# ANALYSING PATTERNS OF GEOGRAPHIC DISTRIBUTIONS OF HEALTHCARE SERVICES ALONGSIDE ACCESSIBILITY IN SEKHUKHUNE DISTRICT MUNICIPALITY, A GIS CASE STUDY

by

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Open Rubric

**Declaration**

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ANALYSING PATTERNS OF GEOGRAPHIC DISTRIBUTIONS OF HEALTHCARE SERVICES ALONGSIDE ACCESSIBILITY IN SEKHUKHUNE DISTRICT MUNICIPALITY, A GIS CASE STUDY.

I declare that the above dissertation is my own work and that all the sources that I have used or quoted from have been indicated and acknowledged by means of complete references.

I further declare that I have submitted the dissertation for originality checking and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or a portion of it, for examination at Unisa for another qualification or at any other higher education institution.

SIGNATURE:  DATE: JULY 2024

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**Abstract**

Access to healthcare is a complex and multifaceted issue that is exacerbated by geographic disparities, scarce healthcare resources, and topographical challenges. People make use of clinics as the primary entry point into the healthcare system and access to high-quality and affordable care is critical to their physical, social, and mental well-being. As opposed to their metropolitan counterparts, rural populations face additional barriers to accessing clinics. However, although access to clinics in rural areas continues to be a major issue, few studies have looked at the frequency of associations between the geographic distribution patterns of clinics and accessibility in mountainous regions.

The aim of this study was to evaluate the accessibility of clinics in the Sekhukhune District Municipal Area (SDMA), Limpopo province, South Africa which is largely characterized by its mountainous terrain. The survey used to collect the data for the quantitative research approach involved interviews with 400 public clinic users above the age of 18 who completed the self-administered questionnaires distributed to them. ArcMap and Flowmap software's were then used to perform spatial analyses on the data thus obtained to determine the level of healthcare accessibility in this municipal area. The findings of this research revealed that the geographical distribution of clinics, travel distance, and unreliable public transportation are major contributors to the lack of access to care and that equity in this respect is still a major issue. In fact, the prevailing spatial distribution of clinics could not provide the population with equitable healthcare services. Based on the 10km travel distance and the 10 000-population requirement to warrant a clinic, more than half of the 1,076,840 persons, that is 573,946, were not assigned to any clinic.

Thus, the study recommends that additional healthcare clinics be constructed to reduce travel distances and relieve the load on the existing clinics to promote

equitable access and to boost community health and well-being. Based on the findings of this study it is recommended that the Department of Health should employ geographic Information System (GIS) technology to determine the centricity of the population and to promote its welfare in the health domain by monitoring and responding to its wide range of healthcare needs. Apart from serving in this respect, The Department of Health should also collaborate with the community leaders and other stakeholders to address healthcare needs.

**Key terms:** accessibility; geographic information system (GIS); geographic distribution; patterns; healthcare; municipality; spatial; analysis; travel distance; inequality.

**Abbreviations**

| | |
|---|---|
| ACA | American Healthcare Act |
| CHCs | Community Health Centres |
| COVID-19 | Coronavirus Disease 2019 |
| CSIR | Council for Scientific and Industrial Research |
| DBF | Database File |
| DEM | Digital Elevation Model |
| DoH | Department of Health |
| ED | Enumeration District |
| ENVI | Environment for Visualizing Images |
| ESAP | Economic Structural Adjustment Programme |
| GDPR | General Data Protection Regulation |
| GIS | Geographic Information System |
| GPS | Global Positioning System |
| HIPAA | Health Insurance Portability and Accountability Act |
| HIV | Human Immunodeficiency Virus Infection |
| ID | Unique Identifier |
| IMSS | *Instituto Mexicano de Seguro Social* |
| KEMRI | Kenya Medical Research Institute |
| MIMS | Multi-island Micro States |

| | |
|---|---|
| NFZ | National Health Fund |
| NHI | National Health Insurance |
| NHS | National Health Survey |
| OSM | OpenStreetMap |
| PHC | Primary Health Care |
| PHI | Private Health Insurance |
| SBC | Spot Building Count |
| SDMA | Sekhukhune District Municipal Area |
| SHI | Statutory Health Insurance |
| SOEP | Socio-economic Panel |
| UHC | Universal Health Coverage |
| UK | United Kingdom |
| UNISA | University of South Africa |
| USA | United States of America |

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# CHAPTER 1: INTRODUCTION

## 1.1 Background to the study

Section 27(1)(a) of the Constitution of the Republic of South Africa states that every South African citizen residing within the borders of South Africa has the right to accessible healthcare services (The Constitution of the Republic of South Africa, 1996). On 23 July 2004, the National Health Act (61 of 2003) was enacted to carry out the mandate set out in the South African Constitution. But even after two decades of democracy, rural residents continue to face a variety of healthcare problems, and access to healthcare remains a challenge (MedlinePlus, 2017).

