Exploring community health workers' experiences with mHealth: A case study on digital public health interventions at Ekangala Clinic in Gauteng Province

Name: Siphokazi Ntuli

Student Number: 20N4284

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at the

Department of Sociology

Supervisor: Ms Janet Chisaka

j.chisaka@ru.ac.za

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ABSTRACT

Using the theoretical framework of social capital, this study examines the impact of public digital health interventions (mHealth technology) on community health workers (CHWs), with a focus on their experiences and the integration of this technology into their work. A qualitative research approach was employed, involving ten CHWs who participated in in-depth semi-structured interviews. Through the lens of social capital theory, this study argues that mHealth facilitates connections and relationships among CHWs, nurses, the community, and the Department of Health (DoH). Specifically, mHealth has the potential to strengthen coordination among public health structures, bridge networks, and enhance communication. The findings of the study indicate that community health workers (CHWs) are generally positive about using mHealth, although some older participants are less comfortable with the tools than their younger counterparts. Additionally, the study's findings suggest that mHealth strategies can support the Department of Health in achieving the goals outlined in the South African National Digital Health Strategy for 2019–2024. For example, mHealth could be used beyond primary care registration, follow-ups, referrals to health facilities, tracking high-risk patients, and addressing defaulters. This intervention can also support health promotion and disease prevention campaigns, ultimately contributing to better health for all South Africans and helping to address broader primary health care (PHC) challenges.

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TABLE OF CONTENTS

LIST OF ACRONYMS

DoH	Department of Health
CHW	Community Health Work
CHWs	Community Health Workers
GDHS	Global Digital Health Strategy
ICT	Information Communication Technology
IHR	International Health Regulation
IR	Industrial Revolution
MDG	Millennial Development Goals
mHealth	Mobile Health
MTSF	Medium-Term Strategic Framework
NDoH	National Department of Health
NDHS	National Development Health Strategy
NDP	National Development Plan
NGO	Non-Governmental Organisation
NHI	National Health Insurance
PHC	Primary Health Care
UHC	Universal Health Cover
UN	United Nations
UNDP	United Nations Development Plan
USA	United States of America
WBPHCOTS	Ward-Based Primary Healthcare Outreach Teams
WHA	World Health Assembly
WHO	World Health Organisation
SDG	Sustainable Development Goals
SVS	Stock Visibility System

STUDY INTRODUCTION

In today's rapidly evolving technological world, the connection between digital health and healthcare presents a bright future that brings innovative solutions to the never-ending problems of healthcare inaccessibility. The rapid progress of digital technology has sparked a revolutionary shift in healthcare delivery, advancing community health work (CHW) and bringing in a period characterised by accessibility, innovation, and connectivity (Tshikomana & Ramukumba, 2022: 10-11). The digital health field is full of innovative ideas that have the potential to change how we perceive, use, and interact with healthcare services.

In low- and middle-income communities around the world, access to quality healthcare continues to be a significant obstacle, often made worse by factors such as socioeconomic disparities, geographic remoteness, and limited resources (Hall *et al.*, 2014: 9). Innovative approaches that go beyond traditional medical paradigms can take advantage of the revolutionary potential of digital health to achieve fair access to health, especially in marginalised communities (Tshikomana & Ramukumba, 2022: 10-11). Fundamental changes must occur to build a more robust healthcare system.

Community health workers (CHWs) play a crucial role in addressing community health needs through collaborative, community-driven strategies that focus on preventive care, health promotion, and overall well-being (Lunguza *et al*., 2011: 2). They are essential in bridging the gap between formal healthcare systems and the primary health needs of local communities. Empowering CHWs with digital health tools can enhance their ability to work within the Primary Health Care (PHC) system, ultimately improving the connection between community-based care and formal healthcare services. Moreover, in recent years, digital health technologies have become effective instruments for expanding the scope and capability of community health services, providing fresh chances for involvement, education, and empowerment (Tshikomana & Ramukumba, 2022: 10-11). Digital health solutions can change how community-based healthcare services are delivered, expanding the scope of care outside conventional clinical settings.

This study applies social capital theory to explore the impact of mHealth (one of the digital health interventions) on CHWs' experiences in the community they serve. In this study, social capital is viewed as resources in social networks leading to trust and reciprocity (Abbott & Freeth, 2008: 874-880). Studies that use social capital theory to study health reveal that individuals with strong social networks and supportive communities are likely to experience

better health outcomes, including mental health, reduced mortality, and enhanced resilience against diseases (Erikson, 2011: 3). Similarly, in this study, the approach is that social capital plays an important role in shaping health-related outcomes. This study explored CHW's incorporation and experiences of using mHealth in their work. In South Africa, CHWs are employed to improve the public health sector by harnessing the strengths of social networks and using mHealth technologies to increase social support, ensure collective action toward healthier lifestyles and disease prevention, and facilitate health-related communication (Saltiel *et al*., 2017: 450).

1.1 Goals of the research

The primary goal of this study was to explore the CHWs' incorporation and experiences of using digital health interventions, specifically mHealth and Apps CHW use into their work. mHealth (or eHealth) refers to the use of mobile phones in healthcare, and it is aimed at a particular technology, namely smartphones and mobile sensors (WHO, 2021: 40). The main goal of this research was achieved by:

1. Finding out how mHealth is applied in community healthcare work and the type of mHealth Apps that CHWs use;
2. Exploring the training and support that CHWs receive when using mHealth;
3. Exploring the experiences of using mHealth, including the advantages and disadvantages of using mHealth.

1.2 Thesis Outline

This thesis is divided into 5 chapters, starting chapter 1, which introduces the study, and an outline the primary and secondary goal. Chapter consists of two sections, the first section reviews literature on the digitalisation of public health and community health work globally, and in South African. It also includes relevant policy documents on digital public health from the World Health Organization (WHO) and South Africa's National Department of Health (NDoH). The second section of chapter 2 outlines the theoretical framework of the study and examines how social capital theory supports communication between Community Health Workers, the community, and the Department of Health through mHealth. Chapter 3 provides a discussion on why qualitative research methods for data collection and data analysis was appropriate for this study. Chapter 4 analyses the participants' responses using thematic data analysis method. Finally, chapter 5 provides a conclusion to the study and its limitations.

A LITERATURE REVIEW AND SOCIAL CAPITAL

2.1 INTRODUCTION

This literature review chapter begins with a brief discussion of various concepts in digital health or healthcare digitalisation to provide clarity and a foundation for the context of this research. The global context of digital health follows this discussion to provide a broad perspective of digital health developments in other countries and how they experience these innovative advancements. This review includes various policy documents, such as the Global Digital Health Strategy (GDHS) for 2020-2025 published by WHO (2021). This document recognises the potential of digital health to transform and improve health outcomes and healthcare delivery worldwide. This is followed by a discussion on the NDoH's policy on the National Digital Health Strategy (NDHS) for 2019-2024. This strategy is a response to and is influenced by the GDHS (WHO, 2021). The section concludes with a review of literature on the implementation of mHealth (or eHealth) in South Africa and its impact on healthcare provision, specifically by CHWs. Included is a review on the disadvantages of mHealth, such as the consequences of the digital divide. It is important to note that, although, digital health public technologies consist of various interventions such as artificial intelligence and wearable devices, this study focuses on mobile health, also known as mHealth.

2.2 CONCEPTS IN DIGITAL PUBLIC HEALTH INTERVENTIONS

The integration of digital technologies into healthcare systems and practices, often known as the "digitalisation of health or digital health," has become an innovative force that has the potential to enhance quality, accessibility, and efficiency of care (Wang *et al*., 2021: 2). Digitalisation of health includes digital public health interventions such as eHealth, mHealth, and emerging fields to improve quality of life and provide essential services (Wang *et al*., 2021: 2). This digitalisation is a dynamic field concentrating on applications of information and communication technologies (ICTs) for health (Zeeb *et al*., 2022: 1). Digital health technologies include telehealth, teletherapy, fitness apps, text messaging, computer programs, smartphone, and many more (Crowe-Cumella *et al.,* 2023: 1). It is acknowledged that digital health and health informatics are bringing about revolutionary advances in healthcare management, research, and delivery (Botha & Booi, 2016: 1). Health informatics is a discipline that intersects information systems, computer science, and healthcare, and is at the heart of digital health innovation as it advances digital health strategies and technology (Botha & Booi,

2016: 1). Health informatics uses ICTs to obtain, store, retrieve, and apply data to enhance healthcare services.

eHealth is the first word in this field of digital health, which means that the eHealth concept precedes digital health, thus digital health is rooted in eHealth (Wang *et al*., 2021; Wienert et al., 2022). For this reason, it is difficult to describe or define the concept of eHealth due to its dynamism (Wiernert *et. al*., 2022: 2). For example, Botha and Booi (2016: 1) describe eHealth as the use of ICTs to "support the exchange of healthcare information to facilitate efficient and effective delivery of healthcare services." Like others, they agree that using eHealth is necessary because it allows for enhanced patient safety, more precise clinical data, more readable medical documents, and a decrease in the total cost of healthcare services ICT (Wang *et al.*, 2021; Wiernert *et al*., 2022). This means that the primary focus in eHealth is healthcare provision, and not health promotion and disease prevention. mHealth, on the hand, is described as the broad use of mobile cellular communication devices, sensor devices, and multimedia devices in mobile and wireless health services (Botha & Booi, 2016: 1). Similarly, the WHO defines mHealth as medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices.

This study focuses on mHealth (use of smartphones), although in South Africa formerly separated strategies, mHealth and eHealth, have been combined into one digital health approach (NDoH, 2022: 16). Moreover, mHealth is positioned as a specific subset of digital health. To elaborate, mHealth offers a more mobile-cantered approach to healthcare compared to the broader, systematic focus on eHealth ((Botha & Booi, 2016: 1). Its relation to this study lies in the integration of mobile technology to enhance community healthcare work, making it a key area for exploration in digital public health strategy. While mHealth focuses on health management through Apps like Comm Care Apps. eHealth continues to be critical backbone for structured systematic-wide healthcare delivery (Wiernert *et. al*., 2022: 2).

Global advancements in digital health or health technologies are becoming more prevalent within health systems, and organisations dedicated to global health improvements, such as the WHO and the United Nations (UN) are endorsing these developments (Novillo-Ortiz *et al*., 2018: 123). The rapid advancement of digital technology, encompassing both hardware and software components, has led to a profound comprehension of how digitalisation might enhance public health, particularly in the areas of health prevention and promotion (Wienert *et*

al., 2022: 1). As researchers note that “technological innovations in apps for tracking health-related behaviour, monitoring potential health risks, and communication and interaction have rapidly changed many aspects of public health” (Zeeb *et al*., 2020 cited in Wienert *et al*., 2022: 1). This is evident in the way individuals, businesses and organisations are using social media sites such as Facebook, Instagram, X (formerly Twitter), and LinkedIn to disseminate health-related content.

2.2.1 Studies on digital health

Researching the impact of mHealth interventions can inform strategies to reach vulnerable populations and reduce disparities in healthcare access and health outcomes (Medhanyie *et al*., 2015: 8-9). There are many studies investigating and evaluating mHealth intervention and its impact on CHWs (Braun *et al*., 2013; Greuel *et al*., 2023; Medhanyie *et al*., 2015; Ojo, 2018). For example, Medhanyie *et al.* (2015) conducted a study to assess health workers' experiences, barriers, preferences, and motivating factors in using mobile health medical forms on smartphones. This study was focused on maternal health care in Ethiopia and concluded that health extension workers (or CHWs) and midwives found the electronic forms on smartphones useful for their daily maternal care services. Another study by Ojo (2018) titled *mHealth intervention in South Africa,* investigated the implementation of mHealth in South Africa and found that there are many projects on mHealth, but they are most likely to continue as pilots to "confirm the potential of mobile technologies but with unclear evidence of outcomes and benefits." Similarly, this study is about the incorporation of mHealth intervention by health workers; it differs from other studies done in South Africa as it focuses on the incorporation and experiences of using mHealth by CHWs.

Moreover, another study done by Neupane et al. (2014), study entitled "*Comparing a paper-based monitoring and evaluation system to mHealth system to support the national community health worker program, South Africa: an evaluation*" was an evaluation of the development of a phone-based and paper-based monitoring system to support CHW (Neupane *et al.*, 2014). In this study, "Ten CHWs maintained the paper forms and mHealth system to record household data on community-based intervention." This was done to "calculate the correspondence between the paper and phone records." Furthermore, this study assessed how impactful the formalisation of mHealth (monitoring and evaluation) for outreach teams could enhance their supervision system. The researchers found that using mHealth systems strengthens the CHW program.

However, less is known about CHW's incorporation of mHealth tools and their experiences with mHealth interventions in South Africa. The current study will add to the existing literature on the impact of mHealth on CHW's and on primary healthcare services. Furthermore, some researchers in the field of CHWs and mHealth collect information using systematic or scoping reviews of existing literature to collect data (e.g. Braun *et al*., 2013; Gruel *et al*., 2023; White *et al*., 2016). This study will take a qualitative approach by investigating digital public health intervention in community health work- a case study on using mHealth intervention in a clinic.

Public health organisations and health professionals can increase their reach, enhance access to care, and better serve the needs of disadvantaged populations by utilising these digital technologies. For example, telehealth can allow individuals to access healthcare online, conquering obstacles such as lack of transport, geographical distance, and mobility issues. The Sustainable Development 2030 Agenda highlights that utilising ICT, and globalisation has a vast potential to advance human progress to close the gap in the digital divide and enhance knowledge societies (WHO, 2023: 7). Moreover, the outcome of the meeting that was held by the United Nations General Assembly "on the overall review of the implementation of Information Technology outcome document" highlighted that technology allowed for the government to provide healthcare in a revolutionary way (WHO, 2023: 7). This outcome is positive as it was found that through digital health, more people can access care as it was previously hard to access (WHO, 2023: 7). The potential advantages and benefits of public health brought forward by digitalisation are summarised by Odene et al. (2019: 30), these public health advantages include; (a) that "It supports the transition from cure to prevention" (b) "It helps to put people and patients at the center" and (c) "supports CHW empowerment; It makes healthcare management and delivery more efficient, safer and cheaper."

