Patients would have to pay out of their own pocket to stay overnight, pay for their own medications, food, and post-operative dressings. This was simply unaffordable for many of the residents in the local area, given that the majority were subsistence farmers with very little disposable income. Secondly, despite my best efforts to establish a functioning link for surgical referrals, this did not transpire. I made attempts to contact several ENT specialists in Jinja and Kampala (the major cities which were geographically much closer to Mukono and thus theoretically more convenient for referrals) but to no avail. Alternative strategies for

surgical service delivery which could be explored in this context include surgical camps, where the surgeons set up basic operating theatres in the community and perform operations locally; however, this again requires appropriate investment, equipment and the willingness of local surgeons to sustain the service.

Likewise, for the children and adults who required specialist hearing services (e.g. formal audiological assessments) and input from allied specialities (e.g. speech-and-language therapists) such services were either unavailable in the public sector or unaffordable in the private sector. For example, at the 'Kampala Audiology and Speech Centre' (*a private clinic in Kampala*) a formal audiological assessment cost 60,000 UGX (≅£12), which was more than some local people earned in a month. Similarly, hearing aids cost in the region of 1.5 million UGX (≅£300) each and this did not account for ongoing maintenance (e.g. replacement batteries), which many people were unable to afford.

It is also important to note that, despite taking a participatory approach to intervention design, I was unable to "solve" all of the challenges faced by the CHWs. One such continuing challenge raised by all CHWs and both peer-supervisors during the post-intervention interviews was the lack of access to personal transport. This was viewed as problematic since it meant that in-person supervisory visits were less frequent than desired due to the long distances that the CHW peer-supervisors had to travel.

> *"As a supervisor, it has hindered me from accompanying some of the CHWs to home visits. If I am supervising CHWs whose households are nearby, transportation is not a problem. Challenge is if I am supervising CHWs from Makata like Paul* and Rosetta* from Kirujja-Butoke. That is where the challenge comes from."* **Susan, CHW Peer Supervisor 1**

> *"My supervisor is unable to accompany me to as many home visits as she would love to because of transportation. You know our villages are far apart."* **Josephine, CHW 1**

CHWs therefore suggested that their peer-supervisors should either be provided with a small additional stipend to help cover the extra costs of using public transport to attend home visits, or they should be provided with their own form of private transport (such as a boda-boda, or bicycle).

> "*They [CHW peer-supervisors] should get means of transport specifically for supervision like a motor bike. Our supervisors will be able to accompany us to many home visits if they do so.*" **Samantha, CHW 5**

> "*Our supervisors stay far away from some of their CHWs. For example Susan* [CHW peer supervisor] … her home is in Seeta but [she] has VHTs [CHWs] who stay in Makata and Kirujja Butoke. If not getting her a bicycle, there are taxis heading to Mukono that could drop her in Makata, so she should be given money for transportation.*" **Alex, CHW 6**

One important aspect of participatory studies is appropriately managing participant expectations, which if not done correctly, can be a potential source of tension. On the one hand, participatory research approaches encourage the researcher to work collaboratively with participants to understand their concerns and find ways to address them. However, there are also constraints against actioning every challenge and concern – in my case, this was a financial and logistical constraint. Not only could I not afford to purchase personal transport for individual CHWs, given my limited project budget, I also did not want to create tensions between the CHWs selected to be part of my study and their colleagues in neighbouring districts who were not, by supplying those involved with expensive equipment that was outside of the direct remit of the project. This was in order to avoid creating divides and feelings of resentment that might linger after I left. As such, other action researchers such as Mey and Van Hoven, suggest the importance of "explicitly and continuously engag(ing) in dialogues to negotiate and determine expectations across the research process and thereafter" (Mey and van Hoven, 2019:332).

9.8 Chapter Summary

The findings from Phase Three highlight the ways in which the use of mobile technologies, within a blended model, impacted on the nature of CHW supervision in this setting.

Referring back to Kearney et al.'s (2012) framework for characterising mobile-facilitated learning experiences viewed through a pedagogical lens (*see Chapter 2; Section 2.6:58*) this intervention encapsulated three important elements: *authenticity; collaboration and personalisation* (Kearney et al., 2012). I suggest that the CBPR approach taken towards the design of this intervention helped to promote these ideals.

From the perspective of authenticity, the nature of the WhatsApp intervention enabled supervision to be both situated and contextualised. Supervisory tasks were largely designed around the burden of ear and hearing disease in the local community, a topic identified as relevant and important by the CHWs during the photovoice study as part of the Phase One. There were also other cases designed over the course of Phase Three which were directly relevant to the CHWs daily practice, such as the treatment of malaria and diarrhoea; both of which are leading causes of morbidity and mortality in the local area. The nature of the cases was also highly contextualised. For example, the photographic images shared as part of the learning cases were often captured locally helping to situate the learning within the local context and solutions to challenges posed as part of the learning cases were also frame in a contextually appropriate manner. This was aided by the active feedback of multiple stakeholders who could bring local knowledge and solutions to the fore.

As such, the WhatsApp learning space also promoted collaboration. In contrast to the previous supervisory status quo (*which often involved one-off ongoing training sessions at the local health centre*), this intervention enabled conservation between a network of multiple

stakeholders including CHWs, project facilitators and ENT specialists. However, it is also important to caveat that although all the stakeholders engaged with the shared learning space, some individuals were more active than others (indicated by the wide range of messages send between individual users). Furthermore, CHWs in rural areas were unable to engage in real-time learning as easily as their counterparts in more urban areas due to infrastructural challenges related to cellular connectivity. It is therefore important to note that technical issues can impact the pedagogical benefits of such an intervention and that these were not conferred across all CHWs. This nuanced level of analysis and critique is often missing from the existing literature on supervisory interventions involving mHealth, but is necessary to give it due attention in order to ensure that marginalised CHWs (*for example those in rural areas*) are not left behind.

Finally, from a personalisation perspective, the WhatsApp supervisory intervention allowed learners to exert a level of agency over their supervision. Engagement was flexible, and although there were periods where CHWs were reprimanded, these were minimal. Furthermore, although many of the cases were designed and led by the project facilitators, CHWs were also able to customise their supervision by presenting their own cases and posing their own questions regarding issues that they encountered in the field – something which began to happen more often as the project progressed and CHWs became more familiar with the nature of the learning space.

These concepts are summarised in Figure 53 below.

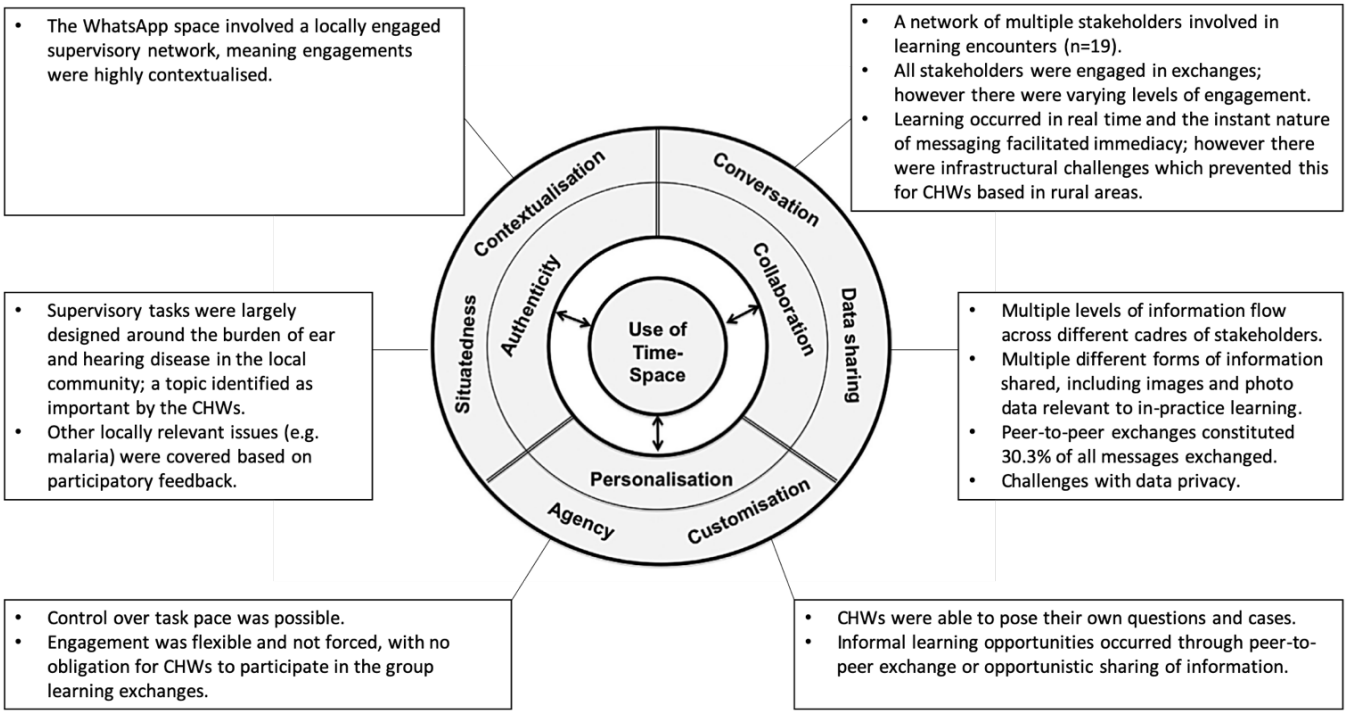


Figure 53 - How the use of WhatsApp helped to facilitate CHW supervision in this setting, viewed through a pedagogical lens underpinned by socio-cultural theories of learning.

Chapter 10 – Reflections, Conclusions, and Looking to the Future

> *"I have watched what happens when European and North American donors and academics depart from the meeting room. The friendly faces from the communities begin to dissipate into sounds of mockery. Laughter, tssks and 'Assa!' fill the room. That is all that is needed to understand that more work needs to be done to gain the trust of the community."* (Kalinga, 2019)

10.1 Chapter Overview

In this final chapter I reflect on my experiences from the project as a whole by drawing upon entries from my research diary. I also include subsequent reflections, which I have developed since returning from Uganda.

I consider how my positionality influenced the relationships I developed with some of the key stakeholders throughout my fieldwork, including the CHWs, the District Health staff, David and Jane, and NGO A. This reflexive practice and documentation is often missing from the existing literature concerning research regarding CHW programmes.

I conclude my thesis by summarising the key contributions of my research at a theoretical, methodological, empirical, and policy level, before outlining directions for future work and how I envision mobile-facilitated supervision for CHWs will evolve over the next decade. I finally end by reflecting on the contested concept of 'Global Health' which was a 'catch-all' term to describe my general area of work over the past three years (*but to which I had given little prior critical thought*) and my role within this field moving forward.

10.2 Reflections on relationships with key stakeholders

10.2.1 Community Health Workers

My first encounter with the CHWs was in early October 2018. I vividly remember them gathered in the ART Clinic at Health Centre III A, sat on rows of wooden benches. I stood at the front of the room and introduced myself, then explained the aims of the project. At the time, I distinctly remember feeling like a teacher on the first day at a new school, stood in front of a group of students trying to gain their trust. This awkward encounter was further compounded by the language barrier; although all of the CHWs spoke English, they preferred to converse in Luganda. Jane therefore translated each of my sentences, and I was able to judge whether the CHWs resonated (*or indeed disagreed*) with what I was saying by assessing the glances they shot back and forth between each other. Sometimes there was laughter, occasionally there were nods of approval, and at other times eye-rolling (I later came to learn that many of the CHWs had previously been involved in research projects led by non-native researchers, who had made promises of equipment and salaries, but which had never materialised).

It quickly became apparent that establishing a level of trust and acceptance would not be an easy task. Simply working with the CHWs was no guarantee that I would be able to form meaningful, open relationships. To build trust, it was going to take time; something which I previously had not been afforded on my trips to Uganda. This was due to work commitments in the UK, meaning that previously I could only stay for a couple of weeks at a time. In the past, due to limited time on the ground, I scheduled meetings to the nearest hour and planned research activities well in advance. This military-like efficiency of my past visits removed some of the more human aspects of connecting with participants. In this project, however, I had the luxury of time. I had hoped this would allow me to avoid developing a distant

'hierarchical relationship' with the CHWs, and help me learn more about their lives outside of their working environment.

However, this did not happen overnight. It took months before the CHWs were willing to extend invitations to wedding functions, church celebrations, and funerals; but once I was invited, these important community events helped me to better understand the multi-faceted roles the CHWs had within their communities. For example, Luke was the main food-caterer at major community events such as burial ceremonies and wedding introduction ceremonies. Julia owned one of the busiest food and drink stalls at Seeta Nazigo trading centre. Isabelle was a tailor who repaired peoples' clothes and Albert was the former LC1 for Makata village and was highly regarded in the local community. The fact that they were well known in the local community partly helped to explain why people trusted them as healthcare providers.

Similarly, attending patient home visits with the CHWs also helped me gain a deeper appreciation for their work, as well as a better understanding of the challenges they face. The CHWs would frequently have to travel long distances on foot to visit the homes they were responsible for, often in the heat of the day. In addition, I visibly saw their frustration when they were asked to help a sick member of a household they were caring for, but did not have the equipment or medications to do so. As a result, it was not uncommon for them to use their own money to help others.

Spending time with the CHWs on a daily basis also made me realise that they fulfilled roles far beyond those of what I understood to be a "healthcare worker". In the Western paradigm of medicine, a professional boundary is often established between the doctor and patient. Although this healthcare provider-patient relationship should always embody trust, confidentiality and empathy, the healthcare provider often does not know the patient outside of the professional setting and the physical space in which healthcare is delivered is usually

from the confines of a hospital or clinic, bounded by the clinical nature of these spaces. This means that as a doctor I often fail to see the broader determinants affecting the health of my patients, including their living circumstances. In contrast, the CHWs deliver care in the community and are often from the same villages as their patients. This means they are better placed to "accompany" patients on their health journey, which Heidi Behforouz of Partners In Health defines as "walk(ing) with the patient—not behind or in front of the patient—lending solidarity, a shoulder, a sounding board, a word of counsel or caution. Empowering not enabling" (Behforouz, 2009). As Paul Farmer stated in a 2011 speech:

> *"Accompaniment does not privilege technical expertise above solidarity or compassion or a willingness to tackle what may seem to be insuperable challenges. It requires cooperation, openness, and teamwork…Much more can be accomplished looking forward with an open-source view of the world. Ideas for good governance, whether of organizations, or government bureaucracies, or corporations, are meant to be shared, and shared widely"* (Farmer, 2011).

Moving forward, I plan to draw on this important principle of accompaniment in my own clinical practice as a General Practitioner and take a patient-partnership approach to care. This will mean taking extra time to visit patients in their homes and developing truly collaborative healthcare plans, rather than dictating management through a top-down approach.

The CHWs' willingness to undertake important health roles voluntarily also made me reflect on my own privileged position as a paid health worker. This was brought sharply into focus when Paul, one of the CHWs involved in the project, sadly passed away in May 2020, aged just 48. With little income as a subsistence farmer and his family now living in a different region of Uganda, I was asked by his fellow CHWs if I could help to raise some funds to cover the cost of the burial. This tragic series of events strengthened my view that every CHW must be recompensed for the work they undertake. As a doctor in the UK I receive a

regular, fair salary for my role, a pension contribution, and if I were to die my immediate family would not face financial hardship. Despite Paul being the primary healthcare worker for his village, he was a volunteer without a salary or insurance to cover the costs of a dignified funeral. This left me feeling angry, upset, and in many ways confused. Through each stage of my study I was reminded of the financial burdens facing the CHWs – from a lack of salary, to spending their own money to use public transport attend supervisory sessions. At the beginning of my DPhil I felt responsible for recompensing them for taking part in my study, however this also led to multiple questions such as "How much should I pay them?" "What would happen when I leave and my research funding ends?" "Would payments set up unrealistic expectations?" After a series of discussions with the CHWs, David, Jane and I decided it was appropriate (*and only right*) for me to recompense the CHWs for their time. However, ultimately a long-term solution needs to be found to address their financial hardships. This is not the job of one individual, or group, but a responsibility for all stakeholders involved in CHW programming and research – from local governments, to NGOs, to individuals such as myself asking them to give up their time to take part in research projects.

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Despite the positive connections I was able to build with the majority of CHWs, it would be remiss of me not to consider how my positionality influenced and shaped these relationships.

One challenging issue was how the CHWs perceived my role as a patron. For example, one of the research partners commented that some of the CHWs were reluctant to provide 'negative' answers about their opinions of the project out of fear that they might be dropped and thus lose the material benefits that were attached to their involvement, such as the mobile phone and data plans. The research partners, such as David and Jane, also commented on the

high expectations placed upon me by the CHWs to solve some of their financial problems. This led me to feel under pressure to meet their expectations and not to disappoint them.