Community participation is the foundation of primary health care (PHC) (Bath & Wakerman, 2015). Community engagement is essential as it addresses ill health issues and explains how government can help members of a community to make decisions (Rifkin, 2014). Community engagement consists of three components, namely, contributions, where communities contribute money, labour, or material; consultations, where members at all levels are consulted for their views and are updated on project plans; and management, where members actively participate in decision-making processes and resource control (WHO, 2012).

Poor physical and mental health conditions pose a threat that leads to morbidity and mortality (SAHRC, 2002). PHC organizations and service providers are encouraged to work with communities to prioritize and implement PHC service delivery solutions (Bath & Wakerman, 2015). This study examined the geographic distribution of healthcare services along with accessibility; and proposed Geographic Information System (GIS)-based solutions to improve and prioritise access to healthcare to better serve the needs of the communities.

The quality of healthcare is vital in every country as it prolongs the lives of citizens (Mgijima, 2010). As such, efficient locations should be sought to allow for a reduction in transportation costs to and from healthcare facilities, a

maximization of their usage, and aid in promoting proper decision-making to improve the access of the population to healthcare facilities and services (Peng & Afshari, 2014).

## 1.2 Problem statement

Access to healthcare services in rural areas poses a significant concern in South Africa (Gaede and Versteeg, 2011). This is due to serious health problems and the prevalence of chronic diseases and is compounded by scarce healthcare resources and topographical challenges (The Sentinel Watch, 2016). The last two factors pose serious challenges for patients in accessing clinics in rural areas and are exacerbated by geographic disparities (Ian & David, 2011). This is particularly true in the Sekhukhune District Municipality, that form the focus of this research study.

Owing to a lack of access to healthcare services, there is a high prevalence of morbidity and mortality in rural areas world-wide (Stanford Medicine, 2018). The link between poverty and limited access to health care persists, with poverty leading to disease and disease perpetuating poverty (Peters et al., 2008). Disparities in access to health care vary by gender, age, race, education, and income (ODPHP, 2019). Furthermore, people living in the rural areas of South Africa do not have adequate access to healthcare services owing to the ineffectual geographical distribution of services (Ibid).

## 1.3 Research aim and objectives

The following aim was set to attain the research goal.

### 1.3.1. Research aim.

The aim of this study was to evaluate the accessibility of clinics in the Sekhukhune District Municipal Area (SDMA), which is largely characterized by

its mountainous terrain. SDMA includes the local municipalities of Fetakgomo Tubatse, Makhuduthamaga, Elias Motsoaledi and Ephraim Mogale.

### 1.3.2. Research objectives.

The study, focusing on SDMA, had the following research objectives:

1. To determine the requirements for equal access to clinics in accordance with the norms and standards of the Department of Health (DoH).
2. To determine the current distribution of clinics and measure them against the prevailing norms and standards as set by the Department of Health.
3. To propose appropriate locations for new clinics to improve accessibility and ranking them for implementation.
4. To assess the community's perceptions of the dynamics of healthcare accessibility.

## 1.4 Significance of the research

Inequality in access to healthcare services is a significant issue worldwide and there is abundant proof of differences in health outcomes among various social groups across nations of varying income levels (Huguet, 2020). Most countries have highlighted significant disparities in access to specialized healthcare that benefit wealthier individuals, largely impacted by geographical differences in healthcare availability for various demographics (Ibid). Many policies aim to address the substantial social and economic costs that these inequities pose to individuals and societies (Ibid). Equity in access to healthcare services is a crucial component of a healthcare system and Most societies consider healthcare inequalities undesirable (Mulyanto et al., 2019).

Poor physical and mental health are major issues in the public health arena, particularly in rural areas, and result in high morbidity and mortality rates (SAHRC, 2020). Health injustices (inequities) arise because of the various

disparities that municipalities must face in dealing with health issues in their rural areas (RHIhub, 2017). As opposed to communities which are lacking in access to efficient healthcare facilities and services, communities with adequate healthcare resources, are, therefore, healthier and recover more readily from disasters leading to poor health.

Differences in healthcare utuilization across regions can be traced back to both characteristics of the population and factors specific to certain locations (Mulyanto et al., 2019). Demographic factors like age and gender, as well as socioeconomic factors such as income, education, and employment, affect service usage if the population composition varies significantly between different regions (Ibid). Conversely, discrepancies in factors related to location, like the quantity and kind of medical facilities, are also responsible for discrepancies in healthcare utilization across different regions (Ibid).

Geographical inaccessibility to healthcare facilities is becoming increasingly common in remote areas, hampering access to care, the distribution of medicines, and other supplies (Peters et al., 2008). Inadequate healthcare services contribute to ill health and chronic disease (CDC, 2015). People with access to safe healthcare facilities enjoy better health and there are fewer inconsistencies in the delivery of health services to them (Ibid), it is important that the challenge of improving healthcare be met ─ The requirement being to ensure access to and the exploitation of healthcare facilities and services (ODPHP, 2019).

Studies have been conducted on the accessibility of clinics, especially in metropolitan areas (Mokgalaka, 2014). In addition to the disparities in wealth and privileges among different social classes, the utilization of healthcare services varies across provinces and is often highlighted in national health reports, however, there is limited information on the factors causing these variations and their prevalence in smaller areas like districts (Mulyanto et al., 2019). Analysis at the district level could pinpoint specific geographic trends and determine if the

geographic patterns within districts play a role in creating inequalities and this could highlight the perspectives for comprehending geographic disparities in access to healthcare services (Mulyanto et al., 2019).