2.3 A GLOBAL CONTEXT ON THE DIGITALISATION OF HEALTH

In 2005, WHO member countries pledged to deliver Universal Health Cover (UHC) that would provide citizens access to quality healthcare services, which is now being provided through digital technologies (Novillo-Ortiz et al., 2018: 123). In addition, the International Health Regulation (IHR) requires that member countries "have the capacity to ensure national preparedness for infectious hazards that have the potential to spread internationally" (Budd *et al*., 2022: 1183). This obligation can be met by developing new methods and technologies (such as mHealth) to strengthen the core abilities outlined by the IHR (Budd *et al*., 2022: 1183). It is apparent that technological health innovations have revolutionised global healthcare, for

example, during the Covid-19 outbreak, digital technologies were harnessed to support public health (Lubinga *et al*., 2021: 286; Wang *et al.*, 2021: 39). Studies show that Covid-19 has accelerated the development and implementation of digital technologies (Budd *et al*., 2020; Wang *et al*., 2021; Wong *et al*., 2022). For example, using digital health technologies during Covid-19 made essential contributions to various public health functions such as contact tracing, mass immunisation, public communication, and epidemiological surveillance (Wong *et al*., 2022: 2). However, the rapid transmission rate of Covid-19 shows that "there remains significant untapped potential in harnessing, leveraging, and repurposing digital technologies for public health" (Wong *et al.*, 2022: 1).

According to WHO (2023: 3), over 130 member countries, including low- and middle-income countries, have implemented digital health strategies and policies. Despite the significant advancements made by some countries, many countries still need institutional backing to develop and consolidate digital health or eHealth strategies and implementation (WHO, 2020: 8). In the last ten years, developed countries such as the United States of America (USA) have made significant investments in various digital health technologies that will enable a better response to the next epidemic (Center for Strategic and International Studies [CSIS], 2019). The USA government's "innovations in digital technologies have enabled rapid progress in the collection, analysis, presentation, and use of data to improve health outcomes" (CSIS, 2019:1). Other researchers have found that the extensive "use of ICTs in the field of health evidence a notable improvement in results obtained by institutions, health professionals and patients (Novillo-Ortiz *et al*., 2018: 123-24). It is for this reason that the South African government is building digital health capacities that will enable successful implementation of the NDHS (NDoH, 2022: 17). Some universities in South Africa have begun to offer short courses in digital health and postgraduate studies that explore digital health topics (NDoH: 2022: 17).

2.4 The World Health Organization's global strategy for digital health

This section will review the GDHS for 2020-2025, published by the WHO in 2021. WHO's World Health Assembly (WHA) in 2005 encouraged member countries to draw a long-term strategic plan for developing and implementing eHealth services that would establish health information and communication infrastructure (WHO, 2021: 3). Countries were also urged to develop action plans that would deliver the suggested vision and to create a framework to track and assess eHealth implementation and progress (WHO, 2021: 3). The purpose of this global strategy is to solidify healthcare systems through the development of public digital health

interventions for consumers, healthcare providers, health professionals, and industry towards patient empowering and striving for the 'health for all' vision (WHO, 2021: 11). The global strategy is suitable for use by all member countries, including those with "limited access to digital technologies, goods and services" (WHO, 2021: 11). The global strategy also aims to promote international collaboration and give support to a country's national health programs such as UHC and the SDG related to health.

2.5 Healthcare in South Africa

It is important to contextualise healthcare discussions in South Africa in its history. After the abolition of apartheid, much work has been done to address disparities in South Africa, such as providing free access to primary healthcare. However, more work is still needed to ensure equity in access to healthcare (McLaren *et al*., 2013: 2). The term *access to healthcare* is used to describe the chance to access and utilise high-quality healthcare service (Mclntyre & Ataguba, 2014: 1). *Access to healthcare* focuses on the *degree of high fit* or compatibility that exists between the healthcare system and people who require these services (Mclntyre & Ataguba, 2014: 1). This term 'access' is analysed using a multi-dimensional approach namely: *availability* (or physical access), *affordability* (or financial access) and *acceptability* (or cultural access) (McIntyre *at al*., 2009 cited in McIntyre & Ataguba, 2014: 1). According to McIntyre and Ataguba (2014: 1-3), *availability* focuses on whether the health systems satisfy the demands of the population and that the proper services are offered at the appropriate time and location. *Affordability* examines the *degree of fit* between the total ability to obtain medical care and the ability of the individual to pay given the constraints of their household budget. Finally, *acceptability* concerns the alignment of expectations and attitudes between the patient and the provider (Mclntyre & Ataguba, 2014: 11, 16-17, 21-22).

In 1994, South Africa embarked on reforming healthcare as part of the national development agenda (Burger & Christian, 2020: 43). Since then, several policies and legislation, such as the National Health Act, which governs the entire health system, have been introduced (Mclntyre & Ataguba, 2014: 3). This section will not consider each piece of legislation in detail as the focus is on the progress made in access to healthcare, particularly the development of digital health as a response to improve access to healthcare. The centralised and hospital-based public health is being reformed by progressive policies that support primary healthcare that is accessible and effective (Burger & Christian, 2020: 44). The Constitution states that South African citizens have a right to healthcare, including reproductive healthcare services (South

African Constitution, 1996: 11). However, depending on the resources available, the right to health care may be restricted in some situations. This study contributes to the merging literature on digital public health interventions in community healthcare work, and how these interventions can improve community health outcomes.

The UN supports the development of digital health, and South Africa, as a member country, aims to fulfil SDG Number 3 on healthy lifestyles and well-being for all (United Nations Development Programme [UNDP], 2024). In addition, the UNDP also argues that UHC progress can be achieved by developing digital health technologies. Like many other countries, South Africa is reforming and developing its health systems to achieve UHC (Thomas *et al.,* 2021: 1-2). This includes re-prioritising and reorganising PHC to promote health, control disease outbreaks, and focus on disease prevention. According to Thomas *et al.* (2021: 2), altering health systems to achieve UHC can be achieved through a *multi-pronged approach* that features CHW teams, also known as Municipal Ward-Based Primary Healthcare Outreach Teams (WBPHCOTs). The work of CHW teams is essential for re-engineering the PHC strategy in South Africa, which may increase healthcare access and health outcomes.

The Medium-Term Strategic Framework (MTSF) found in the National Health Insurance (NHI) policy states that one of the interventions by the government is to "supply public health facilities with adequate ICT infrastructure to implement the digital strategy 2019-2024 for South Africa" (NDoH, 2022: 12). The adoption and application of information and ICT tools is believed to be an innovative solution that can assist in improving health systems across several countries, including South Africa (Ojo, 2018: 1). As noted earlier, digital innovations should be developed to promote healthcare equality and enhance the general physical and mental well-being of the population (Crowe-Cumella *et al*., 2023; WHO, 2021).

2.5.1 Digital Health in South Africa

This section discusses the NDHS 2019-2024, published in 2022 by the NDoH. South Africa is among the countries that have successfully implemented a NDHS. The main goal of this strategy is a realisation of the promise of technology in digital health to improve the quality and coverage of healthcare services, and promote behavior change to lessen the onset and acute diseases (NDoH: 2022). The NDHS aims to support the "health sector priorities as articulated in the National Development Plan (NDP) and in line with the current NHI transformation imperatives towards UHC" (NDoH, 2022: 8). It's mission to achieve *better health for all South Africans* partly relies on digital health technologies that are expected to play a considerable role in advancing health systems transformation and enabling the realization of the NDoH's

vision of *a long and healthy life for all South Africans*. The NDHS 2019-2024 is embodied within "five strategic principles of a person-centered focus, expanded access, innovation for sustainable impact, digital health workforce for economic development and a whole-of-government approach" (NDoH, 2022: 8). As earlier stated, this strategy acknowledges the transformative power of health technologies to increase access to the low-resourced communities. Importantly, this strategy conforms with the WHO's World Health Assembly (WHA) Resolution on digital health which was implemented in May 2018.

Furthermore, the strategy is set to strengthen the South African National Development Plan Vision 2030 of "ICT that underpins the development of a dynamic and connected information society and a vibrant knowledge economy that is more inclusive and prosperous" (NDoH, 2022: 12). According to the NDoH (2022: 13), "digital health beneficiaries include (a) patients - people who are seeking to obtain medical services; (b) citizens - individuals who want to navigate their health; (c) healthcare workers - people who want access to the latest information and be supported better to fulfill their role; (d) healthcare managers - who wish to plan, manage, and monitor the health system more effectively, securing health benefits for all citizens."

2.5.2 Implementation of mHealth technologies in South Africa

Using mobile devices like smartphones, tablets, and wearable sensors to deliver healthcare services and improve health outcomes is now referred to as mHealth. The availability of voice and data services on low-cost mobile devices, such as smartphones and tablets, has completely changed how people worldwide access information and communication technologies (Hall *et al*., 2014: 2-3). These gadgets are profoundly impacting many areas of individuals' lives, which include their business, education, and health (Hall *et al*., 2014: 1). There is a noteworthy mobile usage rate in South Africa, which is enabling the implementation of various mobile health Apps (Botha and Booi, 2016: 2). This high rate means that the NDoH and the private sector can teach South Africans how to use mobile phones to access healthcare. Furthermore, the increasing rate of mobile usage potentially points to the potential of accessing digital healthcare using mobile phones (Botha and Booi, 2016: 2).

A study conducted by O'Dea (2020, cited in Lubinga *et al*., 2021: 287) found that by the end of 2020, "South Africa had more than 90 million mobile connections, with a third, between 20 and 22 million people using smartphones." And as World Bank researchers have noted that "many people have access to mobile gadgets than clean water, a bank account, or even a source of electricity" (World Bank, 2012 cited in Hall *et al*., 2014: 1). These statistics could mean that there is potential for mHealth interventions to reach many people via their mobile phones and

smartphones. Consequently, if more people have smartphone access, they will likely benefit from mHealth interventions. As highlighted by (Botha & Booi, 2016: 4) that the access to smartphones among South Africans can influence the participation in mHealth initiatives. This highlights the importance of developing mHealth strategies to close the gap in healthcare delivery and access, especially in disadvantaged urban and rural communities (Botha & Booi, 2016: 5-6). mHealth has immense potential to improve health service delivery procedures, particularly in settings with limited resources.

Similarly, results from a review of studies on the impact of mHealth interventions by Hall *et al.* (2014: 3) reveal an increasing "efficacy of mHealth interventions in low-middle income communities," especially in terms of improving treatment adherence, appointment compliance, improving treatment, data gathering, and developing support networks for health workers. Similarly, an evaluation by Neupane *et al.* (2014) titled *Comparing a paper-based monitoring and evaluation system to a mHealth system to support the national community health worker programme: an evaluation* highlights the importance of mHealth interventions to improve CHWs activities of monitoring and evaluating the patients' record system. They conclude that instead of using paper-based monitoring and evaluating systems, mobile-based systems are the best alternative to making CHW effective (Neupane *et al*. (2014: 9).

In South Africa, several mHealth initiatives have been put in place to support essential health programmes (NDoH, 2022: 16). One of the most successful mHealth implementation is the *MomConnect* programme which the NDoH established through the partnership of public and private partners. *MomConnect* has shown to help educate and motivate women to look after themselves and use information on antenatal and post-natal services during and after pregnancy. In early 2019, more than 12 million women were registered as *MomConnect* users (NDoH, 2022: 16). At the end of 2018, Dimagi a global tech company, began supporting South Africa's NDoH to develop and implement a comprehensive suite of mHealth tools built on the Comm Care platform (Dimagi, 2020: 2). The Comm Care is an application used by CHWs in South Africa, and the participants in this study use this App. The 2019-2024 strategy for South Africa state that there is a need to rationalise and consolidate mHealth intervention investment to increase health technologies' impact (NDoH, 2022: 16). As discussed earlier, the proliferation of mobile devices, and if integrated with health technologies, has the potential to significantly improve health outcomes.

2.6 HEALTH DISPARITIES DUE TO DIGITAL HEALTH TECHNOLOGIES

As much as this study anticipates the positive outcome of digital public health intervention, it also acknowledges the disadvantages. Digital technologies are being accelerated to improve healthcare access. However, they also exacerbate healthcare disparities (Saeed & Masters, 2021: 60). Health disparities exacerbated by digital technologies are referred to as the "digital divide" (Saeed & Masters, 2021; 59). A study conducted in Mpumalanga by Witkiness *et al.* (2018 cited in Lubinga *et al*. 2021: 287) found that some patients and health workers who use the internet, especially social media, usage of mHealth was intermittent due to financial constraints.

The consequence of this "digital divide is that communities with poorer health outcomes continue to have poorer health outcomes" despite technological improvements (Saeed & Masters, 2021, 61). Furthermore, Lubinga *et al.* (2021: 287) highlight that many factors contribute to the digital divide, such as low literacy, poverty, and the population's lack of interest and motivation to use eHealth. These factors are common in many countries, which makes digital divide a global crisis (Saeed & Masters, 2021: 60). However, study findings show that the digital divide is decreasing in many ways due to improved access to technology and the internet (Lubinga *et al*., 2021; Saeed & Masters, 2021). These findings reveal that for countries to decrease the digital divide, there must be improved access to the internet infrastructure and affordable technological access, including digital literacy training, especially in rural areas. As Currie and Seddon (2014: 187) argue that "only through developing a health infrastructure supported by these applications will the culture of public health change." Similarly, Wong *et al.* (2022: 4) argue that to implement digital technologies fairly, social determinants must be acknowledged "to ensure digital health technologies for all populations and overcome the geographic and economic barriers to achieving good health."