> *"The challenge you will always face as a mzungu is that people will always feel you have sufficient funds to solve all their issues so the expectations are usually high. Any shortcoming in delivery automatically causes disappointment. Some may assume the mzungu is just a miser withholding the money or not fully invested in helping them…They believe that since a mzungu is involved, anything is possible without struggle and money cannot be a hindrance."* **Jane, RA**

This dilemma has been documented in the literature before by Hubbard et al. (2001), who describe researchers wanting to help, but feeling uncomfortable when this extends beyond their own means (Hubbard et al., 2001).

Similarly, my identity as a white, non-native, researcher was suggested by my Ugandan research partners to have influenced the CHWs perceptions of me. Despite trying my best to adopt a participatory-based approach where everyone was viewed as having an equal role in the study, the CHWs often referred to me as *'boss'*; inferring that I was in charge of them. This made me feel uncomfortable, and when I would ask them not to call me 'boss' and stress that I was learning as much from them as they were learning from me, many would simply laugh. I therefore sought input from David and Jane as to why this was the case. They explained that this was partly due to my position as a doctor (i.e. many of the CHWs felt my formal medical training meant I was more qualified than them), but also because I was from the UK. This highlighted the deeply-rooted (*and problematic*) colonial legacy that was still present in this rural region of Uganda and it made me question if true participatory work could take place in this context.

> *"The idea of the mzungu being the boss was because the project was introduced and financially facilitated by a mzungu. People usually refer to anyone they feel has an upper hand in any setting as boss... It was also because you are a doctor so they knew you were more knowledgeable about the subject than them. I also cannot rule out the possibility of inferiority complex having something to do with it. It is the belief that*

> *mzungu are always superior, wealthier and more knowledgeable than Africans a notion that is worse in rural communities. Any mzungu involved in a project regardless of status, skills or qualifications is automatically referred to as a boss by some people. Others believe mzungu are genius and cannot go wrong. It is partly the reason the VHTs [CHWs] preferred you accompanying them to home visits to their supervisors. It made them feel special in some type of way and secure that all would be well regarding diagnosis and treatment of patients. It is also partly the reason some patients preferred you treating them to their VHTs [CHWs]."* **David, Research Partner**

After this particular discussion with David, the idea of the mzungu being perceived as 'the boss' – which often went unquestioned – began to bother me. Indeed, the potential lack of critical questioning has potentially dangerous implications. For example, during my time in Uganda there was a well-publicised case of a young American woman, Renee Bach, who had established an NGO aimed at treating malnourished children in the nearby town of Jinja (Aizenman and Gharib, 2019). Despite having no formal medical training, she used donor funds from the US to establish a malnutrition rehabilitation centre and prescribed medicines, ran blood transfusions and inserted intravenous lines. Over a five-year period between 2010 and 2015, of the 940 severely malnourished children treated at the centre, 105 died (some due to a series of poor medical decisions, including mismatched blood transfusions). The fact that Bach was able to establish and run a medical facility without appropriate qualifications and oversight not only highlights the poor regulatory standards in Uganda regarding medical NGOs, but also the dangerous trend of white, non-native individuals not being questioned or held to account for their actions by locals. Instances such as this are examples of the "white saviour industrial concept" (Cole, 2012), a term coined by Teju Cole to describe the "confluence of practices, processes, and institutions that reify historical inequities to ultimately validate white privilege" (Anderson, 2013:36). Countless numbers of mzungu volunteers have taken trips to Uganda to help "the needy and poor" with little thought given to the complex historical, cultural and political environment in which they are entering.

Despite being a qualified medical doctor, having several years of experience in running mHealth related projects, and ensuring my project was evaluated by several ethical review boards, this story made me regularly question myself, and led me to ask whether I was also contributing to the problematic "White Saviour Complex". For example, what seemed like the simple act of attending home visits with the CHWs to observe their work for my fieldnotes actually had unintended consequences. Sometimes the patient would ask for me to treat them, despite the CHW being present and leading the consultation. I would have to explain that I could not do this and that the CHW was well qualified to assess them. Others would ask me to touch them, believing that this would simply bring them good luck. I therefore began to attend home visits less frequently, and instead David and Jane would accompany the CHWs, since I did not want the work and ability of the CHWs to be undermined by my presence. The following quote from one of the female CHWs illustrates the belief held amongst some individuals that white people can inherently be trusted, whereas local health workers are held to stricter standards.

> *"Once they see the white person and other people they instantly believe they will be fine. …And for a black person to believe what another black person is doing, there has to be results but if it is a white person, they believe they will be fine even before they are touched."* **Julia, CHW 4**

Similarly, some the CHWs were trusting of the way I managed the project simply because I was white. This sentiment has been documented previously in the literature by Moncrieffe, who found that children and adults in Uganda involved in development projects painted an idealised picture of "people not like them" who (during their limited interactions) displayed acts of kindness and benevolence, compared to "people like them" who they felt were more likely to be corrupt (Moncrieffe, 2009:91). The following quote from one of the CHWs exemplifies this sentiment in the context of my work:

*"My family is happy for me because I am working for a white person so it's all good. **…** The whites have good money and they also handle it well and properly…we trust them more. If they say 'You will be paid' you know you will be paid on time and fairly. But if the project is being run by Ugandans you don't know if you will get paid or if the money will be put into their own pocket. The whites don't steal because they already have enough money of their own that they can afford to pity."* **Samantha, CHW 5**

Lough and Carter-Black have documented the problematic nature of racial inferiority complexes, which they hypothesise have been perpetuated by "contemporary neo-colonial aid relationships" (Lough and Carter-Black, 2015:209). Similarly, the make-up of many 'global health' research projects is of a white Principle Investigator from the Global North, managing projects in the Global South often bringing in significant resources (both financial and non-financial). This phenomenon has been documented extensively by medical anthropologists such as Johanna Tayloe Crane and Crystal Biruk who have highlighted the complexities and challenges of non-native led projects in Ugandan and Malawi (Tayloe Crane, 2013, Biruk, 2018). When this is paralleled to the comparatively well-studied field of "international development", some scholars have argued that there is an neo-colonial inferiority complex which is perpetuated by the foreign actor having access to more funds, better technology, and greater time and is thus in a better position to 'help' than a non-native actor (Kothari, 2006, Lough and Carter-Black, 2015). Other scholars have hypothesised that this discourse can result in "colonization of the mind" (Ngũgĩ wa Thiong'o, 1986), where whiteness is associated with power, privilege and superiority. This was evident at certain points in my study:

"*Whites are highly respected in our society so moving with them automatically earns one respect. Much as we don't have high academic qualifications, they consider us powerful if they see us moving with him. It is a one in a million chance to move with a white. There's a man who said if Dr. James touched him, he would feel blessed. I promised him that I would take him to his household one time."* **Dina, CHW 9**

This can result in individuals perceiving themselves and their roles within projects in a particular way, where certain actors are seen as the managers and others as the recipients i.e. not the active participants (Loftsdóttir, 2009). In the context of my work, this problematic social construction could have made forming genuine, participatory relationships challenging, due to pre-held conceptions around race and positionality; a concept which has been critiqued and suggested in the past by other researchers (White, 2002, Shutt, 2006).

I also faced challenges in gaining the trust of the CHWs and the local community based on previous actions of other white researchers. For example, when it came to taking photographs as part of the photovoice project in Phase One (*see Chapter 5),* some community members were resistant as they were aware that I (a white, non-Ugandan, researcher) was leading the project. In the past white researchers have come to this particular community, taken photos and then used the photos in resulting publications, with the community seeing no benefit from the process.

> *"Some people think back to the colonial era when the colonialists stole gold, silver and other minerals from Africa and made items out of them that they in return sold to them expensively. Such people harbour the belief that the current bazungu are not different from the past ones. They believe they are only using a different tactic that is cunning and hard to see through unless one is keen and analytical. That view is held by a certain percentage of people especially those from the elite class."* **Jane, Research Partner**

Another example of distrust involved the negative experiences of the community following a one-off eye-camp organised by a group of American doctors for people with cataracts. According to one of the CHWs, due to the lack of follow up and appropriate post-operative care, some residents ended up going blind and developing severe infections. This experience led to feelings of scepticism and suspicion about my project amongst certain members of the population, and it took time for these feelings to be alleviated. For example, one CHW shared:

> "*Initially people were saying this project is going to damage people's ears but now they are saying the opposite…Some time back, there was a group of whites who offered to freely treat people's eyes in a camp that was organised in a Born Again [Christian] church. Very many people went there to have their eyes treated but their conditions worsened instead. Those who had a little vision totally went blind. I know one who was operated by them but developed maggots coming out of their eyes. That person eventually died. When people heard about the ear project, they were afraid the same incident would happen… but then they realised our treatment was healing people and posing no threats at all."* **Rosetta, CHW 12**

At times it felt like I was walking a tight-rope. On one side was the danger of being unquestioned and falling prey to the "white-saviour-complex"; on the other side there was the danger of failing to gain the trust and buy-in of the local community and CHWs. This dilemma led to significant periods of self-doubt and left me questioning, "Should I be working here at all?" It is a question which I still do not have an answer for; however, one which I return to regularly.

10.2.2 Health Centre III A staff

From the outset, I was keen that staff from Health Centre III A were involved in the project to ensure that there was an appropriate referral point for the CHWs to send complex patients. Secondly, from a health systems strengthening perspective, it was important to involve the health centre since they compiled health data across the district and submitted this to the District Health Office, which would then determine the budgetary allocation for equipment and medication purchases.

Despite a relatively good working relationship with the health centre staff, one of the challenges I encountered was that several of them often asked me for food, mobile data plans, and medical equipment. The exact reasons for this were unclear, but could have been borne out of previous unidirectional giving-relationships perpetuated by large NGOs who supported

the health centre. For example, one day, one of the CHWs passed me a handwritten note from the manager of the health centre, which stated:

> *"Doctor – you have provided the VHTs [CHWs] with umbrellas and gumboots. Now, I am requesting as the in-charge of this place that you also provide me and the staff here with umbrellas and bags. And we also need phones. So please kindly bring these for us this week."* **Health Facility Manager**

Again, I was viewed as a patron, which was problematic and placed me in an uncomfortable position. Given that I had a limited study budget, I simply could not afford to hand out equipment to multiple stakeholders for whom it was not necessary. For example, I provided the CHWs with umbrellas and gumboots based on the findings from the photovoice study in Chapter 5; however, I deemed this as unnecessary for the manager of the health centre who did not undertake any home visits. As a result, I found myself becoming frustrated with these requests because I felt that people were trying to take advantage of my presence and the project for their own personal gain.

However, when I reflected on these requests from the perspective of the health centre staff, I understood why they were being made. First, I had distributed multiple pieces of equipment to the CHWs who they viewed as lower in the facility hierarchy. Second, as I spent more time at the health centre, I began to understand the difficulties and challenges faced by the staff. For example, Daisy, one of the staff at the health centre, had not been paid in several months and took on roles far beyond her level of experience due to major understaffing. Initially hired as a HIV counsellor on a part-time contract, she was later placed in charge of the administration of the outpatient clinic and also acted as a health care assistant. Similarly, the Health Officer (the most senior healthcare professional at the health centre) was based at the health centre three days a week, but his salary was barely enough to cover his transportation costs. Witnessing these significant shortcomings of the public health system in Uganda also made me question how I was perceived as a doctor

from the UK with a stable job and income. If I had been more conscious at an earlier stage of the juxtaposition of my privileges compared to those of the health centre staff, I may have responded with more empathy and less frustration when asked for equipment and money.

Spending a significant period of time at the health centre also meant that I directly observed some of the challenges facing the underfunded Ugandan public health system. For example, I witnessed twin babies die due to an obstructed delivery. On that day, there was no one qualified at the health centre to perform an emergency caesarean section and because I did not have a medical licence to practice in Uganda (and there was no equipment available to perform a c-section), I was unable to perform the necessary emergency operation which may have potentially saved the babies' lives. This weighed heavily on my mind for several months.

The other health workers passed this event off as relatively common, so initially I felt that perhaps I was not emotionally resilient enough to deal with such events, even though I have witnessed other traumatic events and patients dying in my work as a doctor in the UK. I have therefore grappled with the reasons why this event weighed so heavily on my mind. I still do not have an answer for this, but I have attributed several factors since the event to my reaction. First, there was a lack of an in-person support network available to me in Uganda. Going back to my room each night on the compound after a long day of work felt lonely and isolating (especially on the nights when the power cut so we had no electricity). In the UK, I would have had the opportunity to debrief with a senior colleague or supervisor about such an event, but during overseas fieldwork this was not readily available. Secondly, I struggled to process the event given that the underfunded, understaffed and under-resourced nature of the health centre meant this kind of event

would likely happen again and I felt helpless to prevent it. Thirdly, I (wrongly) blamed myself wondering could I have done more to help in this situation given that I had a medical licence and felt a level of expectation from the health centre staff to help in some way.

For future students undertaking fieldwork in remote or isolated settings, especially where there is a likelihood of experiencing traumatic events and limited in-person support available, greater attention should be paid to pre-departure training. Of course, training cannot be expected to prevent the emotional trauma that can be endured during fieldwork, but it may help sensitise students to some of the more difficult situations they may encounter and allow them to think of potential coping strategies and safeguards that can be put in place prior to leaving. Returning from fieldwork I sought the advice of the university counselling service, but I found that institutional support was generally lacking. I found services around the technical aspects of fieldwork to be well developed and established (e.g. workshops on ethics approval, seminars on how to take field notes and sessions on how to write ethically), yet little exists in the way of psychological support and debriefing and how to deal with emotional trauma. I did find my individual supervisors to be very helpful and always available, but there was only so much I wanted to burden them with given their busy and demanding schedules. I also felt unable to fully articulate some of the challenges I was facing and felt as if others would not be able to understand these challenges without having been in the exact situation and environment I had worked in.

This issue, of trauma experienced during fieldwork, has been documented by other PhD researchers (Ndongwa Bamu et al., 2016). For example, Pollard found that of the 16 PhD students she interviewed following fieldwork, all of them expressed difficulties during

fieldwork which they felt unprepared for, including feelings of depression, anxiety, paranoia, and guilt (Pollard, 2009). It is therefore an area which, in my opinion, requires urgent attention and reform from higher education institutions.

10.2.3 Relationship with David and Jane

Central to the success of project were David and Jane – the two Ugandan graduate students who acted as co-investigators on the project. Not only did they act as project facilitators, but they were also integral in assisting with translation and transcription, conducting interviews and facilitating data collection. Generally, our working relationship was excellent; however, a thought-provoking commentary published towards the end of my fieldwork by a Malawian researcher, Dr Chisomo Kalinga, prompted me to consider the potential unspoken tensions that David and Jane may have experienced working as indigenous researchers on a project in their own country with me, a non-native.

The commentary by Kalinga was littered with quotes that resonated with me and reflected the roles that David and Jane played within my project. For example:

> *"Many project partners don't speak the indigenous languages of the participants and rely on junior African staff for translation, transcription or to 'read between the lines'"* (Kalinga, 2019:270).

Reflecting on this quote, I wondered if David or Jane harboured resentment towards me, for my constant reliance upon them to facilitate meaningful interactions with the CHWs. For example, every voice note that was sent on WhatsApp by the CHWs (of which there were over 1,000) had to be translated into English by David and Jane to accommodate me (*since everyone else was fluent in Luganda*), which was a time-consuming task.

Similarly, Kalinga suggests that indigenous researchers are often caught between the needs of their foreign co-investigators, and those of the community:

> *"…indigenous researchers also have an additional obligation to respect social customs and codes, which are not easily visible to foreign research partners. We have a responsibility to receive and to interpret these codes. We have to interpret body language, expressed anxieties and micro-aggressions."* (Kalinga, 2019:270)

I shared this commentary with David and Jane, eager to hear their perceptions. Jane stated, "*Wow – that piece really spoke to me. It was so accurate*". I went on to have a frank and open discussion with her as to how she perceived her role in the project and asked her to document some of her thoughts after the formal evaluation phase of the project had concluded. She stated that she often found it challenging to obtain honest answers from the CHWs regarding their feelings of the project because many of them were concerned that their responses would be viewed in a negative light and they may lose their place on the project. Jane stated that she would feel personally responsible if this were to happen.

> *"One of the barriers I faced was to do with trying to get the [CHWs] to open up. Many were holding back, especially because they knew they were being recorded. Others felt like criticising the project would put them in jeopardy of being removed from the project and if they did then I would be held to blame".* **Jane, RA**

Jane was also concerned about being judged by her Ugandan friends and colleagues for being involved in what was perceived as 'development work', which is often seen as the preserve of mzungus.