## 1.5 Research outline

In terms of the organizational structure of the dissertation, this study is divided into five chapters, which are discussed as follows:

Chapter 1 gives a summary of the dissertations. The chapter also clarify the reasons behind conducting the research and the strategies put forward for investigation. The chapter also deals with the issues identified in the study and what problem the research aims to solve. The chapter also discusses the main aim of a research project and a clear, brief description of the specific objectives of a research study. The chapter also explores the study's impact on a research field and its contributions. Finally, it discusses the chapter outline, which provides details on the various sections included in the dissertation.

Chapter 2 provides an overview of the literature on the accessibility of clinics and the issues that communities face. It also validates the reasoning behind the research by highlighting the gaps that require attention. The chapter also discusses the norms and standards, ranging from an international perspective to a local perspective, in relation to access to healthcare services. The chapter also compares norms and standards across countries to demonstrate the similarities and differences on a national level, as well as ways in which countries are striving to improve their healthcare services. Access to healthcare deals with the provision and utilization of healthcare services while the norms and standards provide guidelines for ensuring that all citizens have fair access to healthcare services.

Chapter 3 focus on the specifics of putting the research method into practice. It also discusses the research paradigm, which pertains to the approach, framework, or structure utilized in research to provide a foundation for theories and practices.

The chapter outlines the geographical area where the research project takes place, including its connection to nearby provinces and district municipalities. The methodology employed to accomplish the objectives outlined in chapter 1 is also addressed in this chapter. The study's limitations, stemming from practical or theoretical restrictions encountered, were addressed along with the decisions on research focus and scope. The research's reliability and validity were also addressed. Finally, this chapter covers the ethical aspects such as participation, informed consent, anonymity, confidentiality, harm potential, and communicating the results.

Chapter 4 discusses the results of the data analysis and the key findings of the dissertation. The chapter also discusses the results of the flowmap analysis, and the findings deduced from the responses to the questionnaires and compares the results to highlight the similarities and differences pertaining to access to care in respect of African and International countries.

Chapter 5 discusses the strategic discoveries that offer crucial details about the credibility of evidence, the impact of the interventions studied, and the total information available on all significant outcomes for a specific comparison. The section also addresses the constraints of the research including the sample size, data collection methods for analysis to meet the research objectives, the obsolete census data, and the self-reported bias from the participants. Finally, the chapter delves into possible avenues for future research.

## 1.6 Summary

The relationship between the spatial distribution of clinics and critical healthcare challenges, such as amongst others, accessibility to such facilities, affects most people in South Africa. Owing to the increase in healthcare problems, policymakers are still facing the challenge of improving healthcare services, especially in rural areas. The aim of this study was to evaluate the accessibility

of clinics in the Sekhukhune District Municipality, which has a mountainous terrain. The spatial analysis model was performed and the results emanating from the analysis of the responses to questionnaires were used to ascertain the accessibility to clinics in SDMA from a sample of community respondents. The findings of the surveys and the spatial analysis model were compared to determine similarities and differences in evaluating the accessibility of community members to the clinics in SDMA. A knowledge of where phenomena are located, such as their geographical locations, is crucial for future planning in the healthcare sector.

The following chapter focuses on a literature review to support a discussion on the relationship between the physical distribution of clinics and accessibility.

# CHAPTER 2: BACKGROUND AND LITERATURE REVIEW

## 2.1 Introduction

The importance of access to quality healthcare services is recognized as a basic requirement worldwide, but inequalities worldwide persist (Dawkins et al., 2020). Access is central to the performance of healthcare systems around the world (Scheffler et al., 2015). However, access to healthcare remains a complex concept, as demonstrated by the author's different interpretations of the concept (Ibid). In addition, equity in the distribution of healthcare services has been a significant challenge for health researchers, planners, and policy makers (Omrani-Khoo et al., 2013).

The right to healthcare is a fundamental human right enshrined in the South African Constitution (The Constitution of the Republic of South Africa, 1996). The National Health Act 61 of 2003 (as amended) establishes a framework for a structured uniform healthcare system within the Republic, considering the obligations imposed on the national, provincial, and local governments in terms of health services by the Constitution (The National Health Act, 2003). South Africa continues to be an unequal society in which the quality and type of services people receive are heavily influenced by their socioeconomic status and ability to access services, regardless of their level of need for care (SAHRC, 2020).

This chapter reviews the literature on access to care, particularly in remote areas characterized by mountainous terrain. The chapter discusses access to healthcare services from an international to a local perspective, the role of community participation, community health workers, and related studies on access to healthcare services. The chapter also discusses the norms and standards framework outlining the fundamental aspects of quality in healthcare services, as well as the responsibilities of the various role players at the national, provincial, and local levels from an international to a local perspective.