For Currie and Seddon (2014: 187), the concept of mHealth includes quality, affordability, access, and "matching of resources and behavioural norms through the exchange of information." Therefore, mHealth intervention should achieve its goals of decreasing health inaccessibility more than exacerbating health inequalities. Furthermore, mHealth developments should be perceived as social innovations not as economic or technical challenges as this will lessen health disparities and achieve mHealth potential (Currie & Seddon, 2014:187). While technical and economic challenges are important considerations, developing mHealth to address accessibility, affordability, cultural norms, and user engagement would go a long way in solving the digital divide. Perceiving mHealth as a social

innovation recognises the importance of addressing and understanding factors leading to health disparities or the digital divide to ensure its impact on healthcare delivery (Currie & Seddon, 2014: 187).

However, a study conducted by Lubinga *et al.* (2021) entitled *"Health Disparities and the Digital Divide within South African Disadvantaged Communities during the Covid-19 Pandemic"* focused on how healthcare technologies increased health disparities in South Africa during COVID-19. This study found that digital health advancement favoured the few who can afford it, while these advancements disadvantage poor people who cannot afford to maintain services including mobile data (Lubinga *et al*., 2021: 287). South Africa experiences health disparities due to a two-tiered system in which the wealthy people have access to private healthcare that is well-resourced, and the vulnerable majority depend on the public health system that is under-resourced (Lubinga et al., 2021; McIntyre & Ataguba, 2014).

2.7 Community health workers in South Africa

CHWs are front-line public workers who connect formal healthcare services and the communities they serve. They can overcome some of the challenges associated with the inaccessibility to healthcare services in poor communities. CHWs are defined as any community worker who is trained with little to no professional medical education, and they provide patient-facing assistance and services (Hartzler *et al*., 2018:1). Others define CHWs as individuals who have a broad understanding of the language and culture of the community they live in and can offer culturally competent healthcare services to communities (Thomas *et al*., 2021: 2). And according to the WHO (2014: 5), CHWs can enhance community-based healthcare delivery and primary care access, bridge the gap between communities and healthcare systems, and enhance national health information systems. Although CHW programs were first institutionalised in the 1920s and have been present in South Africa since then (Spotlight, 2024), however, during colonialism and apartheid there was a limitation on the number programs and roles of CHW (Thomas *et al*., 2021: 3).

After 1994, the new health policy (1997 White paper) which was about the transformation of health sector did not regard CHW as part of PHC teams, and did not support the incorporation of CHW in the public service (Spotlight, 2024, Thomas *et al*., 2021: 2). In the early 1990s during the HIV epidemic, new CHW initiatives received funding through non-governmental organisations (NGO) (Thomas *et al*., 2021: 2). These NGO led CHWs made limited contributions to the local health as they "had a technical and disease orientated focus" (Thomas

et al., 2021: 1). This begun to change in 2010 after the Minister of Health and other health officials visited Brazil, they returned bearing a vision "of a wide-reaching CHW cadre integrated into the healthcare system" (Spotlight, 2024, Thomas *et al*., 2021: 2). As a result, in 2011 the National Health Council advocated the implementation of the WBPHCOTs. In addition, the Provincial Guidelines for the Implementation of the Three Streams of PHC Reengineering were established (Thomas *et al.,* 2021: 2), and the NDoH declared that standardisation of CHW employment is necessary to this strategy (Spotlight, 2024).

South Africa has developed and updated the current PHC model incorporating care among various health care levels. This was done to achieve the Millennium Development Goals (MDGs) 4 and 5 as well as other disease burdens (Neupane *et. al*., 2014: 2). Health professionals are currently advocating for the recruitment of CHWs because of the crucial role they play in the achievement of primary objectives in public health (Tshikamana & Ramukumba, 2022: 2). This is why the WBPHCOTs was implemented as it is aimed at improving access to healthcare for poor and vulnerable communities (NDoH, 2022; 3).

In South Africa, like many other medium-income countries, CHWs face challenges in their everyday work activities, as well as outside their control (Gruel *et al*., 2023: 1; Johnson *et al*., 2022: 3; Medhanyie *et al*., 2015). A key reason for employing CHWs is to overcome the challenges in primary healthcare. However, CHWs also encounter obstacles that prevent them from performing at their best. The challenges that the current study focuses on are those that can be addressed through mHealth interventions. Other studies have found CHW challenges which include inadequate CHW equipment and education; limited health literacy supplies; lack of community interest; and limited CHWs' communication skills (Gruel *et al*., 2023: 2-3; Johnson *et al*., 2022: 4-5). One of the responses to these challenges would be providing CHWs with educational communication materials that can be carried to the households they visit and using media to reinforce health messages (Hafeez & Haq, 2009 cited in Gruel *et al*., 2023: 3). In response to some of these challenges, the NDoH (2022) has developed mHealth information technologies to support CHWs' roles and responsibilities. The mHealth interventions in CHW are used "conduct household profiling, enrol clients, screen diseases, refer clients and manage monthly reports" (Tshikamana & Ramukumba, 2022: 2).

2.7.1 The role of community healthcare workers

According to the WHO (2014:5), the demand for an increase in healthcare expenses led to the need for resource-saving approaches that promote PHC service delivery and access. CHWs are thus viewed as a strategy to ensure access to PHC (WHO, 2014). For example, the PHC

“outreach programme in South Africa has achieved its expected outcomes because of the support provided by CHWs who operate effectively in linking the community with the health system” (Nxumalo *et a*l., 2013 cited in WHO, 2014: 7). Additionally, as the proactive part of health services, CHW teams offer education in homes and communities, including tracing, early screening, and referrals for a range of health and social services (Thomas *et al*., 2021:1). CHW teams, including school health services, health promotion and environmental health services play a crucial role in empowering community-based health services (Thomas *et al*., 2021: 2).

There is a broad understanding of what constitute the roles of CHW, as Austin-Evelyn *et. al*., (2017: 2) and D’Ambruso *et al*., (2023: 2) list the functions of CHWs:

- They promote health and prevent illness;
- they conduct community assessments and mobilise around community needs;
- they conduct a structured household assessment to identify their healthy needs;
- they provide psychosocial support to community members;
- they identify and manage minor health problems;
- they support screening and health promotion problems and Early Childhood Development (ECD) centers;
- they promote and work with other sectors and undertake collaborative community-based interventions;
- they support a continuum of care through service coordination with other relevant service providers.

During the recent pandemic, South African CHWs carried out over a million Covid-19 screening activities within nine months (Thomas *et al*., 2021: 2). Moreover, D'Ambruoso et al. (2023: 3) study found that CHWs in South Africa played a crucial role in the response to Covid-19 as they were educating the community about Covid-19, and they were a linkage to facilities. This is why the current study is interested in exploring the integration of mHealth into CHW to find out if this intervention is improving CHWs’ functions and the impact on the community they serve.

2.7.2 The digitalisation of community health work

In the South African public health institutions, “the realities of overcrowding, long waiting times, shortage of health professionals and excessive strain placed on staff employed in public health facilities, limits access to acceptable and high-quality care” (DoH, 2011 cited in

Williams, 2020: 3; Rossouw *et al*., 2013 cited in Williams, 2020:3). CHWs are employed to alleviate the many problems affecting public healthcare. This is why integrating digital interventions strategically can provide solutions for the DoH, healthcare workers, and community. There is potential to improve access to care, health promotion and disease prevention campaigns as this strategic development can include using SMSes to spread health information to communities. As a study by Tshikomana and Ramukumba (2022) titled *Implementation of mHealth applications in community-based health care: Insights from Ward-Based Outreach Teams in South Africa* found that using an mHealth App called Mobenzi allowed CHWs to effectively and efficiently participate in PHC initiatives. Mobenzi also allowed them to handle their clients efficiently, and they were able to seek advice and request emergency support without any delays (Tshikomana & Ramukumba, 2022: 10).

A review by Greuel *et al.* (2023) examined to what extent mobile health in the form of smart devices may enhance the delivery of public health messages in CHW-client interactions. They found that mHealth may increase the effectiveness of CHWs' promotional messages on healthy behaviours. Their review shows that "smart mobile devices have the potential to enhance face-to-face interactions between CHWs and their clients, as these job aides address many of the challenges that CHWs commonly encounter in the field" (Greuel et al., 2023: 9). However, the reviewed studies were "unclear whether mHealth helps CHWs change clients' health behaviours, … and the impact of employing mHealth in the field is not all positive, as smart devices may burden CHWs with technological difficulties and lead them to act more passively in their interactions with clients" (Greuel et al., 2023:9). In addition to the earlier challenges discussed by CHWs, Greuel *et al.* (2023) found that CHWs encounter resistance to behavior change from the communities they serve, and the health messages are taken for granted (Greuel *et al*., 2023).

2.8 A Conclusion on literature review

To conclude, the chapter has provided a global and South African discussion and review of digital health technologies developed to improve access to healthcare and healthcare delivery and to advance CHW. The discussion started with the definitions of ICTs in health, and the global literature on digital public health. This included the WHO's IHR requirement that member countries develop digital health technologies to be more prepared for future pandemics, and to improve access to healthcare and health outcomes. Additionally, the chapter discussed the recent document by the WHO on digital health advancements that supports the

implementation of mHealth to address global health challenges and strengthen health systems to support various member states.

Studies on mHealth interventions in South Africa provide the local context in which this study is conducted. Most reviewed studies found that the digitalization of community healthcare work could improve CHWs interactions with the communities they serve by providing them with tools to empower them. In this literature, it is argued that using digital health technologies provides opportunities to improve healthcare systems. However, literature also shows that there are challenges in employing mHealth in the field as smart devices may burden CHWs with technological difficulties, and there is a *digital divide* in the community they serve.

SOCIAL CAPITAL

2.9 INTRODUCTION

This section discusses and justifies why social capital theory is an ideal theoretical framework for this study. The focus is on the potential of mHealth interventions to draw and build on the community's social capital (e.g. networks) in improving health outcomes. The discussion of social capital between CHW and communities in relation to mHealth interventions draws on Rojas *et al*.'s (2011: 690) *communicative underpinnings of social capital*, which is an approach that views social capital as the primary source of societal integration. The study applies social capital to examine and understand social networking in health as social capital theory has been widely acknowledged to have an influence on health (Abbott & Freeth, 2008: 875). An overview of social capital theory is provided, and the concept of *social networks* explains its influence on health outcomes (Putnam, 2000). Included is a discussion on how social capital is viewed as an individual and a collective attribute.

2.10 AN OVERVIEW OF SOCIAL CAPITAL THEORY

Social capital is part of our daily lives - we are social beings, we are born to be social, and working as a group for collective action is deeply rooted in us (Claridge, 2018: 4). Most resources that humans need cannot be produced by individual effort instead they require collective effort. Humans benefit from social capital by socialising, and in turn social capital is made possible by human's capacity to act cooperatively and generously (Claridge, 2018: 4-5). Social capital is a complex theory, which has several dimensions, functioning on several levels and with a variety of "factors that determine whether it has a positive or negative effect. …

every feature of social structure can be social capital in the sense that it produces desired outcomes but also can be a liability in the sense that it produces unwanted results" (Claridge, 2018: 5). The negative side to social capital may include fostering behaviour that worsens economic performance, obstructing the process of social inclusion and social mobility, dividing communities instead of uniting (Claridge, 2018: 5). Although this study focuses on the positive aspect of social capital - how it improves access to health through mHealth - it also acknowledges the negative aspect of mHealth intervention because of the digital divide between CHWs and communities and health outcomes.

Social capital is a unique theory as it combines economics and sociology disciplines, and it has multiple theoretical interpretations (Claridge, 2018: 4). Despite having been studied from other disciplines, sociology is credited with advancing social capital as it incorporates the belief that participating in a social group is beneficial for both individuals and communities (Derose & Varda, 2009: 273). From a sociological perspective what is central to social capital theory is that relationships matter, and social networks provide value (Claridge, 2018: 5).

Furthermore, social capital can be used by anyone who wants to investigate "human sociability and cooperation, and its evaluation" (Claridge, 2018: 7). The original development of this theory is attributed to Bourdieu's (1986 cited in Claridge, 2018: 7) *theory of social capital*, which is based on the recognition that capital is not only economic and that social exchanges are not purely self-interested and need to encompass 'capital and profit in all their forms'. Coleman's (1988 cited in Claridge, 2018: 8) *rational choice approach* builds on Bourdieu's ideas in his conceptualisation of social capital by recognising that "capital is not only economic, but that social exchanges are not purely self-interested and need to encompass capital and profit in all their forms." Putnam's (1993 cited in Claridge, 2018: 9) *democratic or civic perspective* also builds on Bourdieu's social capital theory, and he views social capital as a 'public good.' He argues that "social capital is essentially the amount of trust available and is the main stock characterising the political culture of modern society" (Putnam, 1993 cited in Claridge, 2018: 9). Like most research in public health, the current study draws on Putnam's conceptualisations of social capital (Derose & Varda, 2009: 273-306).

As earlier noted, Putnam's (2000: 19) main contention of social capital refers to "connections among individuals-social networks and the norms of reciprocity and trustworthiness that arise from them." For him, *civic virtue* and social capital are interdependent in fostering and strengthening networks, building trust, promoting collective action, and enhancing well-being.

Additionally, the power of *civic virtue*s depends on the tight network "of reciprocal social relation" (Putnam, 2000: 19). To him, the more isolated individuals there are in a society, the weaker social capital. He believes that social capital is characterised by both an "individual and collective aspect - a private face and a public face" (Putnam, 2000: 20). These characteristics of social capital will be discussed in the following paragraphs.