> *"The way Ugandans perceive fellow Ugandans who work in the development sector with mzungu colleagues varies. Whereas some believe they work with them because they genuinely feel for their communities and want to bring about change hence the partnership with the mzungu, others think [we are] are schemers. Schemers who are either using the mzungu to get something out of them or collaborating with the mzungu to get something out of the poor people in the communities in the name of development."* **Jane, RA**

Critically reflecting on these issues made me question whether I should have been leading the project, or if David and Jane would have been better placed to do so. For example, had the project been led by a Ugandan researcher, then certain issues would not have occurred – for example, language barriers. However, both David and Jane pointed out that although this might have been the case, access to the level of funding required to undertake the project was almost impossible to achieve unless you were a researcher based in the Global North. Furthermore, they stated that my expertise as a clinical doctor, as well as my willingness to mentor them was beneficial. Similarly, they pointed out that their university-level education meant that many CHWs also referred to them as 'boss', meaning a totally 'flat' hierarchy was difficult to achieve. This particular issue has been described previously in the literature by Farhana Sultana, a U.S. based Bangladeshi researcher. Despite being born and raised in Bangladesh, she reflected that this did not necessarily mean she felt at home in rural villages where she conducted her research, since she was born and raised in urban Dhaka. As such, she described that "the 'native' can be the 'other' because of a class privilege" (Sultana, 2007:377).

I still have not fully resolved these feelings of self-doubt, which are echoed by other scholars embarking on ethnographic work, some of whom have become paralysed from conducting fieldwork due to crippling reflections of their own positionality (Sultana, 2007). Nonetheless, critically reflecting on how my position may have influenced the findings of my work has been an important reflexive process and has made me more acutely aware of my own position and identity as a researcher, which is important as I move forward in my professional life. In practice, this will mean approaching research collaborations with humility, adopting a participatory approach where possible, and listening closely to key stakeholders during the exploratory phase of the research study.

10.2.4 NGO A

NGO A sits at an interesting interface, in that in some ways it is a 'local NGO' (i.e. the majority of the staff are locals and it has a local leadership team); however, the individual who controls the budget and makes many of the major organisational decisions is an American physician, who is based in the U.S. and visits Uganda for one week, once a year.

Between 2015-2017, NGO A had undergone a transitional period as an organisation. With the rapid rise of 'global health' programmes at U.S. universities since the early 2000s, NGO A was one of many 'host-NGOs' that had cropped up across East Africa, promising "transformative experiences" to students interested in global health. Indeed, NGO A's website describe the organisation as one which provides students with, "*some or no prior international experience*" with "*short-term, effective teaching trips, rendering maximal impact for both volunteers and learners*" (*reference excluded to preserve anonymity*). These "short-term global health volunteer opportunities", where students and healthcare professionals (most commonly from the U.S.) spend time in low- and middle-income countries (Martiniuk et al., 2012), have become increasingly popular and now represents a multi-billion dollar enterprise (Caldron et al., 2016).

In recent years, NGO A transitioned from a small organisation, employing a handful of local staff, to a larger one with ten full-time staff, including drivers, cooks, security guards and operational staff, as well as a U.S. graduate student who serves as a program coordinator for 12-months. It hosts between 30 and 40 student volunteers (each of whom pays several thousand dollars) for periods ranging from one week to three months. The income generated from the students is then used to fund the salaries of the local staff and programmatic activities (such as hosting training sessions for the CHWs).

My perceptions of, and position within, NGO A shifted and changed throughout my time in Uganda. When I commenced my fieldwork I held the official title of 'Director of Research'; however, I found that over time my relationship with the organisation's founder became strained due to fundamental differences in how we felt the CHW programme should be run and how the organisation should pursue research. This led me to step down from this official role in January 2019 in order for me to conduct my DPhil more impartially.

Over the year, I also found the organisational model of NGO A to be problematic and at odds with my own personal and professional views. The NGO A volunteers spent part of their day shadowing the staff on 'home visits' to local villages where they would inspect protected water sources and cookstoves, or lead trainings on different health related topics such as different methods of contraception. The training sessions were conducted in English, often with the volunteer stood at the front of a school classroom and a local staff translating everything to Luganda. Given that most of the students were undergraduates with little to no formal training in community health approaches, this led me to question who was benefitting more from the one-off, seemingly piecemeal, training sessions – the U.S. college volunteers who were soon applying to medical school, or the CHWs receiving the instruction?

The NGO A website states:

> *"We do not allow program or research implementation solely for the sake of meeting an institutional requirement. All aspects of our work and research must fulfil long-term goals of the Ugandan MoH and needs stated by the host communities" (reference excluded to preserve anonymity).*

Although many of the volunteers contributed to ongoing quality improvement projects, including revising iCCM training materials on diarrhoea, malaria and pneumonia, others

attempted to implement their own projects with little thought paid to the needs or wishes of the local community, despite them being the focus of the intervention.

As I spent more time with the volunteers, I found that many of them were eager to "do something and make an impact" during their limited time in country. Despite being well-intentioned (and perhaps naïve), the opportunity to make a *truly* meaningful impact was very limited due to a combination of factors, including a poor understanding of local social norms and needs, language barriers, and a limited time in-country.

This short-term, 'parachute-style' work is one of the more problematic aspects of global health research and has been critiqued extensively in the past (Smith, 2018). McCall and Iltis, have suggested that many young volunteers travel to LMIC countries in order to "make a difference and help others and participate first hand in health care delivery in ways they are not able to do in the U.S." (McCall and Iltis, 2014:287). Other researchers have suggested that individuals in LMICs are often the recipients of NGO initiatives, but have little to no role in designing them, and "when the programmes fail, the people affected often feel abandoned" (Fleck, 2018). The CHWs I worked with explained that they had rarely been consulted as part of the training development process or project design in the past. One CHW shared:

> *"These foreign led projects sometimes come and then go. You don't know how long they will last. I know with this [DPhil] project we have been involved in the design and running of it so we have given consideration to that issue but still – it needs funding and funding does not come easily. It can be disappointing when this all ends, but I know from the beginning of this project we might face this challenge and that Doctor James will continue to try support this and find ways to keep it going…If the project continues facilitating us, we shall keep up with what we are doing. If it stops, there is nothing much we can do….I just hope the project lasts forever so that we the VHTs [CHWs] continue helping people. If it doesn't, people will suffer again like they used to before this project…"* **CHW 6**

As a result, I often advised students to adhere to the mantra, "*do less, listen more*" (an approach I learned to adopt myself).

Reflecting on this particular issue of volunteerism, I understood the practical needs of NGO A - a small NGO with a limited annual budget - to generate revenue to fund their activities; however, I also struggled with the ethical issues attached to short term mission trips. I found myself becoming protective of the CHWs and the community and worried that the trust I had taken so long to build might be undermined. This was exemplified when I heard that a group of volunteers had visited the health centre and taken photographs of some of the patients and their children and subsequently shared them to a social media site. This is a highly troublesome practice, which has been critiqued in the wider literature by Tabb et al. (2020), for the multiple ethical issues it raises (Tabb et al., 2020). With the rise in volunteerism, accompanied with the increased use of social media, this is unfortunately a practice which will likely become more common. I considered this incident particularly frustrating given the effort I had taken during my photovoice study to respect local sensitivities and concerns regarding the capture of photographic images of individuals without prior consent or permission (*see Chapter 5*).

In terms of refining the volunteer programme, I felt that much more pre-service training should be conducted and I relayed this to the staff at NGO A. This is an area of improvement that has been suggested for short term global health missions in the past (St Clair et al., 2017). I also felt that the local staff, in partnership with community representatives, should have devised an ethical code of conduct for all volunteers to read, sign and abide by to avoid potential malpractice and misconduct. Previous attempts have been made at creating guidelines and frameworks for promoting and enhancing ethical short-term medical missions (Melby et al., 2016). However, for reasons already outlined in this thesis, locally created guidelines, specific to the region of interest, developed through a participatory approach are equally important and still lacking. Furthermore, especially given my own experiences with

the sustainability of interventions, I strongly believe that the purpose of the volunteer trips should simply be to 'observe', rather than to 'intervene'.

10.3 Conclusions

In this section, I outline the key findings from my DPhil and the contribution my work has made to the field of CHW supervision and programming more broadly.

10.3.1 Key Findings

Here I bring together the key findings from the multiple stages of my work to evidence how my work has helped to advance our understanding of CHW supervision. These are presented below in Table 20.

Phase of research	Research question	Key findings
Phase One (Chapters 5 and 6)	**RQ1. How do key stakeholders (e.g. CHWs and programme managers) perceive supervision for CHWs and, specifically, how are mobile technologies perceived as having a role in facilitating supervision?**	• Through the use of photovoice I gained first hand perspectives from the CHWs regarding their current experiences of supervision. I found that the current nature of supervision in this setting did not necessarily reflect of their needs as practitioners. For example, supervisory frequency was low and the content of supervision did not always reflect the issues they faced in their daily practice. Furthermore, there were wider socio-cultural issues which affected the CHWs experiences of supervision. These issues (such as challenging relationships with interdisciplinary staff members, and poor local infrastructure) are important factors to consider in the design of supervisory programmes. Photovoice (as a participatory visual research method) helped me to uncover these important first hand perspectives. • The findings from the photovoice study, regarding the inconsistent, patchwork nature of supervision in this setting, were confirmed through individual interviews with key stakeholders. • In this setting, supervision was predominantly conceptualised as a means of

		monitoring and accountability, as well as to provide motivation; however, the pedagogical benefits of supervision were expressed less strongly. This is in keeping with the existing literature on CHW supervision and provides important empirical evidence on this subject. • There were multiple different opinions on who should take on the role of supervisor; however, multi-supervisor models were proposed and the need for a supervisor to have a strong knowledge of the local context and good interpersonal skills were emphasised. • Mobile phones were mainly positioned as a potential means for accountability, improving communication and improving documentation of work; again, the pedagogical benefits of mobile technologies to support supervision were expressed less strongly. This represented an important gap for my subsequent research in Phase Three to fill.
Phase Two (Chapter 7)		• Taking a participatory approach towards the design of a blended supervisory intervention was important to understand the challenges and barriers towards potential uptake and sustainability of such an intervention, and to ensure the design was tailored to the needs of the end users. • Designing the content and nature of supervision around the needs of the CHWs helped to ensure supervision was contextually relevant and situated. • The use of mobile technologies should ensure that supervision encompasses elements of good mLearning e.g. that it is (i) personalised; (ii) authentic; (iii) collaborative. • I leveraged a widely used existing App (WhatsApp) to encompass these needs, after a period of collaborative feedback and reflection.
Phase Three (Chapter 9)	**RQ2. What are the effects of using an mHealth intervention, as part of a blended supervision programme, on the**	• Taking a blended supervisory approach was feasible and acceptable, based on high overall user engagement with the WhatsApp supervisory platform. • Following the intervention there appeared to be a greater emphasis placed on the role of

	nature of CHW supervision?	mHealth to support on-going learning as part of the supervisory process. This suggests that the purposeful design of a supervisory intervention (viewed through a pedagogical lens) might be an important way to enact this paradigm shift, which I called for in Phase One of my project. • The use of a more sophisticated technology (i.e. smartphones) allowed for personalisation (i.e. a strong preference for sending voice notes) and authentic learning encounters (i.e. exchange of real-world photographs and cases) which may not otherwise have been possible with more basic feature phones. • The mHealth platform largely supported messages involving the exchange of information and support. Despite being used to a lesser extent for quality assurance purposes, it did allow CHWs to directly connect with ENT specialists allowing for real-time, remote expert support. • The nature of interactions via the mHealth facilitated supervision platform were largely positive in nature. • The mHealth approach supported peer-to-peer interactions which are known to be an important aspect of learning (according to socio-cultural learning theories). • mHealth approaches cannot be seen as a panacea to solve all supervisory related challenges and personalised approaches need to be taken where possible. Potential challenges were noted with regards to long-term engagement, variable engagement amongst individual users and data security.

Table 19 - A summary table of key findings regarding CHW supervision.

10.3.2 Key contributions

In the following sections, I outline the key contributions I have made towards advancing the field of CHW supervision over the course of my DPhil.

i. Theoretical contributions

Throughout the past three years, I have sought to position CHWs as integral actors within the global health workforce – not only at a regional level but also at a national and international one. My work has highlighted the gaps in CHW supervision and calls for a greater focus to be placed on supervision as part of strong CHW programmes (O'Donovan et al., 2018b). A starting point for this is to define better what 'good' supervision for CHWs entails. I have therefore suggested the need for a drastic paradigm shift in how supervision is conceptualised, away from a means of accountability, towards viewing supervision as a holistic means of supporting CHWs work. This thesis also represents one of the first attempts to frame mobile-facilitated supervision for CHWs through a pedagogical lens; something which has rarely been documented in the existing literature. This is an important starting point for this much needed paradigm shift, and directly answers Winter et al.'s call to "measure better" in the context of mHealth facilitated training and supervision for CHWs (Winters et al., 2017).

ii. Methodological contributions

Despite participatory methods being suggested as a potentially important means of democratising the research process with CHWs, a systematic review I conducted in 2019 noted a relative paucity of studies exploring the role of participatory visual methods with CHWs (O'Donovan et al., 2019b). This was the first comprehensive systematic review to assess the use of PVMs with CHWs and therefore represents a significant methodological contribution to the wider literature.

I have also addressed this methodological gap in the literature by adopting a participatory approach towards my DPhil work, facilitated by the use of photovoice as a method. The first empirical photovoice study I conducted formed the basis for Chapter 5 and concerned the use of photovoice to explore issues of concern related to healthcare delivery from the perspective

of CHWs. This helped me uncover unique insights which helped inform the subsequent design for the rest of my DPhil (O'Donovan et al., 2019a). The second photovoice study explored the perceptions of CHWs with regards to the delivery of primary ear and hearing care services in the community (O'Donovan et al., 2020b). My work also documents some of the more challenging, and underexplored, aspects of using participatory methods, which contributes to the small emerging body of the ethical uses of participatory research methods with CHWs.

iii. Empirical contributions

From an empirical perspective, my work has added to and built upon the small body of existing literature concerning the role of mobile technologies to support the supervision of CHWs. It is one of the first studies to document the views of key stakeholders regarding how CHWs supervision is conceptualised and delivered. It is also one of the first studies to comprehensively document a participatory process towards the design of a blended supervision programme. Furthermore, to my knowledge, my work is one of the first attempts to conduct an in-depth exploration of WhatsApp exchanges between CHWs and their supervisors and analyse these through a pedagogical lens.

I have also described the design and evaluation of a participatory action research study, which is one of the first studies to explore the burden of ear disease and hearing health in Uganda. I have demonstrated that this particular service delivery model is both feasible and effective, and could be one way of addressing the severe shortage of ENT specialists in other LMIC settings.

More broadly, I have published a suite of systematic scoping reviews to advance the field's understanding of how CHWs are positioned in the global health workforce. This includes the

non-traditional roles they can undertake (i.e. in the management of non-communicable diseases such as cancer and ear-disease) (O'Donovan et al., 2019b, MacRae et al., 2020, O'Donovan et al., 2020c, O'Donovan et al., 2019a), and how ongoing training and supervision have a role in supporting their work (O'Donovan et al., 2018b).

iv. Policy contributions

Finally, from a policy perspective, my DPhil has directly contributed to the re-design and redevelopment of the WHO Primary Ear Care and Training Resources. This is a set of multimedia training resources for primary ear care professionals which is distributed worldwide. This represents a major achievement, since by adopting a participatory approach towards the evaluation of a primary ear and hearing care training, the final training materials will have been shaped directly by key stakeholders from LMIC countries where the resource is primarily intended for.

I have also written and contributed to several policy-based articles for leading journals, including BMJ Global Health and The Lancet Global Health, advocating for greater autonomy and financial recompense for CHWs (O'Donovan et al., 2018c, Winters et al., 2018b). In particular, my work has tried to highlight some of the potential challenges of the proposed CHEW programme in Uganda, by drawing upon my participatory research experiences.

10.3.3 Future work

In terms of immediate future work, one unexplored avenue will be the use of artificial intelligence to facilitate analysis of the WhatsApp messages. As a result, I plan to conduct a semantic analysis of the data sets, coding message exchanges for sentiment and emotions and trying to understand the nature of message exchanges both from the data set as a whole, but also between individual cadres of users. This will build on emerging work in the field of

health-sciences from Blasi et al. (2020), who have analysed WhatsApp exchanges between Italian healthcare professionals during the COVID-19 pandemic (Blasi et al., 2020). This will also help me better understand the nature of interactions and whether mobile-based facilitation has enhanced positive interactions, or indeed fostered negative exchanges.

Second, despite increased calls for a greater number of clinical studies in LMICs that explore locally identified areas of concern to ensure research studies are contextually relevant, one of the limitations of this study was my failure to capture household level opinions on the effect of the supervisory intervention. To address this limitation, I have secured post-doctoral funding from the NIHR-MRC Trials Methodology Research Partnership to carry out this work in partnership with the team from Makerere University School of Public Health who I worked with during my DPhil. This will allow me to continue to foster my relationship with the CHWs of Seeta Nazigo Parish and build upon the findings of my DPhil.

With regards to long term evaluation, the effects of scaling the approach I have described are important to understand. As the number of participants using the mobile supervisory platform increases, it will be essential to gauge how the nature of supervision might change. For example, as the number of participants increase, would the benefits of peer-to-peer collaboration increase, or would CHWs be less likely to share their opinions and ideas with a larger group? Similarly, the evaluation approach adopted for this study was time and resource-intensive, requiring me to take a very hands-on approach. This was appropriate in the case of my DPhil, given that I was interested in conducting an in-depth, granular analysis of this particular case-study; however, questions remain as to how such approaches can be best evaluated at scale without losing the finer details which are integral to understanding the complexities of the intervention under exploration.