## 2.2 What is a healthcare system?

The health system, also known as the healthcare system, is a structure whereby institutions, resources, and individuals that deliver health services meet the health needs of the targeted population (Pallipedia, 2021). A good healthcare system ensures that people are healthy and free from disease, while it aims at finding cures for diseases (Somma, 2015). A good healthcare system provides all citizens with equal access to the highest quality healthcare, the right programmes administered by competent healthcare professionals, and clinics for preventive and curative care for most health problems (Beracochea, 2016). The healthcare system must provide quality health services to its citizens (WHO, 2019).

## 2.3 Access to healthcare services

Access to healthcare services contributes to improving health and alleviating illness and concerns the availability of basic health services, such as the ability to go to a health facility (Martin et al., 2013). Access to health care has been justified from an economic perspective by its utility as a process to improve the health of residents (Ibid). Access to healthcare is the timely use of individual health services to achieve the best health outcomes (ODPHP, 2019). A good healthcare system should have three distinct phases: access to the healthcare system; access to the geographic locations where services are provided; and a healthcare provider whom the people concerned at all levels can trust and with whom they can communicate (Ibid).

Access to health services requires geographical accessibility, the availability of the right type of care to those who need it, and the affordability and acceptability of services (Tsui et al., 2020). Geographical accessibility is the availability of good healthcare services within a reasonable distance and other aspects of the service organization (Ibid). The concept of affordability suggests that receiving healthcare services should not put a person in financial hardship, while access to

information in the healthcare sector should be crucial for transparency and accountability (Goudge, 2009). Access to information is the freedom to look for, obtain, and share data that are owned by public entities, without jeopardizing the right to the confidentiality of personal data, all these aspects contribute to equity in access to care (D'Costa et al., 2021).

The availability of services and barriers to access must be considered in the context of the different healthcare needs, material, and the cultural setups of the different societal groups (Gulliford et al., 2002). Equity of access is measured in terms of the availability, utilization, and outcomes of services (Ibid). Geographical distances and lack of transportation services in rural communities pose a serious obstacle for those needing to visit the clinics more frequently (Koller, 2019). The closeness of health services in terms of physical location significantly impact the utilization of primary healthcare services (Mwanyangala et al., 2010).

## 2.4 Access to clinics services from an international perspective

Every country in the world has a healthcare system to address the healthcare needs of its citizens; some have more complex systems than others (Weiss, 2020). This section discusses access to healthcare services from an international perspective and focuses on five prominent countries with well-established healthcare systems.

### *2*.4.1 United States of America (USA)

Access to healthcare services has been regarded as one of the most important socio-political issues in the United States of America (U.S.A.), where citizens currently rank as the most important element within the healthcare system (Zieff et al., 2020). Health inequities and limited healthcare access are common challenges for people and families living in rural areas (Reilly, 2021). Healthcare outcomes in rural areas are worse than those in urban areas, with challenges in

mental health, substance addiction, physical health, and sexual health due to lack of access to healthcare services (Ibid).

Discrepancies in access to healthcare services are also worsened by an equivalent difference in access to and availability of technology, specifically the Internet and urban Americans are three times as likely to have access to Next Generation broadband compared to rural Americans (Douthit et al., 2015). Rural residents must travel farther than urban residents to reach healthcare services (Ibid). This variation in access to healthcare services exists across the Northern part of the country (Ibid). Economic factors, cultural and social distinctions, educational deficiencies, legislative neglect, and the extreme remoteness of rural living are all contributing factors to the limited access to healthcare services (Ibid).

Rural communities have been demonstrated to have fragile economic systems and substantial physical barriers to healthcare services (Douthit et al., 2015). As a result, there is a growing demand for improved access to healthcare services particularly in rural America (Ibid).

### 2.4.2 France

France is dealing with the long-standing issue of geographical disparities in its healthcare services (Chevillard, et al, 2019). This circumstance, among other things, leads to underserved areas, which may result in a lower level of access to basic healthcare services (Ibid). Various obstacles make it difficult for people living in rural areas to access and utilize reliable healthcare services, such as geographic location, distance, and limited financial resources and specialized healthcare services (Ibid).

Rural residents travel long distances to access medical help compared to their urban counterparts (Rivenbark and Ichou, 2020). Lack of equity in access to healthcare services causes mortality rates, higher rates of premature morbidity and mortality and lower access and use of preventive healthcare services due to

the connection between healthcare information access/use and healthcare outcomes (Ibid).

Disparities in healthcare access are also worsened by variations in factors like the occurrence of natural disasters, as well as the extent and allocation of healthcare funding (Rivenbark and Ichou, 2020). Ultimately, these factors impact the level of service delivery in urban and rural areas (Ibid). Disparities in doctor accessibility are most visible in towns, with rural areas generally experiencing more severe disparities compared to urban areas (Ibid). The lack of healthcare access in rural areas is typically attributed to a lower number of healthcare providers available (Lurquin et al., 2021). The examination of rural-urban differences in access to healthcare services help to reduce rural-urban health disparities (Ibid).