While scholars may argue that mobile tools or technological developments can lead to a decline in social capital, this study argues that these tools offer innovative opportunities to facilitate communication and bonding within communities. Our lives have been significantly impacted by how mobile phones have altered communication possibilities (Saltiel *et al*., 2017: 449). It is argued ICTs are fundamental for public health systems as they "bolster levels of social capital through interventions that address a decline in social connectivity by promoting healthy relationships and a greater sense of community" (Sharif, 2007: 37)

Putnam (2000: 22) identifies three forms of social capital, namely *bridging, bonding*, and *linking*. These forms can be applied to understand the influence of mHealth interventions on CHWs and the communities they serve. mHealth can strengthen intra-community ties and *bonding.* As Putnam (2000: 23) argues the concept of *bonding* in "social capital constitutes some kind of sociological glue and creates strong group loyalty." The concept of *bridging* can refer to networks within mHealth that can facilitate connections between CHW and communities. For example, mHealth can disseminate health education via SMS, as Putnam (2000: 23) argues that "bridging networks are better for linkage to external assets and information diffusion." The last concept of *linking* is used to examine how mHealth improves CHW work and access to healthcare. mHealth is essential in fostering social capital development by connecting communities and CHWs.

2.11 SOCIAL CAPITAL IN HEALTHCARE AND ACCESS TO CARE

Social capital in health studies was presented as a community-level attribute and sparked much interest among public health academics and policymakers (Derose & Varda, 2009: 273). However, the recent growing literature on social capital in health research acknowledges the individual attribute of social capital (Erikson, 2011: 2). Health outcomes associated with (health status, mental health, and mental illness) have been the focus in previous systematic reviews of social capital in the health literature (Derose & Varda, 2009: 273). Concerning social capital and health, most public health literature uses Putnam's (1995 cited in Derose & Varda, 2009: 276; Erikson, 2011: 2) conceptualisation as he acknowledges the individual and

collective aspects of social capital. Applying a theoretical understanding of social capital concerning health care through mHealth advances this theory and proves its usefulness for research relating to public health digitalisation (Derose & Varda, 2009: 273).

2.11.1 Social Capital as an individual asset

Under a social network approach, social capital is defined as "the ability of actors to secure benefit by membership in social networks and other social structures" (Erikson, 2011: 2). As Kawachi and Berkman (2000 cited in Derose & Varda, 2009: 276-277) highlight three ways of how social capital influences the individual at the society level:

a) Health-related behaviours, through more rapid diffusion of health information, foster healthy behaviour norms. Similarly, Coleman argues that individuals should engage in social interactions for their benefit (Claridge, 2018: 8). Individuals who trust and agree to engage with community health workers will likely benefit more than those who do not. As Putnam's social capital theory suggests that trust is a crucial factor in health outcomes (Putnam, 2000: 19). Individuals who trust healthcare providers, including CHW's are often more likely to adhere to treatment plans, seek preventive care, and follow medical advice.
b) Social capital influences access to local services and amenities (e.g. community health clinics, transportation etc.). CHWs are employed to increase access to local health services, therefore, individuals will benefit if they network with CHWs.
c) Social capital will influence psychological processes as CHWs are trained to support vulnerable community members. Wan and Lin (2003, cited in Derose & Varda, 2009: 281) concur that individuals who trust others are reported to have better health status and rarely use health services.

Berkman and Glass (2000 cited in Erikson, 2011: 2), outline several hypotheses regarding the relationship between social resources and health. The most evident link is that social network involvement offers a variety of *social support* mechanisms that may influence health by serving as 'buffering factors' against stress (Bartley, 2004 cited in Erikson, 2011:2). *Social influence* is another crucial pathway through which social networks can influence health (Erikson, 2011: 2). There is increasing evidence that social capital is the individual's participation in social networks, which can positively influence their health and health-related behaviours through *social support*, *social participation*, *social influence*, and access to material resources (Erikson, 2011: 6). Improvement and enhancement of health depend on factors other than individual behaviour, including social networks (Erikson, 2011: 6). CHW interventions must be

specifically designed to meet the requirements and resources of the intended audience (Erikson, 2011: 7).

2.11.2 Social Capital as a collective attribute

Putnam (2000: 20) is one of the most influential theorists who views social capital as a collective attribute approach. Social capital in Putnam's conceptualisation highlights the importance of civic engagement in fostering social cohesion and collective action within communities (Putnam, 2000; 40). Concerning healthcare access, this conceptualisation argues that strong civic participation in "some communities can lead to organised advocacy efforts to establish community health centres in underserved areas" (Erikson, 2011: 8). Moreover, social capital between CHW and communities can improve the overall health outcomes of the community and the effectiveness of disease prevention and health promotion through health education, information, and community-based screening services. When social capital is "conceptualised as characterising whole communities, it provides a useful framework for what constitutes health-supporting environments and guidance on how to achieve them" (Erikson, 2011: 1). CHWs have the power to strengthen the relationship and trust between marginalised communities and healthcare providers, which in turn influences the general public's preference for using those health care providers (Derose & Varda, 2009: 278).

Nieminen *et al*.'s (2013: 10) study on how different dimensions of social capital and health-related behaviours are associated, found that "irrespective of their social status, people with higher levels of social capital – especially in terms of social participation and networks – engage in healthier behaviours and feel healthier both physically and psychologically." Communities with high levels of social capital can impact health by encouraging the adoption of healthy norms and values. This approach argues that individuals who have poor social networks can benefit from social resources if they live in an area where there is high social capital, and low degrees of income inequality (Wilkinson, 1996 cited in Erikson, 2011: 3). At a community level, the relationship between health and income inequality is altered by social capital (Erikson, 2011: 3).

Social capital as a collective effort promotes social networks and health by facilitating the fast and broader promotion of health information and knowledge, which might impact the health of communities (Erikson, 2011: 3-4). Building social capital as a collective is related to the *community development approach* in health promotion (Erikson, 2011: 7). Health promotion is one of the critical roles of CHWs. The primary goal for health promotion is to increase the ability of the community to strengthen the foundation for a thriving community (Erikson, 2011:

7). CHWs intervention programs underscore the significance of building environments where people and "communities can become empowered as they improve their capacity for problem-solving or community competence" (Erikson, 2011: 7). There is a theoretical debate on whether social capital is an individual or a collective feature, however, in the current study, social capital is viewed as both an individual asset and a collective attribute.

2.12 A Conclusion

The discussion in the chapter began with an introduction followed by an overview of social capital theory using Robert Putnam's concept. This chapter also discussed social capital at individual and collective levels. Moreover, it applied social capital theory to emphasize the significance of social networks in improving public health outcomes; this was done by using Putnam's conceptualisations of social capital. Putnam's work highlights the importance of civic engagement and participation in ensuring collective action in communities.

The discussion also addressed the influence of social capital on health, highlighting the importance of social capital as both an individual and collective attribute. A discussion on social capital in mobile health shows that communication is critical in this theory, particularly communication between CHWs and the community they serve. Information and social capital benefits can be passed down through mobile communication. For this reason, mobile health is a crucial area of investigation as it offers innovative solutions to healthcare, leading to access to health. The last paragraph acknowledges mHealth's potential to affect social capital, such as the digital divide and disturbance in therapeutic relationships.

STUDY METHODS AND PROCEDURES

3.1 Introduction

This chapter provides an outline of the research strategy used in gathering and analysing this study's data. It explains the methods used in the investigation of the digital public health intervention (mHealth) in community health work. The chapter begins with a discussion on qualitative research design, followed by the sampling, data collection and data analysis processes, and then a brief discussion on the ethical considerations.

3.2 Research design

This study investigated how CHWs are experiencing mHealth, specifically the Oppo A18 smartphone and the Comm Care App. The study sought to explore a real-world setting of CHWs when conducting their jobs. Consequently, a qualitative research design is well-framed to facilitate an understanding of the CHWs nuanced experiences of mHealth use among CHWs. Qualitative research aims to generate deep insights on research topics, and it is broadly interpretivist in nature, meaning that it tries to generate an understanding of the social world by examining how its participants interpret it (Bryman *et al.,* 2022: 279; Leavy, 2023: 141; Taylor *et al*., 2016: 7-8). The design is particularly suited to exploring the personal experiences, perceptions, and challenges they face in a real-world context, which might not be fully captured through a quantitative research design (Tracy, 2020: 9; Yin, 2016: 4). Like other qualitative researchers, I was interested in capturing the meanings that CHWs attach to the usage of the Comm Care App, and how they interpret these meanings, hence the chosen approach.

Furthermore, a qualitative research design was better suited for this study as participants were able to express their feelings and interpretations of how they are experiencing mHealth since data was collected using semi-structured interviews. Another related reason why a qualitative design was chosen is that the study's primary and secondary goals require flexibility during the data collection process, which allowed the researcher to examine the personal views of CHWs and how they use mHealth (Yin, 2016: 6). Qualitative approach is "interested in how people cope and strive in setting" (Yin, 2016: 3), similarly, this study sought to understand the challenges faced by CHWs in using the Comm Care App, and the training that they receive to support their mHealth work. Finally, a qualitative design provides rich, descriptive insights that go beyond numbers, making it ideal for exploring the motivations, frustrations, and rewards of a phenomenon under study (Magilvy & Thomas, 2009: 289). This in-depth exploration is essential to understanding how mHealth is integrated in CHWs daily work, and how they cope with the challenges of the poor internet and mobile connectivity in Ekangala Township.

3.3 Selection of Participants

The chosen sampling method for this study was purposive sampling as participants were selected based on their status as CHWs at the Ekangala Community Health Clinic in Bronkhorstspruit. In this sampling method, participants are selected based on the kind of information they can provide, usually because they have the right kind of life experience for the research in question or because they are expert in a certain field (Bryman *et al*., 2022: 306-

307; Yin, 2016: 88). In addition, snowball sampling was also used to recruit more CHW participants. Snowball occurs when the selected participants help the researcher to identify more participants, such as by referring the researcher to their co-worker (Yin, 2016: 89). In this study, snowball sampling was purposeful and not done out of convenience, meaning that participants were chosen according to their experiences and knowledge working as CHW and using mHealth. The advantage of using snowball sampling in this study was that I recruited more CHWs through my aunt who is a CHW and the initial recruit.

The sampling strategy described; purposive sampling combined with snowball sampling is appropriate for this study. However, this strategy introduces several potential biases that can affect the validity and generalisability of study's findings. For example, the recruiting CHW's through my aunt. I was aware that relying on my family member to recommend all participants may have limited the diversity of perspectives in data. Therefore, other participants I recruited them through recommendations of other participants. Additionally, I ensured that there are different age gaps and years of experience among participants.

Ten CHWs over eighteen years old and attached to Ekangala Clinic were recruited for this qualitative study. This sample size was adequate as semi-structured in-depth interviews produced rich data (Vasileiou *et al*., 2018: 2). The aim of the study was to gain an in-depth understanding of CHWs experiences in using the Oppo A18 smartphone and the Comm Care App. As others have found, choosing a larger sample would have been challenging – e.g. large volumes of data would have been difficult to manage, would have consumed time, and would have led to analysis complexity (Mwita, 2022: 622). In contrast, a smaller sample size would have led to a less robust conclusion of the results (Yin, 2016: 90). According to the gender and racial profiles of the healthcare workforce in the public health sector, most CHWs are women (Matseke, 2023: 64), and this was the case in this study as only one male participant was recruited. Interviews were conducted in public venues convenient to the participants, and with their permission interviews were recorded using a voice recorder App on my smartphone.

The proposed study was conducted in Ekangala, a large township in Tshwane, Gauteng Province. A study conducted in Ekangala by Todes *et al*. (2018: 3) found that residents were frustrated about the opening times of Ekangala clinic and that there were long queues and waiting times. Participants also complained about the lack of a hospital in the area. Moreover, there is one clinic in Ekangala for approximately 48 493 people, making health care inaccessible (Todes *et al*, 2018: 3). This data the need for more studies and solutions, such as

the use of mHealth interventions, to improve access to healthcare services and the health status for the Ekangala community.

3.4 Data Collection Method

As earlier stated, the data collection method used was semi-structured in-depth interviews. Semi-structured, in-depth face-to-face interviews are one of the dominant methods in a qualitative research study (Aurin *et al*., 2022: 130). This method allowed CHWs to express their personal experiences, challenges, and successes of working with Oppo A18 and the Comm Care App in their own words. They were able to provide detailed descriptions of how they navigate the advantages and disadvantages in the field, as well as insights into their emotional and social aspects involved in community health work. All this was possible because semi-structured in-depth interviews are flexible, dynamic, and non-standardised (Taylor *et al*., 2016: 102), which enabled me to engage with the CHWs in a flexible manner, and asked questions on themes that arose during interview sessions. Since interviews were face-to-face, and as other researchers have found, I was able to build rapport and trust with participants (Aurini *et al*., 2021: 131). Moreover, face-to-face interaction was directed toward comprehending CHW's viewpoints on incorporating mHealth in work and their experiences with mHealth (Leavy, 2023: 152; Taylor *et al*., 2016: 102). The chosen interview methods allowed for thematic analysis as they provided a degree of comparison between participants' responses (Aurini *et al*., 2021: 103).

The interview sessions ranged from twenty to thirty minutes, and were conducted in the dominate language in Ekangala Township, which is isiZulu. I chose to conduct the interviews in isiZulu because CHWs have a broad understanding of the language and culture of the community they work in, which enables them to offer culturally competent healthcare services to the communities they serve (Thomas *et al*., 2021: 2). CHWs are community members who are minimally trained in formal medical education (Hartzler *et al*., 2018: 1). This fact suggests that they are likely to conduct their work in the dominant language or dialect spoken within their communities, as the participants in this study do. Since they are embedded within the community, they understand the local language, cultural differences, beliefs, and social norms (Hartzler *et al*., 2018). Conducting interviews in isiZulu had some benefits, for example, the participants' responses were detailed, and they were able to express themselves freely, which yielded quality in-depth data.