Finally, from a broader perspective, this programme (namely a functional, generally well-received, mobile programme supporting supervision) has potential benefits which could be explored beyond this context. I would encourage other researchers to explore the feasibility of similar models, both in terms of other CHW programmes in different geographical contexts, as well as different cadres of health care professionals (e.g. nurses and health facility-based staff).

10.3.4 Envisioning the future for mobile facilitated CHW supervision

The COVID-19 pandemic has brought into focus the need for a well-trained, well-supported, primary health workforce (Ballard et al., 2020, Nepomnyashchiy et al., 2020). Investing and supporting CHWs to form the bedrock of robust primary health care systems will be vital if we are to achieve SDG 3 (*to ensure healthy lives and promote well-being for all at all ages*) and specifically target 3.8 of Universal Health Coverage (UHC) for all (The United Nations, 2015).

One crucial component of strong CHW programmes, as demonstrated throughout my thesis, is supervision. However, a paradigm shift is required, away from the outdated conceptualisation of supervision purely as a way to improve efficiency and productivity through managerial oversight (*still commonly held by some NGO and managerial level stakeholders*), to a more holistic conceptualisation, where supervision is framed and delivered as a collaborative *process* facilitating ongoing training and learning through a supportive environment, in addition to the monitoring and quality assurance to ensure patient safety.

The findings from my work suggest that mHealth has a role in supporting and facilitating this model of supervision. As such, here, I offer three ways I envision this occurring over the next decade, as well as caveats in order to facilitate this process as we move towards the 2030 SDG deadline:

First, I believe there will be a proliferation of mHealth initiatives to support CHW supervision. This growth represents an opportunity to drastically re-think and re-design mHealth facilitated CHW supervision so that it is informed from a pedagogical perspective (rather than the technical perspective).

However, some caveats must be applied when suggesting a role for mHealth to support supervision. First, as demonstrated through this thesis, mHealth cannot be seen as a panacea. Technical and infrastructural challenges still present an issue for CHWs in remote and rural regions. These are not 'easy fixes' and require the government to actively work alongside private mobile network providers to solve these challenges. Transitioning to a shared on-line group learning platform may theoretically be viewed as a more advanced form of pedagogical design, promoting collaborative learning, but in certain cultures where group feedback is not the status quo, and social hierarchies exist, such forms of learning may not be acceptable. Similarly, for complex and manually skilled tasks (*such as otoscopic examination of an eardrum*) there is still no substitute for in-person supervision. Therefore mHealth supervision models should, where possible, be delivered in a blended fashion, combining in-person support with mHealth facilitation.

Second, it is likely that NGOs will be at the forefront of this drive towards mHealth-supported supervision for CHWs and thus play an increasingly important role. A seminal 2017 study by Taylor et al. (2017) explored the affordability of comprehensive CHW programmes across 37 countries in sub-Saharan Africa and found that based on the current average government spend on healthcare, in the majority of countries, a paid cadre of CHWs would be unaffordable (Taylor et al., 2017). As a result, NGOs have bridged the gap in the provision of CHW training and support. These NGOs are now powerful entities, with multi-million dollar budgets, often responsible for designing and delivering whole training and

supervision programmes. One example is Last Mile Health, a US-Liberian NGO, which has pioneered the "Community Health Academy".[43] Last Mile Health have successfully partnered with the government of Liberia to equip over 2000 CHWs with mobile phones to support their work and supervision.[44] They serve as an excellent example as to how a major international NGO can work hand-in-hand with a national government to support CHW programme delivery.

Yet, despite this example, there are many other organisations which have failed to take an integrated approach. As a result, dozens of projects have been initiated in an isolated, patchwork fashion and have failed to involve government level stakeholders responsible for local and national health policies and strategic objectives. If mHealth initiatives implemented by NGO partners are to contribute to a broader health systems strengthening initiative, then they must be done in collaboration with governments at both the local (i.e. village) and national (i.e. Ministry of Health) levels.

Third, and most importantly, CHWs must be at the centre of programme design as we work toward re-conceptualising and re-designing supervision over the next decade. As this project has demonstrated, successful scale-up, long term sustainability, and the avoidance of a one-size-fits-all approach is vitally important to the ultimate success of CHW programmes. CBPR approaches can help us better re-imagine CHW supervision and should be embraced by those responsible for such initiatives.

[43] https://communityhealthacademy.course.tc/
[44] https://lastmilehealth.org/2019/04/30/innovations-at-the-last-mile/

10.4 Afterword

What is "Global Health"?

When asked the seemingly straightforward question, "*What field do you work in?*", I typically respond with the outwardly simple answer, "*Global Health*".

Yet, throughout my DPhil I have become increasingly conflicted each time this question has been put to me. As a result, I began to ask myself "*What is 'global health'?*" – an ostensibly catch-all phrase, commonly used for healthcare work in an international context.

When I have contemplated the definition of global health, I have found myself with more questions than answers. Yes, global health could be defined as working to provide health services for marginalised populations in what are defined as LMICs, but this definition assumes a western-centric position. Would a doctor working in Uganda consider their daily work to be global health, or would it simply be public health? Similarly, do those working in related fields of structural engineering who design safe waste disposal systems, or those working in laboratories to develop vaccines aimed at preventing cervical cancer define themselves as global health practitioners too? After all, 35% of the world's population lacks access to improved sanitation facilities (Centers for Disease Control and Prevention, 2020), and cervical cancer is the leading cause of cancer deaths amongst women in sub-Saharan Africa (Jedy-Agba et al., 2020). From a personal standpoint, if I define working with CHWs in Uganda as working in global health, then should I define my work with marginalised populations in inner-city Leeds as global health as well? In essence, should global health be constrained by geographical boundaries, physical spaces, and the actors involved?

To understand the term 'global health,' it is essential to consider its historical underpinnings. Richard Smith (2013) describes four phases of how our understanding of global health has

evolved (Smith, 2013). 'Global Health 1.0' was termed 'Tropical Medicine' and was primarily concerned with preserving colonial interests in the Global South (Smith, 2013). Global Health 2.0 was termed 'international health', which Smith conceptualised as individuals from countries in the 'Global North' helping those in the Global South. Global Health 3.0 (which is the predominant conceptualisation today) was described as "researchers from rich countries leading research programmes in poor countries" (*ibid*). Finally, Smith suggests Global Health 4.0, as that which the global health community should aspire to – which is "research and other activities being led by researchers from low and middle income countries" (*ibid*).

Ṣẹ̀yẹ Abímbọ́lá (Associate Professor of Justice in Global Health Research at Utrecht University) acknowledges the merits of this staging system but critiques it by stating that it offers little in the way of addressing the "why and how of global health" (Abimbola, 2018:63). He suggests that in reality 'Global Health' may simply be masquerading as a rebranded, repackaged form of 'International Health'. Instead, he proposes Farmer et al.'s (2013) definition of global health as an alternative conceptualisation, suggesting the key distinction is the focus on *health equity*. Farmer et al. (2013) define 'global health' as "not [an academic] discipline but a collection of problems [that]…turn on the quest for equity" (Farmer et al., 2013:xiii).

This reflection has helped me to clarify my own interpretation of global health, which in turn has helped me better position myself within this field. Without this clear definition, it would have been impossible to re-calibrate my internal compass, guiding me to the north-star question of "*What is the purpose of my work and who does it seek to benefit*?"

Moving forward

In line with this guiding question, and as I conclude my DPhil, I have begun to ask, "*What now for my own role in the field of international global health?*" As a white, British, male researcher conducting work in a post-colonial state, should I continue to conduct work in this setting, given the multiple challenges outlined with my own profile throughout this thesis?

A recent report published in by Global Health 50/50 in March 2020 tracked the policies of over 200 'Global Health Organizations' since 2018 (Global Health 50:50, 2020). The report found that 70% of the leaders in these organisations identify as 'male', 80% are nationals of high income countries, and 90% were educated in institutions based in high-income countries; a profile which matches my own. The report concludes that the current system is "neither fair nor fit-for-purpose," and recommends that "the health and well-being of people around the world will benefit from—and require—diverse leadership" (Global Health 50:50, 2020). This has led me to question, "*Am I part of the problem?*"

At the current time of writing, if I conceptualise global health as a discipline concerned with health equity, then moving forward I will remain committed and engaged with global health work in my current role as a General Practitioner in the North-East of England (an area with significant health disparities). In an international context, I plan to mentor and support young Ugandan researchers such as David and Jane on their journey to Principle Investigators. If asked to be involved in future projects, I will remember the importance of learning from others and framing myself as a 'co-participant and enabler'. I tried to undertake my fieldwork with humility and to tread cautiously in partnership with the local community wherever possible. I believe that this latter aspect was one of the major strengths of my work and so abiding by this principle will remain important as I move forward in my professional life. Finally, I will endeavour to always ensure that there is a seat at the decision-making table for

those whom the project is designed to benefit, especially if they are a group that has traditionally been marginalised.

> *"I hope that we can begin to truly decolonize global health by being aware of what we do not know, that people understand their own lives better than we could ever do, that they and only they can truly improve their own circumstances and that those of us who work in global health are only, at best, enablers"* (Abimbola, 2018:64).

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Appendices

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Dear Prospective Participant,

As part of my DPhil (PhD) research at The University of Oxford I want to better understand the role mobile technologies might play in the supervision of Community Health Workers in Uganda.

I have identified you are someone who might have an interest in this area and would like to discuss my research with you further to see if you might be interested taking part in my research project.

If this is something which might interest you I am able to provide you with an information sheet which contains further details about my exact research project.

Deciding whether to take part in the study is voluntary.

Yours Faithfully,

Dr. James O'Donovan

Appendix Figure 1. Initial invitation email/letter to key stakeholders.

A study to understand the role of mobile technologies to support the supervision of Community Health Workers.

PARTICIPANT INFORMATION SHEET

1. ***What is the purpose of this research?***

Background:

Supportive supervision is a poorly understood area of Community Health Workers day-to-day work.

Although mobile phones have been suggested as one way to improve supportive supervision, very little research has looked at how key stakeholders perceive the best way to approach this.

The aims of this research are therefore:

- To better understand how supervision for CHWs should be defined and delivered from the point of view of key stakeholders.
- To understand the potential role for mobile technologies in delivering supervision from the point of view of key stakeholders.

2. ***For what reason have I been invited to take part?***

You have been invited because you have been identified as a key stakeholder who may have an interest in mobile assisted health worker training.

3. ***Do I have to take part?***

No. You can ask questions about the study before deciding whether or not to participate. If you do agree to participate, you may withdraw yourself and any information we collect from you from the study at any time, without giving a reason and without penalty, by advising the researchers of this decision.

If you choose to completely withdraw from the study, we will identify any data that has already been collected from you and remove this from our dataset. If, however, you wish to remain in the study but just retract a certain piece of information we will facilitate this with you to ensure all other data remains but the piece you wish to withdraw is removed from the dataset before final analysis.

You are able to withdraw consent to take part or retract data up until the point the study has been completed and submitted for publication. At this point once the data has been submitted for publication we will no longer be able to retract data.

4. ***What will happen to me if I take part in the research?***

If you are happy to take part in the research, you will be asked to participate in a short one-to-one interview. This will take place in either English or Luganda depending on your preference. Interviews will take place at a time and place convenient to you. It will last between 30 minutes and one hour. With your permission, we will be audio-recording any interviews that take place with you. The reason for this is that we wish to listen to these after the workshop has taken place to elicit any key themes that come up during our conversations. If you do not give permission for us to audio-record, we will ask you if it is ok to write down what you say. If you do not wish us to audio-record or write down what you say this is also fine.

If you are a VHT member, in addition to the interview, you might be asked to use a camera (which we will provide to you) to take photos of your experiences of using your mobile phone

in your day to day work. This will be discussed further with you in person if you are selected for this.

If you are happy to take part, you will then be asked to sign a consent form.

5. ***Are there any potential risks in taking part?***

There are no obvious risks to taking part in the study.

6. ***Are there any benefits in taking part?***

There are no obvious primary benefits from taking part in the study.

7. ***Expenses and payments***

I am unable to reimburse you for any costs associated with taking part in this project but I will be very grateful for your time.

8. ***What will happen to any photos or videos I take?***

Any photographs you take during this project will be used by the researchers in any resulting reports. If you do not wish these photos to be used in such reports this is also ok.
We will ask you to sign a consent form if you are happy for us to use your photos. You will be provided with a copy of this consent form.

9. ***What happens to the data provided?*** [45]

The research data, including any personal information, will be stored confidentially using password-protected computers and all hard drives will be encrypted. We are following data protection guidance provided by The University of Oxford (*http://researchdata.ox.ac.uk/home/managing-your-data-at-oxford/storage-and-backup/)* to make sure any data stays safe.
Your responses will be anonymised. If you give us permission we wish to publish this data in an academic journal so that other people from around the world can read about your experiences.
The researcher and research team, including any translators, will have access to personal and research data. The personal data we plan on collecting are your first and last name (which we will anonymise in any reports), your age, the sub-county you live in and how long you have been serving as a CHW.
We would like your permission to use direct quotes. Your name will be anonymised and all personal identifiable data removed.
All research data and records will be stored for five years after publication or public release of the work of the research and an anonymised data set will be uploaded to an open access data repository in keeping with research councils best practice guidelines (https://erc.europa.eu/funding-and-grants/managing-project/open-access*)*

10. ***Will the research be published?***

[45] Please refer to CUREC's Best Practice Guidance on Data Collection and Management (BPG 09)

The research may be published in an open-access journal. The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

11. ***Who is organising and funding the research?***

    This research is being funded by the Economic and Social Research Council and a grant from the British Medical Association (BMA).

12. ***Who has reviewed this study?***

    This study has been reviewed by the University of Oxford Central University Research Ethics Committee, Mengo Hospital IRB and Uganda Council for Science and Technology (UNCST)

13. ***Who do I contact if I have a concern about the study or I wish to complain?***
    If you have a concern about any aspect of this study, please speak to the relevant researcher James O'Donovan (Telephone +44 7999 177071 or their supervisor Professor Niall Winters (Telephone: +44 1865 274024), who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and give you an indication of how they intend to deal with it. If you remain unhappy or wish to make a formal complaint, please contact the relevant chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter in a reasonably expeditious manner:

    Chair, **Social Sciences & Humanities Inter-Divisional Research Ethics Committee**; Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

14. ***Further Information and Contact Details*** If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact:
    Dr. James O'Donovan
    DPhil Candidate
    15 Norham Gardens, Oxford OX2 6PY
    Tel: +44(0)1865 274024 Fax: +44(0)1865 274027
    Department of Education
    The University of Oxford
    Tel: +44 7999177071
    Email: james.odonovan@seh.ox.ac.uk
    Email: general.enquiries@education.ox.ac.uk Website: www.education.ox.ac.uk

    Or, if you have any questions about my rights as a research subject in this study you may contact the chairperson, **Prof. Micheal Kawooya on 0772505189** of the Mengo Hospital Research Ethics Committee, P.O. Box 7161 Kampala, Uganda.

Appendix Figure 2 - Information sheet for stakeholders taking part in Phase One of the study.

Ebiwandiike ebya balondemu abe enkizo abetaba mumutendera gwokunoonyereza ogusooka

Erinnya Ly'okunoonyereza: Okunoonyeereza okuteegera omulimu gw'enkola ya mbayiro mukuyamba okulambula kwabasawo abokubyaalo.

EBIWANDIIKE BYOYO EYETABYEMU

Okunoonyereza kuno kulina nomugaso ki?

1. Enyanjula:

Okulambulwa sikwe kutugerekeka obulungi mu mirimu gyaba abasawo bomubyaalo egya bulijjo.

Wadde nga amasimu ga lowoozebwako nga engeri emu eyinza okutumbula enambula, okunoonyereza kutono nnyo okwebuuziza kungeri abenkizo abalondemu bekikwatako gyebalowooza gyekiyinza okwatibwamu.

Nolwekyo ebirubirirwa byo'okunonyereza kuno:

- Okwengera okutegera nga enambula yaba CHWs bwerina okuzimbibbwamu no kozesebwa mundowooza zabo abalondemu abenkizo.
- Okutegera omulimu mobayiro tekinologiya bwoba olyawo gwerina bweba ekozeseddwa mundowooza zabo abalondemu abenkizo

2. Lwaki mpitiddwa okwetabamu ?

Osabibwa, kuba olondeddwamu nga owenkizo gwe kikwatako ayinza okubamu nokwagala enkola yo kutendeka CHW nga eyambibwako mobayiiro.

3. Netaaga okwetabamu ?

Nedda. Osobola okubuuza ebibuuzo nga tonasalawo kwetabamu. Bwoba okiriza kwetabamu,osobola okwegyamu weka ne'byona ebirala byetuba twakakungannya ko sawa yonna ngate totuwadde wadde ensonga,ngatotanziddwa kasita otegezza abanoonyereza ensalawo yo.