### 2.4.3 Germany

Germany has been ranked first in the world in terms of the number of healthcare workers and the distribution of healthcare professionals (Blümel et al., 2022). The citizens are experiencing inequalities in access to healthcare services between urban and rural areas for physicians, dentists, and psychotherapists (Ibid). Rural communities tend to have less access to healthcare service and travel long distance to access healthcare services compared to those residing in urban areas (Ibid).

Germany's rural regions face the challenge to develop new strategies to ensure accessibility to healthcare services with the appropriate public infrastructure while becoming less densely populated and experiencing an increasing share of immobile population groups (Noack and Bergmann, 2010). In general, access to healthcare services in Germany is very good, but in some rural areas its provision tends to be problematic (Ibid). The demographic change cause lack of access to healthcare services (Ibid). Declining population and people moving out of rural

areas result in shifts in the spatial layout and affect the availability of healthcare services (Ibid). Rural areas face challenges with decreased doctor to patient ratios and extended travel distances compared to those living in urban areas (Ibid). The rural area and the working conditions of country doctors are unattractive, and Germany also has the task of motivating (young) doctors to reside and practice in remote rural areas (Ibid). Furthermore, despite the increased need, the number of physicians in certain specialties and general practitioners is decreasing because of this imbalance (Blümel et al., 2022).

### 2.4.4 Australia

Australia is the world's sixth-largest country, spanning around 7.7 square kilometres (McGrail and Humphreys, 2015). A significant proportion of the population resides in major coastal metropolitan areas (Ibid). Rural and isolated Australians have lower healthcare outcomes than many metropolitan inhabitants due to inequitable healthcare services (Thomas et la., 2015). Rural and distant residents have significant disadvantages in access to healthcare services due to their geographical location, with poorer health outcomes than their metropolitan counterparts (McGrail and Humphreys, 2015).

The vast geography intensifies the difficulty of attracting healthcare professionals to rural and remote regions, leading to a notable scarcity of medical experts in these areas (McGrail and Humphreys, 2015). Many regions in Australia face barriers in access and utilization of healthcare services (Ibid). Australians residing in rural and remote areas tend to have shorter lifespans and higher levels of diseases and injuries, along with poor access to healthcare services (McGrail and Humphreys, 2015).

It is important to understand how people encounter obstacles during the process of accessing healthcare services to guide for preparation and provision of medical services and the findings be used to enhance ongoing assessment of differences

in access to healthcare services regardless of their location (Corscadden et al., 2018).

### 2.4.5 Mexico

Access to adequate healthcare utilization has been acknowledged as a critical problem in formulating public policies to combat poverty (Brown et al., 2002). For example, Mexico's National Development Plan 2000-2006 states that excellent healthcare is a crucial requirement to achieve equity in economic and social possibilities (Ibid). The Plan states that to have a democratic healthcare system, it is necessary to develop a quality healthcare arrangement that is open to all Mexicans and that is accessible to everyone regardless of socioeconomic status and locations (Ibid). However, inequities in the utilization of healthcare services are more prevalent in rural communities than in urban areas (Ibid).

Inequity in access to healthcare services is exacerbated by income, distance to healthcare services and organizational constraints (Brown et al., 2002). Some services are expensive for certain income groups and simply some individuals may lack the minimal resources necessary to access healthcare services (Ibid). Distance barriers arise from the geography of the health ambulatory services, given that in some areas it is necessary to travel long distances to access healthcare services (Ibid). Access is also more difficult as the population tends to be dispersed (Ibid).

## 2.5. Access to healthcare services from an African perspective

This section discusses access to healthcare services from an African perspective and focuses on developing world countries. The emphasis is on five prominent countries.

### 2.5.1 Botswana

Botswana has a well-developed primary healthcare network; however, this has not resulted in effective universal health coverage (Nkomazana, 2022). The country's health outcomes are poorer than those of countries with comparable per capita health expenditures (Ibid). Access to healthcare services is more readily available to the wealthy people while the poor remain with limited benefits (Keetile and Yaya, 2023). Many people tend to rely more on traditional health practices that are not yet regulated, in fact, the government has yet to draft a law regulating traditional practices that would promote a harmonious healthcare system (WHO, 2018). Botswana's healthcare system is decentralized, with primary healthcare serving as the foundation of the system (Ibid). Botswana's 27 health districts have a comprehensive network of health facilities (hospitals, clinics, health posts, and mobile stops) (Tapera et al, 2018). Citizens receive public healthcare at virtually no cost, while immigrants pay a subsidized charge (Ibid).

Access to healthcare services in Botswana has been integrated into the broader hospital and healthcare service component, which are available in the hospital outpatient departments (Tapera et al, 2018). The government is the largest employer of healthcare workers in the country (Nkomazana, 2022). The Ministry of Local Government was initially in charge of primary healthcare, but now, all healthcare components have been transferred to the Ministry of Health (Ibid). The shortage of skilled and certified healthcare workers remains one of the primary impediments to the availability of affordable high-quality healthcare (Ibid).

The lack of resources has exacerbated the difficulties related to accessing healthcare and rendered the services provided by hospitals unattainable (Jliedu, 2019). There are gaps in the quality of care provided and its management, and rural villages inevitably lack the resources and medical staff (Hollenhorst, 2014).