3.5 Data Analysis Method

There are various ways to analyse and interpret qualitative data, depending on the researcher's objectives and epistemological and ontological assumptions (Vanover *et al.,* 2022: 149). I used thematic analysis, the dominant method within the qualitative data approach (Naeem *et al*., 2023: 15). This method enabled me to code, identify, construct themes, and engage in the active decision-making process to generate themes (Vanover *et al*., 2022: 149). This type of analysis enables researchers "to delve deeper into their data and recognise underlying themes" (Naeeem *et al*., 2023: 15). As a result, I was able to recognise underlying themes in my data to help me answer the research questions in this study. A step-by-step process involved in thematic analysis starts with transcribing (including translation for this study), data familiarisation, keyword identification, and code selection (Naeem *et al.,* 2023: 2-3). After each interview, I transcribed the recorded audio data. I chose an NVivo coding strategy when transcribing the data, which helped me to prioritise and maintain the participants' language (Leavy, 2023: 166). However, since interviews were conducted in isiZulu, there was a process of translating the language from isiZulu to English. I translated data as I did isiZulu in both primary and secondary education, and my home language, isiNdebele, is very similar to isiZulu. As a result, there was minimal loss of meaning during translation.

During coding, I looked for patterns and relationships between the codes, and I also engaged in memo-writing (Leavy, 2023: 166). The study findings are conveyed in a manner that offers rich descriptions of CHWs experiences with mHealth, which are interpreted and analysed in relation to the reviewed studies and literature, theory, and the research goals. Additionally, the organised thematic analysis method ensured the findings' consistency and reproducibility and made it possible to draw direct links between the data, interpretation, and conclusion (Naeem *et al*., 2023: 2-3).

3.6 Ethical Consideration

I followed social research ethical standards to ensure that no harm occurred during data collection. Importantly, the study was conducted with the approval of the Rhodes University Human Ethics Research Committee (see Appendix II).

3.7 Conclusion

The chapter provides a description and justification of the methods, procedures, and techniques used in the study. A qualitative research design was chosen as it is best suited for the research

topic and objective, which is an investigation of CHWs experiences of the incorporation of mHealth in community health work. It was important to understand CHWs' personal views and experiences of mHealth. The flexibility in qualitative data collection method of semi-structured in-depth interviews helped to answer the main research question and objectives. Purposive sampling is justified as a method of recruiting participants as only ten CHWs were selected to participate in the study. In addition, this number of participants is adequate for this study as semi-structured in-depth interviews produced rich data, which was thematically analysed.

CHWs AND MHEALTH INTERVENTION: DATA ANALYSIS

4.1 INTRODUCTION

The study adopted a qualitative research method and data was collected using semi-structured in-depth interviews. Thematic analysis was used to help the researcher code, identify, construct themes, and "engage in the active decision-making process to generate themes" (Vanover *et al*., 2022: 149). The study objective was to investigate digital public health intervention in community healthcare work. Data was collected from ten CHWs. The CHWs are employed by the DoH and are attached to Ekangala clinic in Gauteng. There was only one male participant out of the ten CHWs who participated in the study.

4.1.1 A profile of participants

In this study, I interviewed nine female CHWs and one male CHW (Participant 3). All the CHWs were above the age of eighteen and live and work in Ekangala, specifically at the Ekangala Community Health Clinic. In this analysis, CHWs are labelled as Participant 1 to 10 to differentiate their responses. Three participants (1, 4 and 10) were initially employed by an NGO called Smart Purse, and then they were transferred to the Gauteng DoH. As a result, some of these participants' responses reflect their experiences under the NGO, which they sometimes compare to their current roles within the DoH. For instance, they occasionally compare the Comm Care App (DoH supplied) with the AitaHealth App (Smart Purse supplied).

4.2 KEY THEMES

Four themes emerged from the findings, namely, the *incorporation of mHealth into CHW, training on mHealth ICT's, CHWs experiences of mHealth, and the role of mHealth in addressing broader healthcare challenges. Incorporation of mHealth* explores how mHealth is applied in community healthcare work. *Training on ICT'* explores the frequency that CHWs

are equipped with knowledge and skills to utilise mHealth for healthcare delivery effectively and how they are supported with utilising mHealth. *Experiences of mHealth* analysed advantages and disadvantages of mHealth and Comm Care App, which entails how CHWs experience mHealth in their work. Lastly, *the role of mHealth in addressing broader healthcare challenges* ventured into CHW's opinions on the role of mHealth in primary healthcare.

4.2.1 Incorporation of mHealth into CHW

As noted earlier, the NDoH's *National Digital Strategy for South Africa 2019-2024,* has incorporated mHealth into the health system to provide better healthcare services (NDoH, 2022; Odine, 2015: 182). When asked what device they use at work, participants informed the researcher that they use the Oppo A18 (mHealth) smartphones with an App called Comm Care. From their responses, participants are familiar with the Comm Care App functions, as the following statements show:

> We do household registrations, we log in to the App, then we connect to the GPS so it can capture the area and stand number, and then we register members in each household (Participant 3)
>
> They gave us this phone to record information that we asked patients, as well as other information about the households that we visited (Participant 2).
>
> We do household registrations, follow-ups, and default tracing; we take such statistics and submit them to the DoH at the end of every month (Participant 6).

The above is similar to other studies' finding that mHealth enables CHWs to perform various tasks such as household or client registration, targeted follow-up for key conditions; referral linkage to health facilities; and physical tracing for high-risk patients and defaulters (Dimagi, 2020: 2; Kansiime et al., 2024; Neupane *et al*., 2024:3; Tshikomana & Ramukumba; 2022: 6-7). Moreover, the responses above show that all participants understand the purpose of the Comm Care App, and they already incorporate it into their work. Knowledge may have a positive impact on their work performance as a good understanding of mHealth allows CHWs to use technology to improve health outcomes, reduce inefficiencies, and enhance their ability to collect quality data (Dimagi, 2020; Wong *et al*., 2022). Despite knowing this purpose, CHWs should know how to use mHealth to collect reliable data and function at their level, which gave rise to our next theme on how to use mHealth. Proper training on navigating mHealth is crucial, given that this technology is used daily. When participants were asked if they use Comm Care daily, they said:

> Yes, because we use these phones to register and do follow-ups (Participant 1).

We use this device every day (Participant 3).

I go to different households carrying this gadget when I do my work (Participant 4).

According to the responses, it is clear that CHWs use the smartphones when doing their household check-ups.

4.2.2 Training on mHealth ICTs

Having discussed how mHealth technologies were incorporated into participants' daily work routines and the training they received, this section explores their lived experiences of using the Comm Care App. Participants shared both positive and negative reflections, offering valuable insights into how the app functioned in real-world settings. All participants noted that they had received training and mentioned that the training was and continues to be provided by their supervisor who is a professional nurse at the clinic. In addition to the training, the participants were asked how user-friendly mHealth is, and how often they receive training. In response, they said the following:

> We went for training (Participant 1).
>
> Using this gadget is easy, and it is easier to use than using paper to record information because the App in this gadget is designed to make our work easy. The nurses teach us how to use these gadgets, and they update us on new developments. Nurses often go to training twice a month. When they get back from their training session, they tell us about the new developments in these gadgets, and if there is a problem with them, they tell us how to fix it. Our nurses allow us to give feedback about these gadgets because not every piece of information is included in our App. Therefore, when we give feedback, the nurses report the feedback to the DoH, and then sometimes they upgrade our Apps to add the information that is missing (Participant 2).
>
> Yes, we were trained in detail on how to use the App, and you still have a chance to ask when you are struggling. The training we received was practical (Participant 3).
>
> Participant 5: Yes, we were trained on how to use these gadgets, and we receive training when we ask for it.

The above responses show that mHealth enhances not only CHWs' work experiences, but it also improves social capital between CHWs, nurses (and team leaders), and DoH staff by fostering communication. As Participant 2 said that they hold a feedback session where CHWs report their concerns to the nurses and the nurses report back to the DoH. This is in line with Putnam's (2000: 80-91) ideas on *connections in the workplace* that improves social solidarity and mutual assistant. Similarly, regular training and feedback sessions increases communication between CHWs and nurses, nurses and DoH staff leading to mutual assistance,

social solidarity and shared expertise. As Hall *et al.* (2014: 3) study found that incorporating mHealth in low-middle countries improves support networks for health workers.

Moreover, the above responses show that participants received initial training, and that they also get trained when there are new developments. Some participants stated that they also ask nurses for assistance on how to operate the device when necessary. For example, Participant 7 mentioned that supervisors and nurses involved in the CHW program often go for training on how to operate Comm Care App. They in turn, teach the CHWs how to use the App. This is an advantage, because these supervisors/nurses work at the clinic where the participants are based. Participants noted that CHWs' programs are led by nurses, who are the designated team leaders. As one participant explained:

> Yes, we were trained. We receive training every time they add a new feature to the gadget. The team leader usually goes for training when there is a new feature, and when the team leader is back from the training, he or she will train the rest of the CHW about this new feature (Participant 7).

Due to the training on how to use the Comm Care App, some participants find this App to be user-friendly. However, other participants believe that the user-friendliness of the App is based on the age and how technologically advanced the person using the App is, as illustrated in the following responses:

> Yes, they are easy to use. However, it depends on each person, how fast you are, and if you are used to using smartphones. Usually, some old healthcare workers may find it hard to use them (Participant 1).
>
> It is easy to use; however, it also depends on your understanding of how to use a mobile device. I do not have a problem with using this App. It works very well for me. So far, I have not experienced any challenges, and it may be because I am familiar with using smartphones (Participant 7).
>
> It differs among CHWs; however, for me, using the gadget is easy. So far, so good (Participant 6).

CHWs who are older or less familiar with technology may initially struggle with mHealth tools. However, regular training, peer learning and support may improve their experiences. For example, Participant 6 noted how she finds it challenging when paired with an older CHW who is not technologically literate. She explained that in such instances, she simultaneously helps the older CHW navigate the App while doing her own online work:

> Remember, we work with older CHWs. Some of them may find it challenging to catch up with such technology. For example, when I am teamed up with a co-worker who is

> older than me, I have to help them with using the gadget; this is one of the challenges of using a gadget (Participant 6).

Participant 6 concern highlight important challenges in implementing mHealth solutions among CHWs in South Africa, especially those who are older and less technologically literate. Transitioning to digital platforms can indeed be daunting for individuals who are not familiar with modern technology, potentially impacting their performance and job satisfaction. This might mean that paperwork might work to some CHWs who are not technologically literate, and who may prefer paperwork. However, relying solely on paperwork is not an ideal solution either, as it can be inefficient, prone to errors, and challenging for those who struggle with writing skills. Therefore, developing comprehensive training initiatives that cater to different levels of technological proficiency is important. Such as hands-on workshops and continuous learning opportunities can help bridge the gap.

As much as many participants had positive outcomes of the training they have received, and the user-friendliness of the App, it is important, however, to acknowledge the challenges faced by older CHWs who not as comfortable with smartphones and as as some younger CHWs. This is similar to Kansiime *et al.* (2024: 6) study finding that most of the older CHWs lack enough experience and skills regarding mHealth, and most have low literacy levels.

Regardless of the challenges faced by some of the older CHWs in using the Comm Care App, most of the participants commented on how user-friendly the Oppo A18 (smartphone) and the Comm Care App are. This can be attributed to the quality of the training that is get and support given by their team leader/nurse. The next theme expands on the participants' experiences of using the Comm Care App, focusing on its advantages and disadvantages. Both the advantages and disadvantages influence how CHWs experience mHealth incorporation into their work.

4.2.3 Participants' experiences of the mHealth and Comm Care App

Following the initial training and orientation provided to CHW's on the use of mHealth tools, participants shared a range of experiences using the Comm Care App in their daily work. These experiences were shaped by various contextual, technical, and individual factors. This section presents participants' reflections on the use of the app, highlighting both the advantages—such as improved efficiency and ease of data collection—and the challenges, including connectivity issues and usability concerns. The insights presented here offer a nuanced understanding of how the Comm Care App was integrated into their routine activities and the extent to which it supported or hindered their work.

4.2.3.1 Advantages in mHealth

As discussed earlier, some of the mHealth advantages are that "digital health technologies provide opportunities to strengthen health systems, transforming the way health services are provided and the way in which people engage with those services" (NDoH, 2022: 11). This was partly confirmed by the participants who stated that the Comm Care App empowers and helps them in their work, as illustrated in the following statements:

> These phones make our job much easier because they keep records for us, such that when the month ends, we can see the summarised stats, and then we can copy them to paper. Another advantage is that recorded information is confidential (Participant 1).
>
> It makes our jobs very simple, and we can store information for a long time. For example, I have easier access to the information I need than going through many papers looking for specific information (Participant 10).
>
> These gadgets help us remember follow-ups because there is a reminder of follow-ups. For example, the App tells us that on this specific day, I should go to this household for follow-ups (Participant 6).
>
> Every question I must ask in the household is captured in the App. When I do household screening, I open the App, ask questions from the App, and just tick yes or no. Before, the process was longer because I used pen and paper and made notes. Oppo makes our jobs easy. The information is kept safe in the Comm Care App, and it is not easy to lose the information compared to when we used paperwork (Participant 5).
>
> The gadget already has the questions you should ask when you visit households, and you do not get stressed about the questions because you know what to say. Before the gadgets, some of the critical questions you were supposed to know them by head (Participant 7).

A common sentiment in the above responses is that using Oppo A18 and the Comm Care App makes the participants' job easier. For example, using the smart phone to record and keep the records; using the Comm Care App to summarise data that is collected; storing information for a long time; and easy access to the information when needed. Similarly, the study by Tshikomana and Ramukumba (2022:3) found that CHWs found mHealth easy to use because it organises their daily work. Another advantage highlighted is the availability (on the App) of questions that CHWs are expected to ask patients, as illustrated in the following quote:

> The gadget already has the questions that you should ask when you visit households, and you do not get stressed about the questions because you know what to say. Before the gadgets, some of the critical questions you were supposed to remember them (Participant 7).