Singa osalirilawo ddala okuvamu mukunoonyereza, tujja funa ebikwatako bye twakakungannya tubijje mu tterekero lyaffe. Wabula, singa osalawo okusigalamu naye nga ogyemu ekitundu kyebyo ebikwataako, nakyo tujja kikola okakasa nti ekitundu kyotayagla kyoka kyekijibwamu kyoka nga okwetegeereza ebikunganyiddwa tekunokolebwa

Osobola okugyawo olukusa lwo oba okusaba ebikwatako paka nga alipoota egenda werezebwa kubwengula.Wabula singa obwengula bugikiriza oba tokyayinza kujjayo bikwatako.

4. Ki ekinabeerawo bwemba netaby muku noonyereza.

Bwoba nga tolina buzibu kwetaba mu kunoonyereza kuno, ogya kusabibwa okwetaba mu lukiiko lwomu-kwomu olumpimpi. Luno lujja kuba mulungereza oba Luganda okusinzira kugwalako. Olukiko lujja kubawo mu kifo, obudde obukusanyusa. Lujja kumala dakika 30-ku sawa emu. O lukusa lwo, tujja kwata amaloboozi. Ensonga etukozesa kino eri nti tuddamu ne tuwuliriza emboozi eno ne tujjamu emitwe emikulu. Singa oba totuwadde lukusa kutereka maloboozi,tujja kusaba oba osobola okitutera mu buwandiike. Bwoba byombi (okwata edooboozi, no kuwanidiika) nakyo tekirina mutawana.

Bwoba omu kuba VHT,ojja kwongerwayo olukiiko, oyinza osabibwa okozesa kamera (gye tunakuwa) okuba ebifanaanyi byembeera bwenajja ebera ngokozesa nesimu you mubyabulijjo. Kino tujja kyogerako nawe mubuntu bwoba olondeddwa.

5. ***Waliwo byenyina okwekengera ngatebayemu?***

Teri bisubirwa kuba byabulabe eri mubiri gwo.

6. ***Waliyo ebyenfuna er abo abetabyemu ?*** Teri byanfuna bisubirwa gwo.

7. ***Sente ne'nsasanya***

Okunoonyereza kuno tekusoboIa kudiizawo,naye nasiima nnyo nga osobodde okutukekamu obudde bwo

8. ***Ki ekinabeera ku bifanaanyi oba akatambi?***

Buli kifanaanyi kyokuba mu mukunoonyereza kuno kijja kozesebwa abanoonyereza mu alipoopata yona enavaamu. Bwoba toyagala bifanaanyi kuba mu alipoota, nakyo tekirina mutawaana. Tujja kusaba ekinkumu okozesa ebifanaanyi.

9. ***What happens to the data provided?***

Ebinonyezeebwa nga kwotadde nebikwata kubantu bijja terekebwa ne pasiwaddi mu komputa neterekero litikebweko aka kufuli.Tugoberera nkola ya University of Oxford(*http://researchdata.ox.ac.uk/home/managing-your-data-at-oxford/storage-and-backup/)* to make sure any data stays safe.) Byodmu byonna tebijatekebwako mannya go.Bwo tuwa olukusa,twagala okuteeka alipoota mu terekero lya yunivasite kisobozese abantu munsi yonna okusoma kubyoyitamu.

Omunoonyereza nabanonyereza wamu naba taputa bajja kuba no lukusa okutukirira ebikwatako nebirala ebikwata kukunoonyereza. Ebikwatako byetukungannyako lye linnya lyo erisooka neri sembayo(lisigala lyekusifu mu alipoota zonna),emyaka gyo, gombolola gyosulamu ne banga lyomazeemu nga okola nga CHW.

Tusaba olukusa okozesa edoboozi lyo nga bwoba oyogedde. Amannya go nebirala ebikulaga tujja bijja mu. Byona ebivudde mukunonyereza bija terekebwa okumala emyaka ettano nga alipoota eteredwa mu bwengula oba nga era ebyakunganyizibwangabijidwako amannya bijja tekebwa ewakiriza bulyomu wasobola obituukako kubwengula okutukagana ne kanso ezitereka ebivude mukunoonyereza. (https://erc.europa.eu/funding-and-grants/managing-project/open-access*)*

10. ***Okunoonyereza kunawandikibwa mubwengula?***

Okunoonyereza kuno kwandikwandikibwa mubwengula. Okunoonyereza kwandi wandikibwa mu mubwengula nga bulyomu akusomako. University ya Oxford yesimiisa nnyo okuwaayo okunoonyereza eri obulungi bwansi nenyingiza era kulwekyo ya tekawo e terekero ewagenda kopi eyomubwengula ku internet naddala ezaba somi. Alipoota zino ozi teeka kubwengula kiyamba abanoonyereza abalala okusooma kubikoleddwa nabwekityo nektongera etutumu ya alipoota/okunonyerea okwo.

11. ***Ani mutegesi era ani atekamu ensimbi ?*** Okunoonyereza kuno kutekedwamu ensimbi ekitongole kya Economic and Social Research Council nekirala British Medical Association (BMA) byonna nga byabungereeza.

12. ***Bani abasomye no ku kiriza okunonyereza kuno?*** Okunonyereza kuno kusomeddwa aba University of Oxford Central University Research Ethics Committee, Mengo Hospital IRB ne Uganda Council for Science and Technology (UNCST)

13. ***Ani gwenebuuzako singa mba nina kyenjagadde okwegerako?***
Bwoba ofunye kyewandyagadde okwogerako ekikwata ku research, bambi yogera ne **James O'Donovan (Telephone +44 7999 177071** oba musomesa we **Professor Niall Winters (Telephone: +44 1865 274024)**, abagya okola ekisoboka okuddamu kyewebuza. Omunoonyereza ajja kola ekisoboka okudamu obutaskka naku 10 ezokola. Era bakutegeeze nga bwebasubira okuklako..Bwoba nga osigdde mu akakunakuna oba wandyagadde okuloopa bambi wandikira sentebe waese ar Ethics Committee at the University of Oxford naye anafuba okukola mu mangu ddala. Sentebe, **Social Sciences & Humanities Inter-Divisional Research Ethics Committee**; Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

14. ***Ebisingawo ne gyensagibwawa:*** Singa oba oyagadde okwogeramu ku kunoonyereza kuno,yogera nomuntu nga okunoonyereza tekunaba oba nga kuwedde. Bambi tukirira
Dr. James O'Donovan

DPhil Candidate
15 Norham Gardens, Oxford OX2 6PY
Tel: +44(0)1865 274024 Fax: +44(0)1865 274027
Department of Education
The University of Oxford
Tel: +44 7999177071
Email: james.odonovan@seh.ox.ac.uk
Email: general.enquiries@education.ox.ac.uk Website: www.education.ox.ac.uk

Oba, Singa oba olina ebibuuzo ebikwata kuddembe lyo nga omwetabi mu kunoonyereeza kuno,

oyinza okwebuuza ku ssentebe **Pulofesa Micheal Kawooya ku 0772505189** owakakiiko ka

Mengo Hospital Research Ethics Committee, P.O.Box7161 Kampala, Uganda.

Appendix Figure 3. Translated Information sheet for stakeholders taking part in Phase One of the study.

23rd July 2018

Dear James,

Many thanks for providing these detailed clarifications and additional information.

Title: The role of mobile technologies to support the supervision of Community Health Workers (CHWs) in Uganda.

The above application (**reference number ED-CIA-18-218**) has been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly, approval has been granted.

If your research involves participants whose ability to give free and informed consent is in question (this includes those under 18 and vulnerable adults), then it is advisable to read the following NSPCC professional reporting requirements for cases of suspected abuse http://www.nspcc.org.uk/Inform/research/questions/reporting_child_abuse_wda74908.html

Should there be any subsequent changes to the project which raise ethical issues not covered in the original application you should submit details to research.office@education.ox.ac.uk for consideration.

Good luck with your research study.

Yours sincerely,

Laura Molway
Member of DREC

Laura Molway
PGCE Curriculum Tutor & D.Phil Candidate in Education
University of Oxford, Department of Education
Tel: 01865 611008

Please note that Thursdays are usually my research days and I may not be in my office

Appendix Figure 4. Approval letter from University of Oxford DREC (Reference: ED-CIA-18-218).

MENGO HOSPITAL

FOUNDED ON 22 FEBRUARY 1897

P.O.,Box 7161, Kampala, Uganda
Tel: +256-414-270222/3
Direct: +256-312-307106
Fax: 256-414-340466
Email:medicaldirector@mengohospital.org
Website: www.mengohospital.org

Our Ref: MH

RESEARCH ETHICS COMMITTEE

Your Ref:

7th August, 2018

Dr. James O'Donovan
Principal investigator
University of Oxford

Dear Sir,

RE: A STUDY TO UNDERSTAND THE ROLE OF MOBILE TECHNOLOGIES TO SUPPORT THE SUPERVISION OF COMMUNITY HEALTH WORKERS (VHTs) IN UGANDA

This is to inform you that the Mengo Hospital Research Ethics Committee (MHREC) has approved the above research study subject to final approval from UNCST. The approval period is from **7th August, 2018** to **6th August, 2019**. Your study number is 114/07-18. Please be sure to reference this number in any correspondence with the MHREC.
Continued approval is conditional upon your compliance with the following requirements:

1)A copy of the **Informed Consent Document** approved as of 7th **August, 2018** is enclosed. No other consent form should be used. It must be signed by each subject prior to initiation of any protocol procedures. In addition, each member must be given a copy of the signed consent form.

2)All protocol amendments and changes to approved research must be submitted to the MHREC and not be implemented until approved by the MHREC except where necessary to eliminate apparent immediate hazards to the study subjects.

3)Significant changes to the study site and significant deviations from the research protocol and all unanticipated problems that may involve risks or affect the safety or welfare of subjects or others, or that may affect the integrity of the research must be promptly reported to the MHREC.

4)Please be informed that MHREC has a right and mandate to monitor your research to ensure compliance to UNCST regulations. This monitoring may be by making a visit to your site. The choice of the site to be visited is entirely under the prerogative of MHREC and may be done any time without prior notice.

5)All studies need Human Subject Protection (HSP) training and Good Clinical Practice (GCP) training for clinical studies. MHREC will not approve study protocols whose Principal Investigators have not presented the referred to certificate/certificates.

6)All deaths, life threatening problems or serious or unexpected adverse events, *whether related to the study article or not*, must be reported to the MHREC in a timely manner as specified in the National Guidelines for Research Involving Humans as Research Participants.

7) Please complete and submit reports to the MHREC as follows:

a) Renewal of the study-complete and return the Continuing Review Report- Renewal Request (Form 404A) at least 8 weeks prior to the expiration of the approval period. The study cannot continue after **6th August, 2019 until** re-approved by the MHREC.

b)Completion, termination, or if renewing the projects –send the report upon completion of the study.

8)You are required to disseminate a copy of your research findings to the community/ organisation where your research was conducted.

Please call the chairman if you have any questions about the terms of this approval. Enclosed is the approved informed consent document dated **7th August, 2018.**

Yours Sincerely,

.....

Prof. Kawooya Michael

Chairman (MHREC)

MENGO HOSPITAL
APPROVED
VALID UNTIL
06 AUG 2019
RESEARCH ETHICS COMMITTEE
P. O. BOX 7161 KAMPALA (U)

Appendix Figure 5 - Approval letter from Mengo Hospital IRB (Reference: 114/07-18).

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

Our Ref: SS 4723 **1st October 2018**

Dr. James O'Donovan
Principal Investigator
C/o Omni Med Uganda
Mukono

Dear Dr. O'Donovan,

Re: Research Approval: A Study to Understand the Role of Mobile Technologies to Support the Supervision of Community Health Workers

I am pleased to inform you that on **24/09/2018**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **24/09/2018** to **24/09/2019**.

Your research registration number with the UNCST is **SS 4723**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project.

As Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

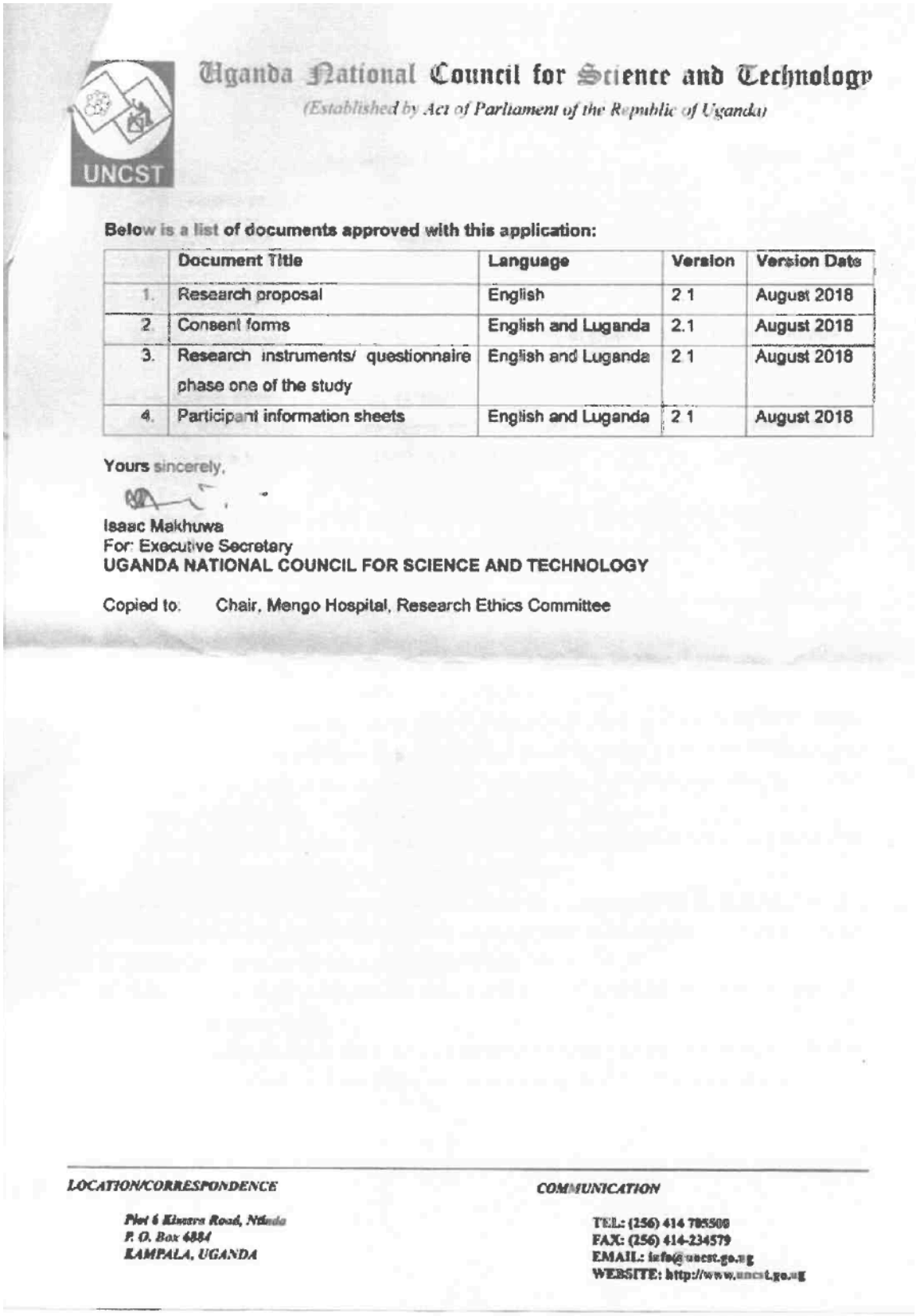
1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the research protocol or the consent form (where applicable) must be submitted to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval prior to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local IRC for review with copies to the National Drug Authority.
4. Unanticipated problems involving risks to research subjects/participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST review.
5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. An annual progress report and approval letter of continuation from the REC must be submitted electronically to UNCST. Failure to do so may result in termination of the research project.

LOCATION/CORRESPONDENCE

Plot 6 Kimera Road, Ntinda
P. O. Box 6884
KAMPALA, UGANDA

COMMUNICATION

TEL: (256) 414 705500
FAX: (256) 414-234579
EMAIL: info@uncst.go.ug
WEBSITE: http://www.uncst.go.ug



Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

UNCST

Below is a list of documents approved with this application:

	Document Title	Language	Version	Version Date
1.	Research proposal	English	2 1	August 2018
2.	Consent forms	English and Luganda	2.1	August 2018
3.	Research instruments/ questionnaire phase one of the study	English and Luganda	2 1	August 2018
4.	Participant information sheets	English and Luganda	2 1	August 2018

Yours sincerely,

Isaac Makhuwa
For: Executive Secretary
UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Copied to: Chair, Mengo Hospital, Research Ethics Committee

LOCATION/CORRESPONDENCE

Plot 6 Kimera Road, Ntinda
P. O. Box 6884
KAMPALA, UGANDA

COMMUNICATION

TEL: (256) 414 705500
FAX: (256) 414-234579
EMAIL: info@uncst.go.ug
WEBSITE: http://www.uncst.go.ug

Appendix Figure 6 - Approval letter from The Uganda National Council for Science and Technology (Reference: SS 4723).