### 2.5.2 Zimbabwe

Zimbabwe is one of the countries with little fiscal space, resulting in deteriorating public utilities and inferior service provision (Mutandwa and Zinyama, 2015). The Zimbabwean healthcare system is affected by rising expenses and increased demand for treatment as the population expands (Ibid). The system is currently dealing with significant staff shortages, low work motivation, high absenteeism rates, and general healthcare inefficiencies (Chikwawawa and Bvirind 2019). Despite the country's initiatives for economic change (e.g., the Economic Structural Adjustment Programme (ESAP) to alleviate the economic crisis, the healthcare delivery system has severely deteriorated (Ibid).

Many people in Zimbabwe live in rural areas where there is a great need for health services, such that access to healthcare is more difficult than that for their urban counterparts (Khameer and Kidia, 2018). In fact, Zimbabwean healthcare workers have fled to neighbouring sub-Saharan African countries and the United Kingdom (UK) in search of greener pastures, leaving the government with few doctors to meet the high care needs of the rural communities (Khameer and Kidia, 2018). Although the constitution guarantees every citizen the right to healthcare, Zimbabweans must travel long distances to access care (Roets et al., 2020). Rural residents often walk between 10 and 50km to get medical help (Ibid).

Zimbabwe's healthcare access continues to stagnate, particularly in the rural areas (Tshimanga et al, 2017). Political uncertainty and a lack of political will on the part of political leaders have contributed to the deterioration of the healthcare system, resulting in communities having to travel long distances to receive care (Ibid). People have few opportunities to access medical care because of long distances, the cost of care and the poor road conditions (Ibid). Greater community involvement in health concerns, the implementation of health worker retention

strategies, and the application of additional resources for healthcare delivery will assist in improving healthcare delivery in the country (Chipunza and Nhamo, 2023).

### 2.5.3 Namibia

Namibia is one of the least densely populated countries in Southern Africa (Christians, 2020). The healthcare system in Namibia is differentiated into the private sector, which serves 18% of the population, and the public sector, which serves 82% of the population (Ibid). Healthcare access is comparable, with 76% of the population residing within a 10km radius of a healthcare institution ─ despite the severe obstacles that the country is facing in providing patient-centred primary health care (PHC) (Ibid). The country has improved its primary health care system to better meet the demands of the general population (Van Rooy et al., 2015). The overall focus of healthcare services is mainly on PHC, concentrating particularly on community health, prevention measures, and treatment that can be delivered rapidly (Ibid). Most of these services are delivered by public clinics, outreach sites, and district public hospitals, and drugs are often affordable because the user fees are subsidized (Ibid). Despite these accomplishments, healthcare personnel are seriously lacking ─ particularly in the rural areas ─and patients wait longer to receive medical care (Van Rooy et al., 2015). Unequal access to healthcare services prevails not only between the rural and urban inhabitants, but also between the rich and poor (Ibid).

Despite its tiny population and robust health infrastructure, Namibia is still behind in the delivery of person-centred and quality PHC services (Christians, 2020). Well-trained general and family practitioners, as well as participating family physicians, can all help to turn this scenario around (Ibid). To achieve this objective, Namibia should join the rest of Africa in developing viable frameworks to support health for all (Ibid).

### 2.5.4 Mozambique

Mozambique has a population of around 30 million people, however, about half of the population is impoverished and has limited access to the public healthcare system (International Trade Administration, 2023). The Ministry of Health, which supervises public hospitals and health care centres, offers healthcare services to most of the Mozambican population (Ibid). The remaining individuals rely on traditional medical approaches that involve community health agents, elementary agents, and birth attendants (Ibid).

The delivery of healthcare services in Mozambique remains a major problem, with people walking an hour or more to the nearest healthcare facility and shortages of medicines in all centres (USAID, 2019). The government healthcare system for tracking down, motivating, and retaining healthcare professionals is ineffective (Ibid). Furthermore, frontline healthcare providers are inadequately trained and have limited managerial skills (USAID, 2019). Most of the wealthiest people in the country tend to go to South Africa for elective procedures (Allianz, 2018).

Despite all the challenges, the government has significantly reduced the mortality rate through its improvements to promote greater access to health care. (USAID, 2019). The public healthcare system is simple and limited (Allianz, 2018). People having to walk more than an hour to reach the nearest clinic, understaffing, and resource constraints are the major contributors to ill health (Ibid).

### 2.5.5 South Africa

In pursuit of Universal Health Coverage (UHC), South Africa's National Development Plan (NDP) strives for a radical shift in the equity of health service provision by 2030 (Gordon et al., 2020). Access to healthcare services is one of the "*Batho-Pele*" Principles ("People First") promulgated by the South African government since 1997 and recognized globally as a fundamental human right

(Burger and Christian, 2020). The government initiated a *Batho-Pele* process to oblige public servants to provide services to the people (Ibid). This principle is also enshrined as a fundamental human right in the country's National Health Insurance (NHI), with its implementation requiring changes to healthcare systems, procedures, attitudes, and behaviour (Ibid).