This is important because pre-set questions for CHWs to ask during household visits ensures consistency in data collection and assessment. This structured approach helps identify health issues, guides conversations, and ensures that crucial topics are not overlooked (Mash *et al.,* 2020). It also enables CHWs to deliver tailored health education and interventions based on the specific needs of the household, ultimately enhancing the quality of care provided (Mash *et al*., 2020). Participants also mentioned that reminders in the App helps them remember when follow-ups are due, as some said:

> There is a remainder of follow-ups in the App, and it shows us what to do daily or what you have planned to do for that day, such as if you were planning to do a campaign for that day. It reminds you (Participant 3).
>
> Without these gadgets, it would have been challenging to remember all the follow-ups (Participant 6).
>
> These gadgets help us remember follow-ups because there is a reminder of follow-ups. For example, the App tells us that on this specific day, I should go to this household for follow-ups (Participant 7).

The above quotes are similar to Tshikomana and Ramukumba's (2022: 7) study finding that CHW like the remainders feature on their work smartphones. The only male participant said that he prefers using Oppo A18 and the Comm Care App over paperwork because:

> The gadget is portable; it can fit in my pocket, and all the information we collect goes straight to the devices. We do not have to carry many papers, and you have easy access to the information (Participant 3).

The above response maybe due to the fact that some men do not like carrying bags. Therefore, a smartphone is ideal for some male CHWs because it is portable and can fit in their pockets. Similarly, Kansiime *et al*. (2024: 8) in their study found that CHWs prefer mobile phones because they are portable and easier to use compared to challenges in handling paper forms in households.

- *Social capital between CHW, supervisors (nurses) and DoH*

A study found that mHealth has improved communication between CHWs, nurses, and the DoH in South Africa (Tshikomana & Ramukumba, 2022: 10). This improvement is important in strengthening healthcare delivery and addressing challenges in the country's healthcare system. mHealth tools facilitate direct communication between CHWs, nurses, and the DoH through the Comm Care App. These communication channels allow for quick sharing of patient information and guidance on health protocols (Tshikomana & Ramukumba, 2022: 10). As earlier stated, participants in the current study find communication between themselves and the

nurses is greatly improved because of mHealth ICTs. This also shows how social capital theory is applicable in this study as it supports the view that communication in the healthcare sector is necessary to achieve desirable health outcomes (Erikson, 2011). Social capital among CHWs, nurses, DoH and the community can improve the overall health outcomes and can lead to success in mHealth interventions.

Additionally, social capital theory is important in this instance as theorists argue that communication enables humans to collaborate and co-exist (Putnam, 2020; Rojas, Shah, & Friedland, 2011). As noted above, communication between CHWs, nurses and DoH strengthens public health leading to desirable health outcomes. It is acknowledged that workplace connections play a critical role in building social capital, providing a network of support, information sharing, and collective trust among colleagues (Putnam, 2000: 87). In case of the current study, these connections are fostered through the mutual commitment of improving PHC and health outcomes. Although Putnam (2000: 87-90) argues that workplace ties have weakened over time due to changes in labour markets, economy and work structure, to the contrary, it is argued that mHealth has fostered communication between CHW, nurses and DoH through feedback sessions, training, and field work in the current study

Although patients are still given paperwork referrals, mHealth systems enable CHWs to easily refer patients to nurses or clinics through electronic platforms. Instead of manual paperwork or delayed visits, referrals can now happen instantly, allowing healthcare providers to prepare for the patient's arrival. As one participant said:

> When the patients go to the clinic, they carry the referral paper that I gave them. When the nurses find that this person has to take treatment, they will alert me using the App, and I will have to do follow-ups with that person to make sure that they adhere to the treatment plan (Participant 5).

In addition, data collected in the households can be shared with nurses and the DoH, enabling more coordinated responses to community health issues, which may inform policy decision-making. Other studies have found that mHealth has improved countries' disease surveillance efforts (Kansiime *et al*., 2024: 8; Tshikomana & Ramukumba, 2022: 11). CHWs can use mobile devices to report health concerns directly to nurses. This real-time communication allows for faster interventions, particularly in rural or underserved areas, where outbreaks or public health threats can be quickly contained (Neupane *et al*., 2014). This means that "client's health information from the rural area can get incorporated into broader health systems database via mHealth" (Neupane *et al.,* 2014: 7). Team leaders can communicate with CHWs and monitor

their records via mHealth ICTs. This is an advantage as team leaders can respond fast if they detect any problems, data accuracy, and complicated cases (Neupane *et al.,* 2014: 7). Participants had the following to say on how they are monitored in the mHealth system:

> The DoH has access to the work we do in these gadgets…We used to record the information using paper and submit it to the DoH. Now, the department can access the information through these gadgets (Participant 5).
>
> The team leader can see everything I do with this gadget via their App (Participant 7).
>
> Whatever we do with these gadgets, people who are above us have access to all the information, so whatever challenges we encounter in the household, they can address them and use the information to help the community (Participant 9).

By increasing social capital between CHWs, nurses, and the DoH, mHealth is helping to build a more integrated, responsive, and efficient healthcare system in South Africa. This not only improves patient care but also ensures that the entire healthcare system can adapt to challenges. Erikson (2011: 2) notes that CHW programmes are significant as they build an environment where people and communities are empowered, and that social capital promotes such environments. Consequently, mHealth, compared to paperwork, enhances the nurses' supervision capacities and monitoring of the CHWs' usage of the Oppo A18 smartphones. This may encourage or force CHWs to do their job well as they are monitored. Although some participants did not like that mHealth is monitored, they called it a 'snitch' as it reports everything CHWs on the Oppo A18 smartphone. This is similar to Neupane *et al.* (2014) finding that the main advantage of the mHealth system is that it can offer accuracy in monitoring, which can enhance the supervision of CHWs. They also found that mHealth supervision, monitoring, and evaluation systems ensure the effectiveness of CHW programs.

- *The management of patients' records*

When participants were asked how the management of patients' records on the Oppo A18 smartphone management system is working, some of them preferred the current system to the time when they record on paper, as illustrated in the following responses:

> Gadgets are more reliable than paperwork because the collected information is not easily damaged as compared to using paperwork (Participant 3).
>
> Using these gadgets to manage patient records keeps the information secured because it is easier to misplace paperwork. Misplacing paperwork exposes confidential information. Patient records are kept in the Comm Care App, where the information is confidential as we have login details to access the App (Participant 4).

> It is accessible to use Oppo to keep records of patients rather than doing paperwork because the information is kept safe and secure (Participant 5).

The above statements are similar to Neupane *et al.*'s (2014:2) finding that patients are concerned about the confidentiality of their information which is collected through paperwork. mHealth systems, compared to paper-based recording, offer better security for patients' records through features like data encryption, and controlled access (Neupane *et al*., 2014). Moreover, mHealth systems allow healthcare providers to access records remotely and provide quicker responses. mHealth systems also eliminate human error as it provides automated calculation functionalities and can also provide accurate data and better records (Neupane *et al*., 2014: 6; Tshikomana & Ramukumba, 2022: 7). Paper records, on the other hand, are vulnerable to loss, damage, unauthorised access, lack tracking capabilities, and are more challenging to store and retrieve (Neupane *et al*., 2014: 6). Although mHealth systems come with cybersecurity risks, they can be mitigated with proper security measures, such as providing CHWs with unique login details and user training (Dimagi, 2020). Therefore, cyber records may be a safer alternative to traditional paperwork recording system.

- *The impact of mHealth on CHWs and the community*

The introduction of the mHealth system signals the government's commitment to investing in health infrastructure. This may inspire society's confidence in the DoH initiatives and innovative solutions. Studies show that the introduction of the mHealth system has empowered CHWs and brought hope to community members (Gruel *et al*., 2023: 23; Kansiime *et al*., 2024:8; Neupane *et al*., 2014; Odene *et al.,* 2019: 30). As one participant confirms:

> I love working with smartphones because I have mentioned that these gadgets have made our jobs easier, and these gadgets lessen the stigma about CHWs. It has made people in the community to take us seriously. Because before, people were not taking us seriously (Participant 2).

Some participants spoke about the mHealth's positive impact on patients:

> I do notice a difference because the patients and communities take us seriously when they see us with these devices. They have started to take CHW programs seriously because they see that we are receiving the proper equipment to improve our jobs (Participants 3).
>
> Patients differ, some of them get excited when they see us with devices, and as a result, they engage better as compared to when we were using paperwork (Participant 2).
>
> Yes, patients now take us seriously because they can see that we are upgrading (Participants 6).

Other researchers have found that mHealth technologies often improve access to healthcare services, especially in rural or underserved areas (Neupane *et al*., 2014). This increased accessibility can give communities hope that they may start receiving timely and adequate health care. In addition, some participants spoke about the pride they feel when introducing the mHealth system to the communities they serve. Importantly, all participants spoke positively about their experience whenever they first explained to their patients that they would be using the Oppo A18 to record information. The following are some of the explanations on the use of Oppo A18 smartphone in the community:

> Reaction differs among patients, but as CHWs, we have to tell them that we have gadgets so that we prepare them so that when they see us busy using a cell phone, they do not think that we are ignoring them or that I am recording them (Participant 2).
>
> I have to explain to patients that I will be using a device during my introduction so that they do not get surprised that I am using a phone for work. As soon as you explain, they relax (Participant 3).
>
> I first explain to patients that I will be using the gadget to record information because it will be disrespectful to use a gadget without explaining to them (Participant 5).
>
> Yes, patients now take us seriously, because they can see that we are upgrading (Participant 6).
>
> You have to first explain to the patient that you will be using a mobile phone. You don't just use a phone without explaining because they might think you are using the phone to snoop for information. They understand after you explain to them (Participant 8).

This idea of community's hesitation on the use of mHealth ICTs is similar to Kansiime *et al.*'s (2022: 6) finding that "community members might distrust the new data collection approach, fearing that their information might be used for other purposes without their consent." And as Participant 8 mentioned, CHWs need to explain to community members why they are carrying a smartphone when attending to their patients, otherwise CHWs will be seen as 'snooping for information.

The fact that some patients understand, and some of them showed relief after the CHWs explained what mHealth is for, may suggest that mHealth is viewed positively by the community. This is an advantage, as CHWs can work better with individuals and communities who view mHealth favourably. It can be argued that this intervention has created a positive response among some of the patients. However, not all individuals react positively, this may be because they do not fully understand the mHealth technologies. As Kansiime *et al.* (2024: 6) highlight the importance of mHealth knowledge among the community and conclude that:

> Without proper awareness, community members may not fully understand the purpose and benefits of the new data collection mechanism. Due to the lack of sensitisation, community members might display hostility and rigidity towards providing their health data information. They may be hesitant to participate in data collection using mobile phones as they are accustomed to traditional methods such as VHT registers.

Furthermore, the current findings show that mHealth intervention has positively affected the social capital between CHWs and community members (patients), as trust has been built – i.e. CHWs use mHealth devices in the field with the patients' consent. This confirms the idea that technology complements rather than replaces human interaction, and that it can coexist with, and even enhance, the existing social capital (Derose & Varda, 2009; Erikson, 2011; Putnam, 2000). This aligns with Putnam's (2000) emphasis on the importance of maintaining social networks and community involvement for the overall health and functionality of society. The continued use of mHealth devices in communities indicates that essential components of social capital such as trust, personal interaction, and community bonds remain strong (Putnam, 2000: 135). From a social capital perspective, one might argue that technological interventions like mHealth do not necessarily erode social capital if they support and enhance existing social networks rather than supplant them. Lastly, the physical presence of CHWs ensures that bonding which "…constitutes some kind of sociological glue and creates strong group loyalty" continues to flourish (Putnam, 2000: 23). The mHealth devices serve as tools that enhance the CHWs' ability to provide care without replacing the crucial human element that fosters trust and cooperation.

Furthermore, a study in Uganda found that the incorporation of mHealth technologies in PHC has indeed fostered increased hope and confidence in both the health system and government initiatives within communities (Kansiime *et al*., 2024: 8). As a result, the integration of mHealth technologies not only enhances the effectiveness of CHWs' activities, but it also builds a culture of respect and acceptability within the community. CHWs often serve as a bridge between the health system and the community (Neupane *et al.,* 2014). Their ability to engage with residents using mHealth tools strengthens their relationships and enhances their respect within the community. Furthermore, when communities understand that the DoH equips CHWs with mHealth devices, this elevates their work in the eyes of the community. This support can shift perceptions and enhance the community's respect for CHWs.

4.2.4.1 Disadvantages in mHealth

According to participants' responses, the disadvantages of using the Oppo A18 smartphone relate to technical challenges, which are less than the above discussed mHealth advantages.

Similarly, in the Tshikomana and Ramukumba (2022: 8) study, their participants spoke about several technical barriers when using mHealth devices. These barriers include missing features on the Comm Care App or other mHealth Apps, as a participant in the current study noted:

> We also did not have a space where we could record pregnancy tests for women we test, but they recently added that feature in the gadget since we complained (Participant 4).