Uganda National Council for Science and Technology
(Established by Act of Parliament of the Republic of Uganda)

Our Ref: SS 4723 **17th June 2019**

Dr. James O'Donovan
Principal Investigator
C/o Omni Med Uganda
Mukono

Dear Dr. O'Donovan,

RE: A STUDY TO UNDERSTAND THE ROLE OF MOBILE TECHNOLOGIES TO SUPPORT THE SUPERVISION OF COMMUNITY HEALTH WORKERS

This is to acknowledge receipt of your letter dated **7th June 2019** in which you notified Uganda National Council for Science and Technology (UNCST) about the approved amendments made to the above study by Mengo Hospital, Research Ethics Committee. The UNCST has no objection to the notification.

Yours sincerely,

Isaac Makhuwa
for: Executive Secretary
UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

LOCATION/CORRESPONDENCE

Plot 6 Kimera Road, Ntinda
P. O. Box 6884
KAMPALA, UGANDA

COMMUNICATION

TEL: (256) 414 705500
FAX: (256) 414-234579
EMAIL: info@uncst.go.ug
WEBSITE: http://www.uncst.go.ug

Appendix Figure 7 – Secondary approval letter from The Uganda National Council for Science and Technology (Reference: SS 4723).

MENGO HOSPITAL

Christian Medical Witness

RESEARCH ETHICS COMMITTEE

Our Ref : MH /421

May 15, 2019

Dr. James O'Donovan,
Principal investigator
University of Oxford

Dear Sir,

RE: **Mengo Hospital REC review of protocol amendment for study titled "A study to understand the role of Mobile Technologies to support the Supervision of Community Health Workers. (114/07-18)"**

This is to inform you that the Mengo Hospital Research Ethics Committee (MHREC) reviewed your protocol amendment and found that your revision meets the criteria for minimal risk.

MHREC therefore grants you the approval to continue with the proposed amendment. This includes

1. **The change of sample size from "15 CHWs to 14 CHWs"**
2. **Increase in the number of households from "40 households to 852 households" following a request from the key stakeholders at the District Health Office and Seeta Nazigo Health Center III.**
3. **Change in the Study Setting "to focus on Seeta Nazigo Parish of the Nakisunga sub-county in the Mukono District"**
4. **Change in the Data collection tools "from using Nokia Lumia 630 phones to using Itel A16 phones since the Nokia phones are no longer available"**

You can continue with your study and remember to notify Uganda National Council for Science and Technology (UNCST).

Yours sincerely,

.....
Prof. Kawooya G. Michael
Chairman (MHREC)

MENGO HOSPITAL APPROVED VALID UNTIL 06 AUG 2019 RESEARCH ETHICS COMMITTEE P. O. BOX 7161 KAMPALA (U)

Appendix Figure 8 – Secondary Approval letter from Mengo Hospital IRB (Reference: MH/421).

MEDICAL SCIENCES INTERDIVISIONAL RESEARCH ETHICS COMMITTEE
Research Services, University of Oxford, Wellington Square, Oxford, OX1 2JD
Tel: +44(0)1865 616577 Fax: +44(0)1865 280467
ethics@medsci.ox.ac.uk

CONFIDENTIAL

Ref: R63610/RE001

Dr James O'Donovan
Department of Education
University of Oxford
Norham Gardens
Oxford

22nd May 2019

Dear Dr O'Donovan

Research Ethics Approval - CUREC 2

Study Title: The role of mobile technologies to support the supervision of Community Health Workers (CHWs) in Uganda

The above application has been considered on behalf of the Medical Sciences Interdivisional Research Ethics Committee (IDREC) in accordance with the procedures laid down by the University for Ethical Approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to the IDREC, the proposed research has been judged as meeting appropriate ethical standards, and approval has been granted for a period of **3 months**, commencing on **22nd May 2019**. The reference number for this study is **R63610/RE001**.

This is **subject to:**

a) **it is your responsibility to comply with the requirements for administering any tests or questionnaires and if in doubt to contact the publisher of those tests or questionnaires.**

b) **if new research staff are engaged, the PI is responsible for ensuring they are suitably qualified by training and/or experience**

I would like to remind you that you will be required to submit an annual progress report on each anniversary of study approval, until the study is completed, and that your study may be selected for review by the MS IDREC during an annual audit.

Amendments

Should there be any subsequent changes to the study, which raise ethical issues not covered in the original application, you should submit details to the IDREC for consideration and approval. Details of changes must be listed on an amendment form. If your study received University Sponsorship through CTRG, then the amendment will first need to be submitted to CTRG for approval of continued Sponsorship.

Please do not hesitate to contact me if you have any queries.

Yours sincerely

H. Barby-Porritt

Dr. Helen Barnby-Porritt
Research Ethics Manager, Medical Sciences

Appendix Figure 9 - Approval letter from University of Oxford Medical Sciences Interdivisional Research Ethics Committee (Reference: R63610/RE001).

For all participants please record the following;

- Date of interview:……
- Location of interview: …….
- Interviewer: …….
- Interviewee (initials and participant ID): ……
- Have you checked that consent was obtained for all photographs? ……
- How many photographs were taken: ……

For each photo discuss what the photo represented and use the following framework to guide you through the discussion:

1. What do you See here?

2. What is really Happening here?

3. How does this relate to Our lives?

4. Why does this condition Exist?

5. What can we Do about it?

Remember:

- Encourage the participant to expand on their answers
- Give the participant the chance to speak freely about the photographs
- Ask the participant which photos they deemed to be most important and why

Appendix Figure 10 - Semi-Structured Interview Guide for Photovoice Interviews.

DPhil project – Supervision of CHWs in Uganda

COMMUNITY HEALTH WORKER SURVEY

To be completed by researcher:

INITIALS OF VHT: [redacted] CHW 9

PARISH: SEETA NAZIGO

SUB-COUNTY: NAKISUNGA

DISTRICT #: MUKONO

IDENTIFICATION # #9023

DATE: 1/11/2018

ORGANIZATION: OMNI MED, ~~IJM INTERNATIONAL JUSTICE MISSION~~)

Village: Seeta Nazigo

Please complete all sections. If you are unable to read we are able to help you complete the questions verbally if you wish.

1

SECTION A Demographic information

This section asks general questions about you and your background. Please circle the number corresponding to your response to each question or, where indicated, fill in the blanks.

No.	Question	Response
A1	What is your sex?	1. Male 2. Female
A2	What is your age?	34 years
A3	Number of years of education?	9
A4	What is your highest level of education? (Put a tick next to response)	No education Some primary Completed Primary Some secondary ✓ Completed secondary More than secondary Don't know
A5	What is your current job alongside working as a VHT/CHW? ***Write in response***	FARMER
A6	How long have been a VHT?	8 years _____ months
A7	How many households do you serve?	68
A8	How many home visits did you conduct in the last month?	4
A9	Which health centre are you attached to?	SEETA NAZIGO H/C III
A10	Do you receive a stipend/payment for your work? If Yes, how much a month?	Yes (Ask how much and record here): No

SECTION B Your experience of supervision

This section asks you questions about your personal experiences of supervision. Please circle the number corresponding to your response to each question or, where indicated, fill in the blanks.

Thinking about your supervision with health facility in-charges or management...		
B1	How often do you receive supervision?	1. Never 2. Daily 3. Weekly 4. Monthly 5. Quarterly (circled) 6. Other (Please specify): _____
B2	How do you usually receive supervision?	1. One to one 2. In a group/team (circled) 3. Other (Please specify): _____ 4. I don't receive supervision sessions
B3	How long do your supervision sessions usually last?	1. Less than 15 minutes 2. 15 – 30 minutes 3. 30 – 60 minutes 4. More than 60 minutes (circled) 5. I don't receive supervision sessions
B4	Does your supervisor accompany you on home visits and observe your practice?	Yes No (If no, go to B6) (circled)
B5	How many times a month does your supervisor accompany you on home visits?	1. Daily 2. Weekly 3. Monthly 4. Yearly 5. Never
B6	Who would you turn to if you needed advice about a work matter? (tick as many as appropriate)	1. VHT/CHW supervisor or coordinator 2. Other CHWs / VHTs 3. Program Managers 4. Health Facility staff (circled) 5. Other (please write down who)

B7	**FOR SUPERVISORS ONLY** Have you received formal training in how to carry out your role as a supervisor?	A. Yes B. No
B8	**FOR SUPERVISORS ONLY** How often do you receive support from your manager to discuss challenges you might be facing	A. Daily B. Weekly C, Monthly D. Yearly E. Never
B9	**FOR SUPERVISORS ONLY** In your role as CHW supervisor do you feel well supported?	A. Yes B. No C. Don't know
B10	What suggestions do you have for how your managing organisation could support CHWs/VHTs to do their job well? **Please write your suggestions here (or if being completed by the Context Mediator please record findings here).**	

Appendix Figure 11 – Initial survey to understand the current delivery of supervision.

Interview questions for Policymakers at Ugandan Ministry of Health and CHW Programme Managers

1. What do you consider important features and outcomes of CHW supervision to be?

2. Who do you think should be a CHW supervisor?

3. What qualities do you think a good supervisor should have (and how might this be reflected in a mobile based training platform)?

4. What do you know about the existing training and supervision of Community Health Workers (CHWs)?

5. What do you know about the challenges of CHW supervision in low-income settings?

6. How do you think mobile technologies might be used to help support the supervision of CHWs?

7. What do you anticipate being the main benefits and/or challenges of mobile assisted health worker training?

8. What are the most important factors you would consider in the design/ implementation/evaluation phase of a supervisory training program for CHWs using mobile technologies?

Luganda Translation

Ebibuuzo ebinabuuzibwa ku mutendera ogusooka ogwokunoonyereza. Ebibuuzo byabo abenkizo abakola amateeka ku WHO (ekitongole kyebyobulamu munsi yona), nabo abakola amateeka ku ministule yebyobulamu nabakulira abasawo bokubyaalo.

1. Ki kyotwaala nga ekyomugaso ne kigendererwa nga emirimu gyabasawo bokukyaalo (CHW/VHT)girambulwa?

2. Ani gwolowooza asaanidde okuba omu kuba balambula abasawo bo kukyalo (CHW)?

3. Bisaanizo ki byolowooza omulambuzi omulungi byeyandibadde alina? Era biyinza kuteekebwa bitya muntendeka ekozesa mobayiro?

4. Ki kyomanyi kuntendeeka ne'nambula eriwo eya abasawo abomu byaalo (CHW)?

5. Ki kyomanyi ku kusomoozebwa kwo'kulambula ba CHW kwe'kuliko naddala munsi ezikyalina enfuna eyawansi?

6. Olowooza enkola a mobayiro tekinologiya eyinza etya okozesebwa okuyamba okutumbula mu nambula ya ba CHWs?

7. Biki / Ki kyosubira okuba ekyenfuna era/oba nokusomoozebwa munkozesa eyo kuntendeka abasawo be byobulamu nga bayambiddwako mobayiro tekinologiya?

8. Bintu ki bwoba ozimba/okozesa/ wekenenya enkola ebyomugaso byewanditadde mu pologulamu yokutendeeka abalambuzi ba basawo (CHWs) ekozesa mobayiro?

Interview questions for CHWs

1. What do you consider important features and outcomes of CHW supervision to be?

2. Who do you think should be a CHW supervisor?

3. What qualities do you think a good supervisor should have (and how might this be reflected in a mobile based training platform)?

4. How are you currently supervised (prompts: time, location, duration, frequency, perceived quality etc.)?

5. What are some of the challenges you face with regards to supervision?

6. How do you think mobile technologies might be used to help support your supervision?

7. What do you think might be being the main benefits and/or challenges of using mobile phones to help assist in your supervision?

8. What are the most important factors you would consider in the design/ implementation/evaluation phase of a supervisory training programme for CHWs using mobile technologies?

Luganda Translation

1. Ki kyotwaala nga ekyomugaso ne kigendererwa nga emirimu gyabasawo bokukyaalo (CHW/VHT) girambulwa?

2. Ani gwolowooza asaanidde okuba omu kuba balambula abasawo bo kukyalo (CHW)?

3. Bisaanizo ki byolowooza omulambuzi omulungi byeyandibadde alina? Era biyinza kuteekebwa bitya muntendeka ekozesa mobayiro?

4. Mu kakyo kano olwambulwa otya (okugeza; kusawa ki?, Era olumbulwa oliwa?, Okumala sawa/ddakika meka?, Buli dd?, omutindo gwokulambula mundaba yo?

5. Bisoomozo ki byosisinkana mu kulambulwa ?

6. Olowooza enkola a mobayiro tekinologiya eyinza etya okozesebwa okuyamba okutumbula mu nambula ya ba CHWs?

7. Biki / Ki kyosubira okuba ekyenfuna era/oba nokusomoozebwa munkozesa eyo kuntendeka abasawo be byobulamu nga bayambiddwako mobayiro tekinologiya?

8. Bintu ki bwoba ozimba/okozesa/ wekenenya enkola ebyomugaso byewanditadde mu pologulamu yokutendeeka abalambuzi ba basawo (CHWs) ekozesa mobayiro

Appendix Figure 12 - Semi-structured interview guides.

Training Schedule

DAY 1

9:15 Welcome
9:30 Introduction and overview
10:00 Assessing ear and hearing problems
10:30 **Break**
10:45 Practical: taking a history of ear and hearing problems
11:15 Practical: Examination of the ear
12:00 Practical: The whispered voice test of hearing
12:45 **Lunch**
13:30 The outer ear: diagnose, treat, refer
14:15 Middle ear infections: diagnose, treat refer
15:00 **Break**
15:15 Practical: Ear washout
16:00 Practical: Ear wicking and treating with ear drops
16:45 Questions and finish

DAY 2

9:15 Welcome and recap quiz
9:30 Other middle ear problems: diagnose, treat, refer
10:15 The inner ear: diagnose, treat, refer
11:00 Rehabilitation of hearing loss and hearing aids
11:30 **Break**
11:45 Practical: Care of hearing aids
12:15 Hearing loss in babies and young children
12:45 Demonstration of distraction hearing test
13:00 **Lunch**
13:45 Case studies
15:00 Promoting ear and hearing care
15.30 Good supervision: what does it entail?

DAY 3

9:15 Registration (7 morning candidates)
9:45-11:05 CIRCUIT 1 (4 candidates)
11:05-11:20 **Break**
11:20-12:20 CIRCUIT 2 (3 candidates)
12:20 **Lunch**
13:00 Registration (6 afternoon candidates)
13:15-14:15 CIRCUIT 3 (3 candidates)
14:15-14:30 **Break**
14:30-15:30 CIRCUIT 4 (3 candidates)
15:45 End

Appendix Figure 13 - Initial training workshop timetable.

Examination: Otoscopy

Name of VHT_____

Study number_____

Date_____

Item	Done? (Yes or No)	Comments
Introduces themselves/explains procedure		
Gains consent		
Checks the otoscope is working prior to using it e.g. light source is ok		
Attaches speculum correctly		
Inspects the ear (externally)		
Examines the ear using the otoscope		
Examines the second ear		
Does not cause discomfort to the patient		
Cleans speculum		
Q. Did they see the number in the box (3)		
TOTAL SCORE		

Examination: Whisper Hearing Test

Name of VHT_____

Study number_____

Date_____

Item	Done? (Yes or No)	Comments
Introduces themselves/explains procedure		
Gains consent		
Explains what the examination involves to the patient.		
VHT stands behind patient and masks 'non-test' ear by rubbing tragus		
VHT stands arm length away from the patient		
VHT whispers three random letter/number sequence		
VHT tests second ear		
VHT repeats the exam when the second ear is 'incorrect'		
Ask question 'Did they pass or fail the left / right ear'. If answers correctly give mark.		
Question: Which place would you ideally perform this exam in? (A: A quiet room)		
TOTAL SCORE		

Skill: Instillation of ear drops

Name of VHT_____

Study number_____

Date_____

Item	Done? (Yes or No)	Comments
Introduces themselves and explains procedure		
Checks for patients allergy status		
Gains consent		
Gets patient to tilt head to side to apply ear drops		
Applies correct number of ear drops		
Does not let bottle touch ear		
Asks patient to gently massage their tragus to allow drops to enter ear canal		
Asks patient to stay still for 3 minutes		
Answers question correctly: What should you do if the patient reports an allergy to the antibiotic ear drops you want to use? Correct answer: Do not give those ear drops.		
Show them a dry perforation and CSOM. Mark if correctly identifies that they would only give Abx to the patient with CSOM.		
TOTAL SCORE		

Skill: Ear Washout and dry mopping

Name of VHT_____

Study number_____

Date_____

Item	Done? (Yes or No)	Comments
Washes hands		
Introduces themselves and explains procedure		
Gains consent		
Holds otoscope in correct manner while performing internal exam of ear		
Prepares washout solution correctly		
Disposes sharp in sharps bin		
Adds washout to ear directing the syringe towards the ear canal (NEVER TOWARDS THE DRUM)		
Make tissue spear correctly		
Cleans ear using tissue spear appropriately (pulls pinna back, gently cleans the ear rotating tissue spear)		
What should you do if you re-examine and there is still pus in the ear? A: Redo the ear washout.		
TOTAL SCORE		

Appendix Figure 14 - OSCE mark schemes.