South Africa's healthcare system is considered one of the most dynamic in the world (Bophelo, 2019). The country appears to be on the right track in terms of providing quality health services (Ibid). The public sector serves almost 80% of the population, while the private sector accounts for only 18%, and non-governmental organizations for only two percent (2%) (Ibid). The private sector plays an important role in healthcare and supports the government in fulfilling its mandate to provide quality healthcare to all citizens (Ibid).

The government has significantly increased the provision of PHC and there are still areas that need to be addressed, which could lead to inequalities in the South African healthcare system (Presidential Health Summit, 2018). The government has prioritized the needs of rural residents and focused on social and economic development (Conco, 2015). South African rural communities, like other African countries, are often affected by poverty and unemployment, both of which contribute to the ill health of people in remote areas (Ibid). The lack of adequate health information remains a challenge and stems from the country's poor healthcare status and the unequal distribution of health resources that favours the rich while the poor continue to suffer from diseases (Strasser et al., 2016).

In addition to staff shortages, healthcare workers are unevenly distributed across the country (Strasser et al., 2016). Most healthcare professionals prefer to work in the urban and affluent areas ─ although the people in the rural communities are the ones more deserving of attention (Ibid).

The healthcare system faces challenges, such as poor governance structures, insufficient management capacity, lack of funding, lack of medical professionals, maladministration, and a poorly maintained infrastructure (Presidential Health Summit, 2018). To address the afore-mentioned healthcare challenges, the government introduced the National Health Insurance (NHI) initiative to provide a means to improve the ability to pay for healthcare expenses and thus to address the issue of affordability (Ibid). On the other hand, inequalities between the actual and perceived needs of healthcare justified investment in the health literacy outreach programmes that the President proposed in his address (Ibid).

## 2.6 Comparison of access to care: international and African perspectives

Equity in access to healthcare services is a major issue in both the international and local perspective (Banerjee, 2020). The foundation of UHC offers affordable high-quality primary healthcare, but many people continue to struggle to meet their primary healthcare needs. The goal of UHC is to ensure that people have access to the healthcare they need without paying a high price. Some countries, such as the USA, lack a UHC system so that medical costs are relatively high.

Access to care poses similar challenges to international and local perspective (Banerjee, 2020). They face disparities in access to care, particularly among those living in remote areas. Some countries, such as France and Mexico, have been ranked as having the best healthcare systems in the world, but their citizens face the same challenges as others in terms of the high medical costs.

The commonality in the countries discussed is that those who can afford healthcare costs, prefer private medical services, whereas most people rely on public medical services and need to travel long distances to access health care. In all, the latter are facing the consequences of inequality of care. Rural residents must either rely on inefficient local medical clinics or travel long distances to the nearest cities to access care.

Some countries, such as Botswana, have fully implemented universal systems only in their major cities, leaving the rest of the country with limited healthcare resources whereas in countries such as Zimbabwe, Namibia, and Mozambique are still struggling with the universal systems. The president of South Africa has signed the National Health Insurance (NHI) into law, whereas other countries such a Namibia, Botswana, and Zimbabwe do not have the national health insurance. Countries such as South Africa, Namibia, and Mozambique are working to enhance access to healthcare services, whereas Zimbabwe's healthcare system is deteriorating.

Healthcare systems differ from one country to another, and each country strives to provide affordable, quality health services to its citizens with the limited monetary resources at their disposal. Access to care, high medical costs, travelling long distances to access care, particularly in remote areas, and inequality are the horizontal challenges affecting every country such a Zimbabwe, Namibia, Mozambique, and South Africa.

## 2.7 Community participation in healthcare

Community participation in the primary healthcare system ensures that everyone has the right and responsibility to participate individually or collectively in the planning and implementation of their needs in the provision of health services (Gholipour et al., 2023). Planning, organizing, implementing, and regulating healthcare services at the highest possible of community and individual levels are processes that are strictly required to promote an effective primary healthcare system (Haldane et al., 2019). Community participation is a feature and process that plays an important role in healthcare delivery in that it improves the quality of health services and results in integrated and coherent health programmes that support health professionals (WHO, 2019).

The participation of health institutions, public health authorities, and communities in public health policy and research is crucial to meeting the healthcare needs of the people and in reducing social inequalities in the healthcare sector (Morales-Garzón et al., 2023). As such, community participation in health services should not be regarded as an option but rather as a core component of health service delivery and critical to the public health sector (Ibid). In practice, previous healthcare reforms tended to focus more on technical, economic, and managerial issues while paying less attention to community involvement (Geneva, 2005).

Figure 2.1 shows the nine aspects where community involvement can positively impact the healthcare sector. The first aspect, agenda, concerns the selection and direction of health projects, how they are launched and new areas for health improvement; the second aspect, ethics, concerns research into the design, tools and interventions used in healthcare; the third aspect, individual research participants, considers improvements through research to bring about change; the fourth aspect, design and delivery, identifies ethical pitfalls and ways to resolve them, creating opportunities to improve the consent process; the fifth aspect, public involvement, requires the knowledge and skills of the public to participate in health projects (ATDSR, 2015) .