Other responses show that the Comm Care App is flexible when it comes to adding new features or improving it. The flexibility of the Comm Care App in adding new features or improving existing ones offers several advantages such as DoH can easily adjust the App to meet changing needs or specific requirements, ensuring that it remains relevant and effective over time (Neupane *et al.,* 2014: 7). Similarly, Tshikomana and Ramukumba (2022: 8) also noted that "participants mentioned that most technical problems were addressed by a technician." Consequently, instead of investing in a completely new system, the NdoH and other organisations can modify the mHealth Apps to include new features, which will improve healthcare service. As Dimagi (2020: 5) note that customisation can allow DoH to tailor the user experience for their staff, making the App more intuitive and user-friendly based on feedback and specific workflows. However, constantly upgrading the App can be a challenge, as one participant said:

> They keep on upgrading the applications we use, making it complicated or hard to adapt. The phone does not include everything that we need, making it hard to use this phone to keep every record and all the information we have asked in the household that we have visited (Participant 1)

Therefore, the flexibility of mHealth Apps come with disadvantages, such as the constant need to customise or upgrade the App, which can lead to operational challenges for the users, as Participant 1 noted. The challenges faced by users unfamiliar with technology highlight the importance of frequent and comprehensive training for CHWs. By providing consistent training and support, organisations can empower CHWs to overcome technological barriers, leading to improved outcomes in community health initiatives. Frequent changes and customisations can lead to an inconsistent user experience, which may confuse users or reduce their confidence in the App. This is also confirmed in a study conducted by Neupane *et al* (2014: 7) who found that continuous improvement of mHealth during the pilot period was a challenge to CHWs as they had to keep up with changes.

However, the flexibility of the mHealth Apps, such as the Comm Care App, means that features can be added without significant disruption, allowing for continuous improvement in data quality and relevance (Dimagi, 2020: 5). As confirmed in the following accounts:

> Nurses tell us about the new developments in these gadgets, and if there is a problem with them, they tell us how to fix it. Our nurses and managers allow us to give feedback about these gadgets, for example, not every piece of information is included in our App. Therefore, when we give feedback, the nurses report the feedback to the DoH, and then sometimes they upgrade our Apps to add the information we want (Participant 2).
>
> The Apps are usually updated, so when there is a new update, we get trained (Participant 3).
>
> We receive training every time they add a new feature to the gadget. The team leader usually goes for training when there is a new feature, and when the team leader is back from the training, he or she will train the rest of the CHWs about this new feature (Participant 6).

Despite the constant upgrading of the App, most participants complained about the features that are not available, which makes their job challenging. They complained that some of the work, such as screening and testing patients, cannot all be recorded on the Comm Care App. As a result, they must record some of the information on paper. Nearly all participants said that they would like the Comm Care App to capture everything they do in the field. When asked about the challenges they encounter with using the Comm Care App, one participant said:

> The challenge I face is that some information that we need to ask patients is not included in the gadget. Therefore, we must record that information on the paper. So, we use both smartphones and paper to record (Participant 4).

This finding about the challenge of mHealth having pre-set questions contradicts the earlier discussion about the advantage of pre-set questions, because not all questions are included on the list. As such, when CHWs have follow-up or other questions these cannot be captured on the Comm Care App and is recorded manually as Participant 4 points out. When CHWs have follow-up questions or need to conduct additional tests, the rigidity of the Comm Care App can hinder their ability to provide comprehensive care. This limitation frustrates CHWs and may compromise patient outcome.

In addition to the theme of missing features, participants mentioned that they only get monthly data from the DoH, and airtime is not part of the allocation. Nearly all the participants stated that the provision of airtime would make a difference in their work. However, one participant felt that:

> Not getting airtime does not cause any inconvenience. Unless there are specific cases where I need to call the patient ASAP (Participant 6).

Participants mentioned that airtime would improve the roles they perform as it is the means that links primary healthcare with the community. mHealth should also serve as a communication tool between CHW and community members, not only as a data collection tool. This view is supported by social capital theory, as communication led by mHealth technological tools can serve as a medium of exchange for health-related information and knowledge.

Social capital is crucial because CHW effectiveness hinges on strong connections with both the healthcare system and the community they serve. The finding that airtime would improve the CHWs field performance as it is the means that links primary healthcare with the community, highlights the importance of communication in building and maintaining these important connections. Airtime will enhance social capital for various reasons such as, building trust – i.e. having regular contact with community members strengthens relationships and builds trust, a key component in social capital theory (Putnam, 2000). Additionally, airtime would enable CHWs to disseminate important health information, that can lead to community awareness and behaviour change. Finally, airtime can enable CHWs to check on patients' progress, ensuring continuity of care and adherence to treatment plans. Another discussion on the disadvantages in mHealth interventions is provided after the following section.

Their responses vary as some noted challenges relating to load-shedding, time management, crime.

For example, one participant compared the Comm Care App to the AitaHealth App, which was used at the NGO, her previous employer. She said:

> We used to use an App called AitaHealth. Now, we use Comm Care App, which is a bit tricky because it has a lot of information to record. This new App makes us take extended time in each household due to the many questions we have to ask, and it requires a lot from us when recording the information (Participant 1).

The increased volume of information required in the Comm Care App means that CHWs spend more time in each household. Participants said that they find long lists of questions, and the detailed data input negatively impact their work performance. Another issue that they spoke about is the complexity of the App, which demands technical abilities in navigating the App. As one participant illustrates:

> The challenge I face is that the App makes the process longer when we do disease screening because it asks the same question for most of the diseases. For example, when we are screening for diseases such as COVID-19, we will ask about coughing, and then we will also ask the same 'coughing' question for TB for the same person. Repeating questions irritate patients (Participant 2).

As earlier stated, the increased volume of information required in the Comm Care App, coupled with redundant questions, has led to extended time spent at each household. Participants are finding that the numerous and repetitive questions impact their efficiency and time management. The repetition not only prolongs the screening process but also causes frustration among patients, potentially affecting the quality of interactions, which negatively affects social capital among CHWs and patients.

When asked what challenges participants face using mobile devices at work, one participant spoke about the high crime rate in the area she lives in. As CHW who has been given a smartphone for work, she fears being targeted by criminals:

> I don't have challenges using the mobile phone at work. I am only afraid of the crime in this area because there are people who steal phones, so they might steal these phones (Participant 9).

In addition to the App specific challenges, external factors such as crime remain a significant concern to most South African CHWs. The risk of theft or personal harm in high-crime areas makes participants cautious about using mobile devices openly during fieldwork. Other issues raised by participants were related to data depletion because once the data runs out, Oppo A18 smartphone cannot be used in the field. All participants said that they would appreciate it if the DoH could provide unlimited data bundles. However, the current provision could be enough if CHWs limit or do not use the Oppo A18 smartphone for personal social networking or internet browsing. Some participants acknowledged that the private use of data is a personal challenge, but not every participant experiences this challenge:

> The data runs fast. However, I often do not face such a challenge, but my co-workers often complain about data running out (Participant 3).

One participant acknowledged the personal use of data:

> Yes, we use the work phone for personal things, and sometimes the data finishes because we do other things with it (Participant 8).

When asked to name the benefits of mHealth in community work, one participant pointed to the personal benefits derived from the mHealth data:

> I also benefit from getting the data (Participant 9).

Yet another participant believes that the DoH will not increase their data because of personal use:

> I think it is impossible to get unlimited data from the DoH because they are afraid that we might use the data for something else (Participant 1).

- *Challenges with internet connectivity*

The participants' answers to the question on internet connectivity in the area vary, some mentioned that the internet challenges are mainly based on the location of the patients' homes or the service provider technical challenges:

> There are times when the internet is slow, it depends on the section you are in (Participant 1).

Other participants said:

> I don't have many difficulties with network connectivity issues, only when there is loadshedding or load reduction (Participant 3).
>
> I often face a challenge when there is loadshedding because there is no network. So, it becomes hard to log into the App (Participant 2).

This is similar to Kansiime *et al.*'s (2024) study participants were concerned about the unreliable power supply to fully charge their phones, which is crucial to the success of the mHealth intervention. Most participants in the current study noted how frequent power outages disrupt their ability to charge devices and maintain internet connectivity, which hinders consistent use of the App.

- *More mHealth disadvantages*

In addition to and similar to the above discussed challenges, one participant said that some of the questions in the Comm Care App are inappropriate:

> They should remove unnecessary questions in the Comm Care App that we ask people we visit. We should not ask questions like how many rooms are in the house and if they have a fridge, especially if the government will not buy the fridge. With such questions, people expect that the government will do something to improve their situation (Participant 10)

This is a disadvantage as such questions may lead to expectations for home improvements by the government. For this reason, Participant 10 suggests that the Comm Care App should streamline its questionnaire to focus on more relevant and impactful questions. Reducing 'unnecessary' questions, like the number of rooms in a house or the possession of a fridge,

especially if these do not lead to direct support or services. Relevant questions can affect the CHWs' field experience and a meaningful interaction with patients. Focusing on questions that directly relate to the needs of the patient could lead to better effective healthcare service. However, 'unnecessary' questions have significant implications for PHC as the overall living conditions for patients and the community are key determinants of health (Mclntyre & Ataguba, 2014).

Another disadvantage that participants noted is that nurses and other clinicians do not always update the patients' personal information, which means that they add information that is outdated in Comm Care App. Participants said that this frustrates them as it is difficult to reach some patients because their records are not updated. This illustrated by one participant, who said:

> Sometimes it is hard to do follow-ups because the home address information we have is outdated. When I do follow-ups, I do not find the patient I'm looking for because the street name has changed, or they no longer stay in the house that is registered on the system. Therefore, I would like the clinic to update home address information and share with us the correct information on our gadgets because we take other information from the clinic when we must do follow-ups. For example, sometimes we take the information of patients who are on treatment and on default from the clinic, and we must do follow-ups (Participant 3).

Another participant shared similar concerns:

> It would have been better if the clinic wrote all the information of the patients that are referred to us for follow-ups. Because some patients do not want to disclose their information when we go to them and the treatment they take. They just look at us. So, if the clinic would share all the information about the patient on our gadgets so that we know when to do follow-ups, we know what to do or say (Participant 4).

Some of the younger participants said that they do not experience any challenges using the Comm Care App, which points to a digital divide (discussed below) between the young and old. This also means the above discussed advantages and disadvantages in the use of mHealth devices cannot be generalised to all CHWs.

- *The Digital divide*

The digital divide is a major disadvantage to the implementation of mHealth interventions in developing countries such as South Africa (WHO, 2021). When participants were asked whether health promotion can be achieved when conducted via phones, some of them were concerned about the digital divide. As one said:

> I mostly work in disadvantaged areas, so some of the patients do not have electricity. They use phones that do not have WhatsApp, so I cannot use WhatsApp for health education (Participant 7).

Similarly, another participant said:

> Yes, I think it can be achieved, but it will be a problem because some members of the community do not have access to smartphones. Not everyone has access to smartphones. Even when that household has young adults or youth residing in the home, we cannot use the phone to spread health-related information because they might complain about not having data (Participant 1).

The digital divide, as discussed in detail in the literature review chapter, focuses on the fact that digital health technologies are not easily accessible to vulnerable populations (Lubinga *et al*., 2021: 287). There is agreement that improving access to technology and the internet will decrease the digital divide, improve healthcare provision and health outcomes (Currie & Sneddon, 2021; Lubinga *et al*., 2021;Saeed & Masters, 2014; Wong *et al*., 2022). This means that tackling the social determinants is crucial for equitable mHealth implementation (Wong *et al.*, 2022). In South Africa, addressing the digital divide in mHealth within disadvantaged communities in South Africa requires a multifaceted approach that includes improving digital literacy, ensuring equitable access to technology, and creating culturally sensitive and accessible health resources (Budd *et al*., 2020; Lubinga *et al*., 2021). Collaborations between government, NGOs, and the private sector can help bridge these gaps, ensuring that mHealth initiatives serve as a tool for health equity rather than a contributor to further disparities (Lubinga *et al*., 2021).

- *Insufficient data and lack of airtime*

As earlier noted, most participants spoke about the challenge of not being able to communicate with the patients for health promotion purposes, because the Oppo A18 and the Comm Care App are used only for field work. The main reason is that airtime is not provided, which most participants said would help improve the working relationship with their patients. This claim is supported by Putnam's (2000: 22) idea that "communication is a catalyst for bridging, bonding and linking relationships." In this case, phone calls and phone text messages between the CHWs and the communities they serve, may improve the relationship. This communication goes beyond developing good relationships, as one participant who used to work for an NGO that supplied CHWs with airtime said:

> Before, when we were working for an NGO Smart Purse, they provided us with airtime and data. But now, with the DoH, we only get data. When we were provided with

> airtime, we would call patients before we went to them for follow-up and ask if they were home, but now you can go and find the patient is not there (Participant 4)

Most of the participants said that they would appreciate if the DoH provided airtime so that they can call their patients for follow-ups, make appointments for home visits and to remind patients about their appointments at the clinic. Some participants had the following to say on the issue of airtime provision:

> We cannot call patients because we do not have airtime (Participant 1).

> Yes, airtime will be of great help. Especially in cases where I do follow-ups and do not find the patient in the house, I can call them to ask about their whereabouts (Participant 5).

Another participant believes that airtime provision would positively contribute to their work experience. She gave this response when asked what features could be added to the Comm Care App that could improve her work experience. She simply said:

> It would be good if only they can provide us with airtime to call patients because we only get data (Participant 7).

The participants' responses shows that a lack of airtime for CHWs negatively affects their work, and the relationship with patients. As discussed in the literature review, the SMS feature could decrease the digital divide in mHealth, since all mobile phones can send and receive SMS's, and the patients do not even need to have airtime or data to receive messages ((Tshikomana & Ramukumba, 2022). According to participants, using SMS for health promotion would decrease their workload as this can be done remotely, as one participant said:

> Sending information via phone will help. It will save time because we conduct a lot of work in the household, including verbally giving them health education, which takes time (Participant 5).