Details of otoscopes

In order to accurately diagnose certain ear conditions, CHWs had to be able to visualise the tympanic membrane (*eardrum*) with a piece of equipment called an otoscope. All CHWs were therefore supplied with an Arclight™ otoscope, two specula (which could be cleaned and reused), a charging cable and a protective case to store the otoscope (*see below*). The Arclight™ has a built-in solar charger, meaning that the otoscopes light source does not rely on access to electricity, which was important in this context. The Arclight™ was also selected for pragmatic reasons since it costs under £5 GBP (*existing alternatives are upwards of £100 GBP*) and I was constrained by financial budgets.



An Arclight otoscope.

The manufacturers of Arclight™ have also produced an attachment which allows it to be clipped on to the back of a smartphone. This means that, in theory, the CHWs could use their phone camera to capture a still- or video-image of the tympanic membrane for subsequent review by an expert in a remote location in a 'store-and-forward' approach. This approach has already been demonstrated to be feasible in settings such as India and remote regions of Alaska, where specialist ear services are lacking in rural areas. However, after trialling this feature with CHWs in the field, I found that the image quality was too poor to accurately visualise the tympanic membrane and so did not pursue this option further.

Nonetheless, given that the ENT experts (Dr Nakku, Dr. Nyanzi and Dr Nakasagga) who needed to provide opinions and plans for complex cases were located remotely, the 'store-and-forward' feature was important in the context of this project,. Therefore, in order to capture a good quality image of the tympanic membrane, the study RAs and the staff at Health Centre III A were supplied with an alternative, more expensive video otoscope (*see below*). CHWs were not supplied with a video otoscope due to project budget constraints. However, if this had not been a limiting factor, I would have supplied all CHWs with the same technology, just as all CHWs received a smartphone, for equity-related reasons.

The decision to supply the RAs and the staff at Health Centre III A with the video otoscopes was made in a participatory manner with the CHWs, and premised heavily on the fact that if a CHW had a difficult or challenging case, they wanted to be able to refer the patient either to a central contact point (which, in the case of this study, was the RAs), or a central location (which, in the case of this study, was Health Centre III A). All RAs and health centre staff were trained in use of the video otoscopes, as well as how to store and forward the images.



A video otoscope in protective case, with speculum attached. The video otoscope could be tethered with the camera of a smartphone by using Bluetooth in order to capture a still or video image of the tympanic membrane.

Appendix Figure 15 - Otoscopes used in the project.

Dr. James O'Donovan
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DPhil Student, University of Oxford
Telephone: +256 786 111211
Oxford e-mail: james.odonovan@seh.ox.ac.uk

PARTICIPANT INFORMATION SHEET

ADULT (18+) / ADOLESCENT INDIVIDUAL (13-18) / RESPONSIBLE ADULT OF CHILD (<18)

The role of mobile technologies to support the supervision of Community Health Workers (CHWs) in Uganda.

We'd like to invite you to take part in our research study. Before you decide, it is important that you understand why the research is being done and what it would involve for you. Please take time to read this information, and discuss it with others if you wish. If there is anything that is not clear, or if you *would like more information, please ask us.*

What is the purpose of the study?

We are researching how mobile phones are used by Community Health Workers in Uganda to help with their training and supervision. As part of their training and supervision they will be providing ear care to members of the community, such as yourself and receiving feedback and extra training from supervisors.

Special Information for parents, guardians or head of household of children under the age of 18: We need to seek your permission so that the CHWs can screen your child (<18) for potential ear problems.

Why have I been invited?

- You have been invited to be part of this study to check if you have any problems with your, or your child's, ears.

Do I have to take part?

- No. Participation is entirely voluntary.
- You are free to withdraw your (or your child's) consent if you later change your mind, without giving a reason.
- Withdrawal will not affect the care you receive from your CHW.

What will happen to me if I decide to take part?

- The total duration of the study will be 3 months.
- Your CHW will ask you questions such as your (or your child's) age, if you (or your child) have had any ear problems, and if so what these were. They will then

look inside your (or your child's) ear using an otoscope (a small device that shines a beam of light into the ear). If the CHW feels there is an issue with your (or your child's) ear, they will (a) document the information you provide (b) send a message to a CHW supervisor at Omni Med to review you (or your child), and (c) if appropriate seek specialist input from an ENT doctor in Uganda. It is possible they may need to take a photo of your (or your child's) ear. This will only be seen by the research team and the specialist doctor.

- For children under the age of 18, this will involve the same process as outlined above. The CHW will ask you some key questions including your child's age, if they have any ear problems and how long these have lasted for. They will then look inside your child's ear using an otoscope. If they find a problem your child will be seen by a specialist Ear, Nose and Throat (ENT) doctor who will visit Mukono once every two months for the duration of the project.
- If your (or your child's) ear is normal nothing more will happen.

Are there any possible disadvantages or risks from taking part?

There are no obvious risks or disadvantages to taking part in the study, however when the ear is examined with an otoscope there may be slight discomfort.

What are the possible benefits of taking part?

If you (or your child) have an ear problem or develop an ear problem during the duration of the study your case will be reviewed by a specialist ENT doctor from Mbarara Regional Referral Hospital who will advise you on the care you (or your child) need free or charge, or provide you (or your child) with this care free of charge. **You will however, be required to pay for your own transport to Mbarara Regional Referral Hospital.** In addition, if you (or your child) have hearing loss, this is very difficult to treat in the community setting as it requires specialist equipment like hearing aids. These are very difficult to find in Uganda, and so you (or your child) will not be provided with these free of charge, but they may be something you wish to consider purchasing if you are told that they would help by the ENT specialist.

Will my taking part in the study be kept confidential?

- We will need to record your (or your child's) name, age, and village where you live in the event that you need to be referred to a specialist doctor. If this is not necessary, or once you have been fully reviewed by this specialist doctor, this personal information will no longer be kept.
- Responsible members of the University of Oxford may be given access to data for monitoring and/or audit of the study to ensure that the research is complying with applicable regulations.
- It is possible that a CHW supervisor or the ENT doctor will take a photo of your (or your child's) ear-drum or outer ear to assist with diagnosis. This image would be stored for a period of five years in a secure database.

Will I be reimbursed for taking part?

- There will be no financial payment for taking part.
- If you (or your child) require simple medications like antibiotic ear drops or olive oil these will be provided by the local health centre (Seeta Nazigo) free of charge in line with local government policy. If you require a specialist treatment, such as surgery or hearing aids, this will be your responsibility to cover the costs of this treatment.

What will happen to my data?

We will be using information from you (or your child) in order to undertake this study. Research is a task that we perform in the public interest. The University of Oxford is the data controller. This means that we, as University of Oxford researchers, are responsible for looking after your (or your child's) information and using it properly. We will use the minimum personally-identifiable information possible. Identifiable data will be destroyed as soon as no longer needed, after any treatment has finished, or after end of study (August 2019), and only non-identifiable data will be kept beyond this. We will store the anonymised research data and any research documents with personal information, such as consent forms, securely at the University of Oxford for 5 years after the end of the study. This is done as part of the research record.

Further information about your rights with respect to your personal data is available at [http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/]

You can find out more about how we use your information by contacting Dr. O'Donovan. His contact details are at the end of this sheet.

What will happen if I don't want to carry on with the study?

- Participation is voluntary and you may change your mind to take part at any stage. This includes withdrawing you or your child from taking part in the project.
- Withdrawal will not affect the care you or your family receive from your CHW.
- If you wish to withdraw please inform your CHW or the Primary Investigator of the study (details can be found at the bottom of this information form).
- If you decide to withdraw yourself or your child from the study mid-way through, any data collected from you (or your child) up until that point will be identified and removed from the data set.

What happens at the end of the study?

- You (or your child) will not be identified personally in any reports resulting from this project.

- We aim to publish the findings of this project in an academic journal to help inform the research community
- We aim to present our findings at a conference to share our findings with the research community
- We will hold a community workshop at the end of the project in Mukono. You will be invited to attend to hear about the findings of the research study. We will invite community members, CHWs and members of District Health Office to this workshop.
- If you cannot attend this workshop we will provide you with an information leaflet summarising information
- The research being undertaken will also contribute to the fulfilment of an educational requirement (PhD) for Dr. James O'Donovan.

What if we find something unexpected?

If there is something that needs a specialist doctor to look at it your CHW will make a referral to a specialist ENT doctor in Mbarara who will review your (or your child's) case. They will also visit Mukono in May and July.

What if there is a problem?

The University of Oxford has appropriate insurance in place in the unlikely event that you suffer any harm as a direct consequence of your participation in this study. If you wish to complain about any aspect of the way in which you have been approached or treated during the course of this study, you should contact Dr. James O'Donovan. Alternatively, you can contact Professor Micheal Kawooya from Mengo Hospital Ethics Committee who has reviewed this study. The contact details for both individuals are listed at the bottom of this information sheet.

How have patients and the public been involved in this study?

- Service users and Ugandan stakeholders helped develop the research topic and what research questions should be asked and several of them are co-applicants who will continue to be involved in the study.
- Potential participants were involved in reviewing the Participant Information Sheet.
- In designing this study, we have considered community members opinions on the frequency of participant visits and the questions which should be asked.
- We have sought the advice of key local leaders including Local Chairperson 1's, The District Health Office, The Health Facility Manager, CHWs.

Who is organising and funding the study?

This research is being organised by researchers from The University of Oxford in the UK and Ugandan doctors from Mbarara Regional Referral Hospital.

Who has reviewed the study?

This study has been reviewed by *an independent group of people, called a Research Ethics Committee, to protect participants' interests.*

The following committees have reviewed this research:

The University of Oxford Central University Research Ethics Committee

Mengo Hospital IRB

Uganda National Council for Science and Technology

Further information and contact details:

Please contact:

A. Dr. James O'Donovan by telephone, email or writing.

Telephone: +256786111211

Address: Omni Med Compound, Makata, Seeta Nazigo, Mukono, Uganda.

Email: james.odonovan@seh.ox.ac.uk

B. Professor Micheal Kawooya by telephone of writing/

Telephone: 0772505189

Address: Mengo Hospital Research Ethics Committee, PO Box 7161, Kampala, Uganda.

Thank you for reading this information.

Appendix Figure 16 – Phase Three Participant information sheet.

Modified Consent Form – Phase 3

The University of Oxford Department of Education,



Dr. James O'Donovan
Department of Education, University of Oxford, Oxford, OX2 6PS.
Telephone: +447999177071
Oxford e-mail: james.odonovan@seh.ox.ac.uk

The role of mobile technologies to support the supervision of Community Health Workers (CHWs) in Uganda.

PARTICIPANT CONSENT FOR REFERENCE: ED-CIA-18-210

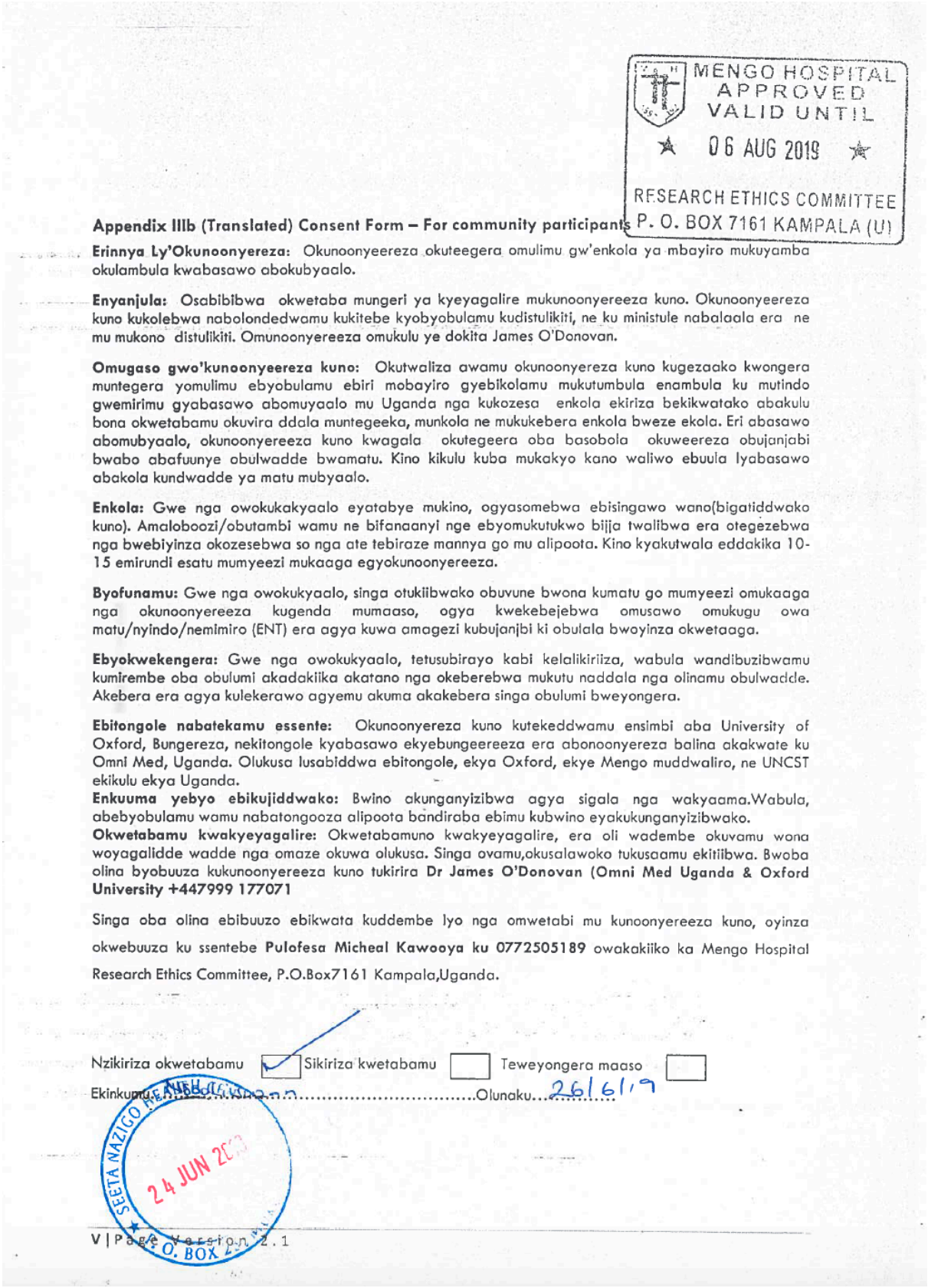
CONSENT FOR ADULT / INDIVUDAL UNDER THE AGE OF 18 (*DELETE AS APPROPRIATE*)

Purpose of Study: The aim of this study is toevaluate a mobile based supportive supervision programme for CHWs in Uganda. As part of the study CHWs will be screening for ear disease in the community.

Please initial each box

1	I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	NS
2	I understand that my/~~my child's~~ (*delete where appropriate*) participation is voluntary and that I am free to withdraw myself or them at any time, without giving any reason, and without any adverse consequences or academic penalty.	NS
3	I understand that research data collected during the study may be looked at by designated individuals from the University of Oxford where it is relevant to my/~~my child's~~ (*delete where appropriate*) taking part in this study. I give permission for these individuals to access the data.	NS
4	I understandthat this project has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee.	NS
5	I understand who will have access to personal data provided, how the data will be stored and what will happen to the data at the end of the project.	NS
6	I understand how this research will be written up and published.	NS
7	I understand how to raise a concern or make a complaint.	NS
8	I consent to my / ~~my child's~~ (*delete where appropriate)*information being given to a specialist ENT doctor if necessary for onward specialist management	NS
9	I consent to having a photo of my / ~~my child's~~ (*delete where appropriate)*ear drum taken). This is for research purposes only.	NS
10	I understand how any audio recordings, photographs or videos might be used.	NS
11	I agree to ~~/ give permission for my child to~~ (*delete where appropriate*) take part in the study	NS

Nsoli Suzan	26/6/19	Nsooli Suzan
Name of Participant /Guardian / Head of Household	Date	Signature (or thumbprint)
Namulimi Daisy	26/6/19	
Name of person taking consent	Date	Signature



MENGO HOSPITAL
APPROVED
VALID UNTIL
06 AUG 2019
RESEARCH ETHICS COMMITTEE
P. O. BOX 7161 KAMPALA (U)

Appendix IIIb (Translated) Consent Form – For community participants

Erinnya Ly'Okunoonyereza: Okunoonyeereza okuteegera omulimu gw'enkola ya mbayiro mukuyamba okulambula kwabasawo abokubyaalo.