SMS can be a digital platform for health promotion, disease prevention, and health education. For example, when there is a new outbreak of disease, instead of a traditional way of organising events and educating people, SMS can be used as awareness tools, as it happened during Covid-19 pandemic (Lubinga *et al*., 2021: 286; Wang *et al.*, 2021: 39). Not everyone will be able to attend the health promotion events that CHWs organise, therefore, SMS could be used to reach a wider population. Participants said that they conduct health promotion events using the Comm Care App to plan events, schedule dates and set reminders, and this could be improved if they could also publicise the events via SMSes. This is similar to an earlier cited study finding that SMSes are crucial means of communication in mHealth initiatives, between healthcare

providers and patients (Odine, 2014). SMSes were also used as reminders for appointments and for patents to take their medicine, which significantly improved patient engagement and compliance (Odine, 2014). The simplicity and wide accessibility of SMS make it particularly effective in reaching poor communities, especially in rural areas where smartphone use is limited (Odine, 2014). It is ideal that SMSs or media content about health promotion and disease prevention are produced locally and reflect social customs and norms of community for better engagement and understanding (Greuel *et al*., 2023).

For the current study, participants regret the lack of SMS feature (no airtime) had the following to say on how they conduct health promotion and disease prevention events:

> When we want to educate the community about health, we have to go their home rather than organise events and send health information, we do not educate them using phones (Participant 1).
>
> During household visits we also do health education (Participant 4).
>
> If I find that there is a person who has diabetes in that family, I give them and the members of the family health education about diabetes. I also tell them when and how they should take their medication in order to treat this illness (Participant 2).
>
> If you were planning to do a campaign for that day, the smartphone reminds you, but you have to go to the patient (Participant 3).
>
> In the case of health education, I verbally educate people (Participant 5).

However, while mHealth technologies present numerous opportunities, they also pose significant barriers that extend beyond technology itself (Tshikamana & Ramukumba, 2022). The integration of mHealth into existing health systems can disrupt established practices among health personnel, leading to challenges in implementation and adaptation. This highlights the need for comprehensive strategies that consider both technological and systemic factors to ensure effective adoption of mHealth solutions (Tshikamana & Ramukumba, 2022). This concern of the barriers within mHealth is discussed in the following theme.

4.2.4 mHealth and broader PHC challenges

Beyond individual experiences with mHealth technologies, participants contextualised their use of the Comm Care App within the wider structural and operational challenges facing PHC delivery. The main advantage in the implementation of mHealth is that it improves overall healthcare services (NDoH, 2020: 11). mHealth facilitates various important PHC functions, such as improving the work experiences for CHWs, improving PHC accessibility, driving health promotion, collecting statistics, etc. (Aboye *et al*., 2023: 1-2). Participants were asked

how mHealth can address broader healthcare challenges, such as improving PHC. As earlier stated, participants were concerned that the digital divide negatively affects PHC and mHealth role in health promotion. Their responses varied as some of them think that mHealth can address PHC challenges:

> Yes, because these gadgets have made it easier for CHWs to find health-related information in households we visit. When we see that there is a sick member in the household, we can refer them to the clinic by writing referral letters for them (Participant 1).
>
> Yes. We do referrals when we find a sick member in the household that we visit. When we refer a patient, the nurses attend to that patient (Participant 3).
>
> When I do home visits, I do screening, and when I do disease screening, I find information about any disease people might have in the smartphone. Then the gadgets alert me that I should refer that person to the clinic. For example, they might have TB (Participant 5).
>
> Yes, they can. What we do with these gadgets is that people who are above us have access to all the information, so whatever challenges we encounter in the household, they can address them and use the information to help the community (Participant 9).

Participant 9 believes that the various household statistics that CHWs collect can be used by DoH and other relevant government departments to improve people's health and social conditions. Similarly, other participants who believe that mHealth can address broader healthcare challenges mentioned that disease screening conducted in households helps the community. For example, when they find a member of a household who is sick and not in their data base, they often refer them to the clinic for further assistance. This intervention prevents people living with or dying from diseases that are curable. Most participants believe that they play a crucial health intervention role when they do referrals because when a patient has a referral, they can be motivated to go to the clinic and may get the help they need. As one participant said:

> We bring healthcare to people, and we do continuum care, which treats people in their households (Participant 3).

Another participant had the following detailed account on how mHealth addresses broader healthcare and social challenges:

> I go to different households with this gadget when I do my work. In the Comm Care App, I do household registrations. I write down record information such as how many people are living in that house; how many rooms are in the house; do they have working electric appliances such as a fridge; do they have a toilet inside the house; if there are

> under five children in the household; their general health information, for example, whether they have been immunised; if there are pregnant women in the house; I check people who are on treatment (such as diabetes, mental health, HIV, hypertension etc.); and ask if they adhere to their treatment plan. We also refer children who do not have birth certificates to social workers, and substance abusers are referred to SANCA. We also offer health education, motivate people who are unemployed, and give them job ideas such as gardening. We also advise people who are qualify for social grants to apply to SASSA (Participant 4).

It is evident from the above response that CHWs' role goes beyond health concerns and at times it involves other social problems. However, some participants do not believe that mHealth has improved healthcare services, as one participant said:

> I do not believe that gadgets have improved access to healthcare in my community that much because even before the gadgets, we went house to house to reach the community. The gadgets are just an upgrade from using paper to using technology (Participant 6).

Another participant agreed with the above opinion, when she said:

> We had been referring people to the clinic even before the gadgets (Participant 4).

Participant 1 is sceptical about the notion that mHealth intervention is addressing broader healthcare challenges in their community as she said:

> It helps us *(CHWs)* more than the community (Participant 1).

Participant 1 perspective highlights a potential disconnect between the intended impact of mHealth interventions and their perceived value in the community. Examining these perspectives could reveal valuable insights into the perceived role and effectiveness of mHealth in primary healthcare contexts.

4.8 A CONCLUSION

This chapter discussed and analysed the CHWs' experience of working with the DoH supplied Oppo A18 smartphone using the Comm Care App. This was done under four key themes, namely: *Incorporation of mHealth into CHW; Training on the Comm Care App; CHWs experiences of mHealth; The role of mHealth in addressing broader healthcare challenges.* The findings show that there are both advantages and disadvantages working mHealth. In addition, participants noted that they were initially trained on how to operate the Oppo A18 smartphones, and that nurses/team leaders offer further training whenever the CommCare App is upgraded. The advantage of constant training is that it benefits CHWs in significant ways. First, they gain increased proficiency and confidence in using these applications, which leads

to improved data management and more effective patient engagement. According to Dimagi (2020) the training streamlines their workflows, allowing CHWs to focus more on patient care, which yields in better health outcomes. Additionally, CHWs experience greater job satisfaction due to training received and feedback sessions. The networking opportunities provided by training also foster a supportive environment. Overall, equipping CHWs with mHealth training not only empowers them but also enhances their impact on community health initiatives.

Most participants said that they were satisfied working with mHealth ICTs, and some said that they enjoy using smartphones in the field. They find using the Comm Care App efficient when doing registrations and when communicating with their supervisors, which has increased their job satisfaction. Nearly all participants prefer recording patients' information on the smartphones instead of recoding it on paper. In essence, mHealth tools empower CHWs by simplifying data collection and helping them with patient engagement, especially when doing follow-ups.

The participants' awareness of the advantages, as well as the disadvantages of using the Comm Care App in the field, means there is potential for mHealth interventions to enhance CHWs performance. The use of mHealth technologies in CHW offers several advantages, such as improved communication with healthcare providers and help with real-time data collection. It also helps CHWs with organising their work, keeping records, planning to-do lists, setting reminders for their patients' follow-ups appointments or awareness events. Another advantage is that patients' records are safer on the Comm Care App as CHWs use passwords to access records. Most of the challenges that participants spoke about relate to their personal knowledge of how to operate smartphones, and the constant training due to upgrades of the Comm Care App. Few participants find poor network coverage in some areas as a challenge. Despite these challenges, mHealth interventions still has significant potential to enhance the operations of CHW programs.

Before the interviews, I thought that CHWs use the DoH supplied smartphones to call patients and send health-related SMS's. However, participants said that the DoH only provides monthly data and not airtime, therefore they cannot call patients or WhatsApp them as they do not have smartphones. It can be argued that providing airtime to CHWs who use mHealth mobile devices can significantly improve the CHWs/patient relationship, because CHWs can maintain regular communication with healthcare providers, supervisors, and patients. Regular communication can lead to timely reporting, coordination, and emergency response, which can increase social

capital among CHWs, patients and nurses. By providing airtime, the government can enable CHWs to fully utilise mHealth smartphones, leading to improved healthcare outcomes, especially in remote and underserved areas. However, the digital divide between CHWs and the patients they serve is a disadvantage, and it can negatively affect the important CHWs/patient/nurse communication. As Participant 7 stated that CHWs "work in disadvantaged communities where, sometimes, there is no electricity to charge phones."

Lastly, I acknowledge the potential bias in the analysis results that may have been influenced by the sampling limitations. For example, repeated themes could have emerged due to participants being drawn from the same clinic, which may limit the diversity of perspectives. Additionally, as only one male participant was included in the study, the male perspective on mHealth is likely underrepresented.

A CONCLUDING REFLECTION

5.1 STUDY REFLECTION

Implementing digital technologies, particularly mHealth and its' applications such as the Comm Care App, within health systems, especially public health, is an innovative approach with significant potential of improving PHC delivery. mHealth interventions can also facilitate and increase social capital between CHWs, the communities they serve and health professionals, specifically nurses. This study specifically examined the CHWs' experiences of using the mHealth Comm Care App to conduct field work. mHealth intervention is one of the South African government's strategies of providing 'better health for all South Africans' (NdoH, 2022). Additionally, global organisations such as the WHO and UN acknowledge the potential of digital interventions to strengthen healthcare systems. Research, such as the current study, plays an important role in understanding how such technologies can support and improve health systems, specifically the PHC system.

From this study findings, and other reviewed studies, mHealth ICTs are empowering CHWs by streamlining their tasks, enabling them to collect and store information, track follow-ups appointments, refer patients, and screening. As participants noted that most functions that they perform in the field are better managed under the mHealth Comm Care App. They said that collecting and storing data is much easier and more reliable, compared to the traditional way

of collecting information manually. Importantly, storing records online reduces the risk of losing or misfiling patients' records.

This study used social capital theory to understand the impact of mHealth in health systems and in community. It is evident through participants' responses that mHealth is facilitating communication between CHWs, nurses and DoH, which has the potential of the strengthening bonds among them, which can improve the public health system. Additionally, mHealth act as a bridge, improving information flow and connectivity between different levels of the health system. Social capital theory in this study emphasizes the role of trust, networks, and shared norms in fostering these interactions. Findings in this study show that through the mHealth Comm Care App, CHWs, nurses, and DoH officials leverage these elements to create more efficient and responsive health interventions.

Additionally, the study findings suggest that mHealth strategies can contribute to achieving the DoH's goals of the South African National Digital Strategy for 2019-2024. For example, mHealth could be used beyond primary care registration, follow-ups, referrals to health facilities, tracking high-risk patients, and addressing defaulters. This intervention can also be used to support health promotion and disease prevention campaigns, ultimately ensuring better health for all South Africans, consequently, address the broader primary health care (PHC) challenges. Furthermore, this study acknowledged both potential and its limitations of mHealth intervention. While, mHealth can improve communication and coordination, challenges such as the digital divide, and digital literacy must be addressed to ensure equitable adoption. To ensure mHealth benefits all, inclusive policies must be in place, addressing training, and support for all health workers.

5.2 STUDY LIMITATIONS

Similar to most qualitative studies, a key limitation in this study is the sample size (ten participants), which means that findings cannot be generalised. Another limitation is the duration of the study (six months), which means that I was not able to explore the topic fully (e.g. reviewed the NDHS for South Africa 2019-2025 aims in detail) or spent more time in the field conducting follow-up interviews.

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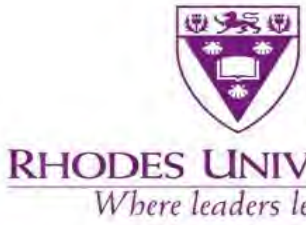
APPENDIX

APPENDIX I - INTERVIEW QUESTIONS

1. Introductory remarks
2. What type of mobile device do you use?
3. Were you trained on how to use it, and do you receive support when you need help?
4. How often do you use the mobile device to call your patients or send them health-related information?
5. Is internet available in the areas where you work or do you use data?
6. Do you receive ongoing training to keep up with new developments in mobile health technology?
7. Do you think using a mobile health device has improved the quality of care you provide to patients?
8. How has using a mobile device affected the management of patients records?
9. In your experience, what are the benefits of using a mobile device?
10. What challenges do you face using a mobile device in your work?
11. How do your patients react to the use of a mobile health device in their care?
12. Concluding remarks.

APPENDIX II – ETHICS APPROVAL LETTER



Rhodes University Human Research Ethics Committee
PO Box 94, Makhanda, 6140, South Africa
t: +27 (0) 46 603 7727
f: +27 (0) 46 603 8822
e: ethics-committee@ru.ac.za
NHREC Registration number: RC-241114-045
https://www.ru.ac.za/researchgateway/ethics/

14 August 2024

Ms Siphokazi Ntuli

Email: g20n4284@campus.ru.ac.za

Review Reference: 2024-7881-8915

Dear Ms Ntuli,

Title: an investigation of the digitalisation of community healthcare work (CHW): A case study on the use of mobile health (mHealth) by Nyahato (an NGO) in Gauteng, Bronkhorstspruit.

Researcher: Ms Siphokazi Ntuli

Supervisor: Ms Janet Chisaka

This letter confirms that the above research proposal has been reviewed and **APPROVED** by the Humanities Faculty Research Ethics Committee (HF-REC). Your Approval number is: 2024-7881-8915

Approval has been granted for 1 year. An annual progress report will be required in order to renew approval for an additional period. You will receive an email notifying you when the annual report is due.

Please ensure that the Humanities Faculty REC is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on the completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the Humanities Faculty REC should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloguing number allocated.

Sincerely,

Dr Priscilla Boshoff

Chair: Humanities Faculty Research Ethics Committee