Enyanjula: Osabibibwa okwetaba mungeri ya kyeyagalire mukunoonyereeza kuno. Okunoonyeereza kuno kukolebwa nabolondedwamu kukitebe kyobyobulamu kudistulikiti, ne ku ministule nabalaala era ne mu mukono distulikiti. Omunoonyereeza omukulu ye dokita James O'Donovan.

Omugaso gwo'kunoonyeereza kuno: Okutwaliza awamu okunoonyereza kuno kugezaako kwongera muntegera yomulimu ebyobulamu ebiri mobayiro gyebikolamu mukutumbula enambula ku mutindo gwemirimu gyabasawo abomuyaalo mu Uganda nga kukozesa enkola ekiriza bekikwatako abakulu bona okwetabamu okuvira ddala muntegeeka, munkola ne mukukebera enkola bweze ekola. Eri abasawo abomubyaalo, okunoonyereeza kuno kwagala okutegeera oba basobola okuweereza obujanjabi bwabo abafuunye obulwadde bwamatu. Kino kikulu kuba mukakyo kano waliwo ebuula lyabasawo abakola kundwadde ya matu mubyaalo.

Enkola: Gwe nga owokukakyaalo eyatabye mukino, ogyasomebwa ebisingawo wano(bigatiddwako kuno). Amaloboozi/obutambi wamu ne bifanaanyi nge ebyomukutukwo bijja twalibwa era otegezebwa nga bwebiyinza okozesebwa so nga ate tebiraze mannya go mu alipoota. Kino kyakutwala eddakika 10-15 emirundi esatu mumyeezi mukaaga egyokunoonyereeza.

Byofunamu: Gwe nga owokukyaalo, singa otukiibwako obuvune bwona kumatu go mumyeezi omukaaga nga okunoonyereeza kugenda mumaaso, ogya kwekebejebwa omusawo omukugu owa matu/nyindo/nemimiro (ENT) era agya kuwa amagezi kubujanjbi ki obulala bwoyinza okwetaaga.

Ebyokwekengera: Gwe nga owokukyaalo, tetusubirayo kabi kelalikiriiza, wabula wandibuzibwamu kumirembe oba obulumi akadakiika akatano nga okeberebwa mukutu naddala nga olinamu obulwadde. Akebera era agya kulekerawo agyemu akuma akakebera singa obulumi bweyongera.

Ebitongole nabatekamu essente: Okunoonyereza kuno kutekeddwamu ensimbi aba University of Oxford, Bungereza, nekitongole kyabasawo ekyebungeereeza era abonoonyereza balina akakwate ku Omni Med, Uganda. Olukusa lusabiddwa ebitongole, ekya Oxford, ekye Mengo muddwaliro, ne UNCST ekikulu ekya Uganda.

Enkuuma yebyo ebikujiddwako: Bwino okunganyizibwa agya sigala nga wakyaama.Wabula, abebyobulamu wamu nabatongooza alipoota bandiraba ebimu kubwino eyakukunganyizibwako.

Okwetabamu kwakyeyagalire: Okwetabamuno kwakyeyagalire, era oli wadembe okuvamu wona woyagalidde wadde nga omaze okuwa olukusa. Singa ovamu,okusalawoko tukusaamu ekitiibwa. Bwoba olina byobuuza kukunoonyereeza kuno tukirira **Dr James O'Donovan (Omni Med Uganda & Oxford University +447999 177071**

Singa oba olina ebibuuzo ebikwata kuddembe lyo nga omwetabi mu kunoonyereeza kuno, oyinza okwebuuza ku ssentebe **Pulofesa Micheal Kawooya ku 0772505189** owakakiiko ka Mengo Hospital Research Ethics Committee, P.O.Box7161 Kampala,Uganda.

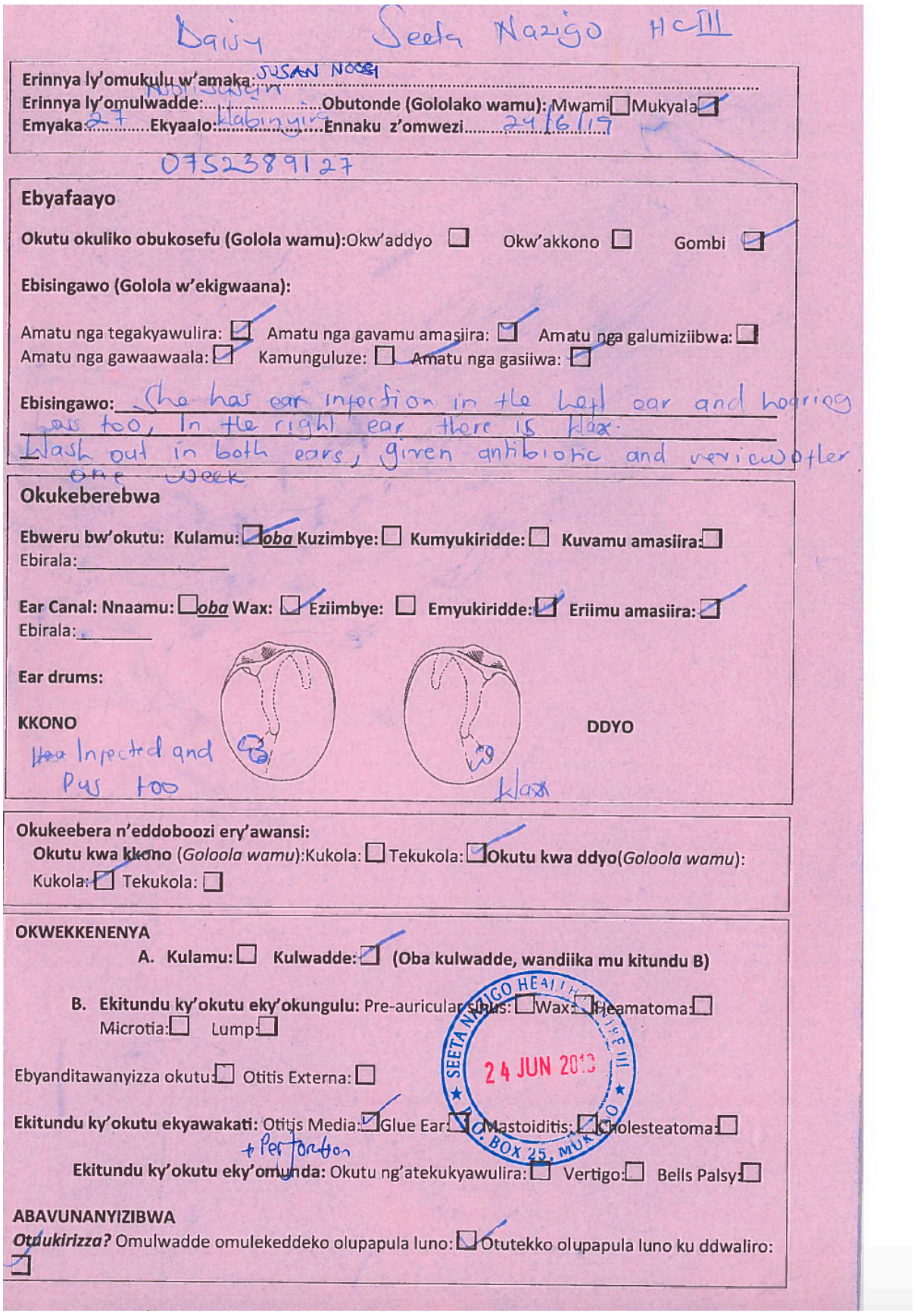
Nzikiriza okwetabamu ☑ Sikiriza kwetabamu ☐ Teweyongera maaso ☐

Ekinkumu/Akabonero.....Olunaku...26/6/19

SEETA NAZIGO
24 JUN 20
P. O. BOX

V | Page Version 2.1

Appendix Figure 17 – Participant consent form.



Daisy Seeta Nazigo HC III

Erinnya ly'omukulu w'amaka: SUSAN NOOR
Erinnya ly'omulwadde: Nabisenyi Obutonde (Gololako wamu): Mwami ☐ Mukyala ☑
Emyaka: 27 Ekyaalo: Kabingiri Ennaku z'omwezi 24/6/19
0752389127

Ebyafaayo

Okutu okuliko obukosefu (Golola wamu): Okw'addyo ☐ Okw'akkono ☐ Gombi ☑

Ebisingawo (Golola w'ekigwaana):

Amatu nga tegakyawulira: ☑ Amatu nga gavamu amasiira: ☑ Amatu nga galumiziibwa: ☐
Amatu nga gawaawaala: ☑ Kamunguluze: ☐ Amatu nga gasiiwa: ☑

Ebisingawo: She has ear infection in the left ear and hearing as too, In the right ear there is Wax. Wash out in both ears, given antibiotic and review after one week

Okukeberebwa

Ebweru bw'okutu: Kulamu: ☐ *oba* **Kuzimbye:** ☐ **Kumyukiridde:** ☐ **Kuvamu amasiira:** ☐
Ebirala: _____

Ear Canal: Nnaamu: ☐ *oba* **Wax:** ☑ **Eziimbye:** ☐ **Emyukiridde:** ☑ **Eriimu amasiira:** ☑
Ebirala: _____

Ear drums:

KKONO Infected and Pus too

DDYO Wax

Okukeebera n'eddoboozi ery'awansi:
Okutu kwa kkono (*Golola wamu*): Kukola: ☐ Tekukola: ☑ **Okutu kwa ddyo**(*Goloola wamu*): Kukola: ☑ Tekukola: ☐

OKWEKKENENYA

A. Kulamu: ☐ **Kulwadde:** ☑ **(Oba kulwadde, wandiika mu kitundu B)**

B. Ekitundu ky'okutu eky'okungulu: Pre-auricular sinus: ☐ Wax: ☐ Heamatoma: ☐
Microtia: ☐ Lump: ☐

Ebyanditawanyizza okutu: ☐ Otitis Externa: ☐

Ekitundu ky'okutu ekyawakati: Otitis Media: ☑ Glue Ear: ☐ Mastoiditis: ☐ Cholesteatoma: ☐
+ Perforation

Ekitundu ky'okutu eky'omunda: Okutu ng'atekukyawulira: ☐ Vertigo: ☐ Bells Palsy: ☐

SEETA NAZIGO HEALTH III ★ P.O. BOX 25, MUKONO ★ 24 JUN 2019

ABAVUNANYIZIBWA

Otaukirizza? Omulwadde omulekeddeko olupapula luno: ☑ Otutekko olupapula luno ku ddwaliro: ☐

Appendix Figure 18 - History and examination record form.

Message category	Logistics group	Case study group	Combined group total
Blank messages/voice notes	9	23	32
Political messages	31	-	31
Nonsensical messages	9	12	21
Links to local news	11	-	11
General videos	5	-	5
Music video	4	1	5
Selling goods	3	-	3
Personal or unclear photograph	-	3	3
Duplicate or repeat message	-	1	1
Total messages removed pre-analysis	**72/1253**	**40 /1264**	**112/2517**

Appendix Figure 19 - Reasons for pre-analysis message exclusion across both WhatsApp Groups.

Month	(A) Logistics Group n; (%)	(B) Case Study Group n; (%)	(A+B) Combined groups n; (%)
February	458; (38.8)	397; (32.4)	855; (35.6)
March	288; (24.4)	256; (20.9)	544; (22.6)
April	157; (13.3)	185; (15.1)	342; (14.2)
May	127; (10.7)	182; (14.9)	309; (12.9)
June	123; (10.4)	159; (13)	282; (11.7)
July	28; (2.4)	45; (3.7)	73; (3)
TOTAL	**1181**	**1224**	**2405**

Appendix Figure 20 - Messages sent across the WhatsApp groups disaggregated by month; (A) – Logistics Group; (B) Case-Study Group; (A+B) Combined groups.

Sender ID	Logistics Group n; (%)	Case-Study Group n; (%)	Combined groups n; (%)
Facilitator 1	354; (30)	171; (14)	525; (21.8)
Facilitator 2	68; (5.8)	19; (1.6)	87; (3.6)
Facilitator 3	27; (2.3)	204; (16.7)	231; (9.7)
Peer Supervisor 1	92; (7.8)	74; (6)	166; (6.9)
Peer Supervisor 2	117; (9.9)	81; (6.6)	198; (8.2)
CHW 1	44; (3.7)	56; (4.6)	100; (4.2)
CHW 2	25; (2.1)	55; (4.5)	80; (3.3)
CHW 3	60; (5.1)	84; (6.9)	144; (6)
CHW 4	80; (6.8)	76; (6.2)	156; (6.5)
CHW 5	22; (1.9)	36; (2.9)	58; (2.4)
CHW 6	23; (1.9)	52; (4.3)	75; (3.1)
CHW 7	112; (9.5)	108; (8.8)	220; (9.2)
CHW 8	38; (3.2)	43; (3.5)	81; (3.4)

CHW 9	42; (3.6)	69; (5.6)	111; (4.6)
CHW 10	23; (1.9)	5; (0.4)	28; (1.2)
CHW 11	12; (1)	41; (3.4)	53; (2.2)
CHW 12	24; (2)	38; (3.1)	62; (2.6)
Health Worker	18; (1.5)	0; (0)	18; (0.8)
ENT Doctor	0; (0)	8; (0.7)	8; (0.3)
TOTAL	**1181**	**1224**	**2405**

Appendix Figure 21 -Number of messages sent by individual stakeholders across the WhatsApp groups.

	Logistics Group				Case Study Group				Combined Group			
	CHW n; (%)	**CHW Peer-Supervisor** n; (%)	**Facilitator** n; (%)	**Health Worker** n; (%)	**CHW** n; (%)	**CHW Peer-Supervisor** n; (%)	**Facilitator** n; (%)	**Health Worker** n; (%)	**CHW** n; (%)	**CHW Peer-Supervisor** n; (%)	**Facilitator** n; (%)	**Health Worker** n; (%)
Voice	404; (79.8)	131; (63.0)	19; (4.2)	0; (0)	531; (79.6)	88; (56.8)	23; (5.8)	0; (0)	935; (79.7)	219; (60.3)	42; (5)	0; (0)
Text	62; (12.3)	64; (30.8)	378; (84.2)	17; (94.4)	78; (11.7)	51; (32.9)	334; (84.8)	7; (87.5)	140; (11.9)	115; (31.7)	712; (84.5)	24; (92.3)
Photo	19; (3.7)	3; (1.4)	45; (10.0)	1; (5.6)	50; (7.5)	15; (9.7)	18; (4.6)	1; (12.5)	69; (5.9)	18; (5)	63; (7.5)	2; (7.7)
Video	6; (1.2)	6; (2.9)	1; (0.2)	0; (0)	6; (0.9)	1; (0.6)	11; (2.8)	0; (0)	12; (1.0)	7; (1.9)	12; (1.4)	0; (0)
.GIF	14; (2.8)	1; (0.5)	0; (0)	0; (0)	2; (0.3)	0; (0)	0; (0)	0; (0)	16; (1.4)	1; (0.3)	0; (0)	0; (0)
Photo and caption	1; (0.2)	3; (1.4)	2; (0.4)	0; (0)	0; (0)	0; (0)	4; (1)	0; (0)	1; (0.1)	3; (0.8)	6; (0.7)	0; (0)
Text and emoji	0; (0)	0; (0)	3; (0.7)	0; (0)	0; (0)	0; (0)	0; (0)	0; (0)	0; (0)	0; (0)	3; (0.4)	0; (0)
Emoji	0; (0)	0; (0)	1; (0.2)	0; (0)	0; (0)	0; (0)	1; (0.3)	0; (0)	0; (0)	0; (0)	2; (0.2)	0; (0)
Video link	0; (0)	0; (0)	0; (0)	0; (0)	0; (0)	0; (0)	3; (0.8)	0; (0)	0; (0)	0; (0)	3; (0.4)	0; (0)

Appendix Figure 22 - Message file types by sender category across the WhatsApp groups (N.B. Percentages may not total 100 due to rounding effect).

	Logistics Group		Case Study Group		Combined groups	
	Yes n; %	**No** n; %	**Yes** n; %	**No** n; %	**Yes** n; %	**No** n; %
February	181 (39.5)	277 (60.5)	73 (18.4)	324; (81.6)	254; (29.7)	601; (70.3)
March	145 (50.3)	143 (49.7)	42 (16.4)	214; (83.6)	187; (34.4)	357; (65.6)
April	84 (53.3)	73 (46.7)	25 (13.5)	160; (86.5)	109; (31.9)	233; (68.1)
May	40 (31.5)	87 (68.5)	22 (12.1)	160; (87.9)	62; (20.1)	247; (79.9)
June	66 (53.7)	57 (46.3)	9 (5.7)	150; (94.3)	75; (26.6)	207; (73.4)
July	13 (46.4)	15 (53.6)	11 (24.4)	34; (75.6)	24; (32.9)	49; (67.1)

Appendix Figure 23 - Peer-to-peer exchanges across the WhatsApp groups over a 6-month period (February – July 2019).