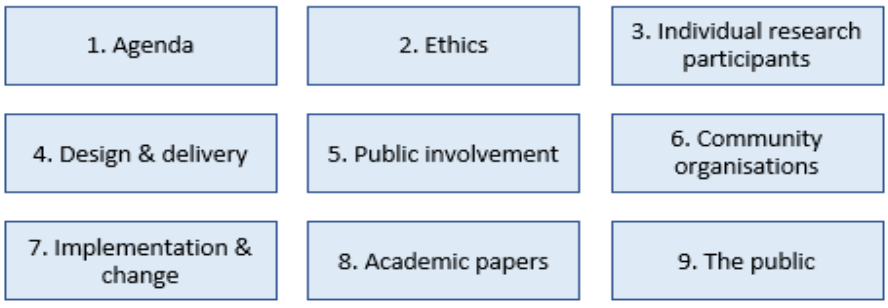



Figure 2.1: Aspects of community involvement

Source: ATDSR, 2015.

The sixth aspect, community organisations, focuses on gaining an understanding of the health issues studied and the appreciation of the role of communities; the seventh aspect, implementation and change, encourages participants to conduct healthcare studies; the eighth aspect, academic papers, requires a means to gain access to information about community members; and finally, the ninth aspect, the public, requires that the public be open to and benefit from such research (ATDSR, 2015)

There is growing agreement on the importance of community participation as a tool, and reviewers argue that participation primarily focuses on healthcare outcomes rather than on assessing the extent of community involvement in the research (George et al., 2015). Finding the best ways to engage the community at all levels and in a manner that will maximize the benefits of healthcare and equity for all involved is indeed a challenge (McEvoy et al., 2019). Practices and research in public health have described several strategies for involving citizens and communities (Ibid).

### 2.8 Related studies on access to healthcare

Several studies on accessing healthcare have been conducted on a local and global scale. As evidenced by the wide range of interpretations of the concept among authors, the performance of global healthcare systems is dependent on their accessibility. Access to healthcare remains a complex concept and, owing to the importance of service delivery to people, has taken centre stage in the healthcare sector.

Greiner et al (2018) investigated access to and the utilization of primary healthcare services using a road network in Germany. Their primary objectives were to determine population accessibility to healthcare services and to investigate individual factors, such as settlement patterns and locational deprivation related to walking great distances to the nearest clinics. A cross-

sectional study using individual survey data from the German Socio-economic Panel (SOEP) and the 2010 Index of Multiple Deprivation was used (Greiner et al., 2018). The responses of the 20601 SOEP survey respondents and the official data on the associated urban and rural settlement structures used in their study were used in this current research study.

A logistics regression model was also used to estimate the relationship between the individual, environmental factors, and distance by road to access care (Greiner et al., 2018). Their primary outcomes focused on walking distance by road whereas their secondary outcomes focused on visits to clinics (Ibid). This study by Greiner et al. (2018) shows that nearly 70% of participants live within 20 minutes by road of the nearest clinics, while the remaining participants live more than 20 minutes away. The authors also stated that individual and environmental factors influence the distance covered to access care, and that deprivation is negatively related to access to healthcare services (Greiner et al., 2018).

Zurynski et al (2021) investigated the accessibility and affordability of healthcare services in Australia using a road network. The aim of their study was to survey a representative sample of adult Australians about healthcare access and affordability (Ibid). They also wanted to compare the perspectives of people with or without chronic conditions, as well as to assess their differences as related to the associated demographics and financial situation. A survey including standardized questionnaires that were distributed electronically to 1 024 Australians, over the age of 18, was conducted. This study, by Zurynski et al. (2021), revealed that health consumers identified costs as a barrier to their gaining access to healthcare services, particularly in cases where they had chronic conditions.

Geldsetzer et al (2020) mapped the physical access to clinics for older people in sub-Saharan Africa, as well as the implications in respect of the COVID-19 responses. The aim of their study was to estimate travel time at a 1 km ×1 km

resolution to the nearest clinic of any type for adults in sub-Saharan Africa aged 60 years and older by road. Geldsetzer et al. (2020) used the geolocation of the clinic dataset obtainable from OpenStreetMap (OSM) and used the geocoded inventory of clinics published by the Kenya Medical Research Institute (KEMRI) Welcome Trust Research Programme.

Geldsetzer et al (2020) used the geolocation of adults aged 60 years and older from population counts obtainable from the WorldPop project. The counts reflected projections for 2020 at a spatial resolution of one square kilometre. Geldsetzer et al. (2020) calculated the road travel time to the nearest clinic by combining OpenStreetMap data and the dataset for the master clinic list. This study by Geldsetzer et al (2020) calculated road travel time with AccessMod Version 5.6.33, which aided in the development of an up-to-date travel model based on the most recent land cover and road network datasets. These authors plotted the distribution of travel time separately for clinics and calculated the median travel time to the nearest clinic.

The findings of this study by Geldsetzer et al (2020) highlighted that approximately 10% of adults in sub-Saharan Africa aged 60 and older have an estimated travel time of six hours or longer by road to the nearest hospital. Thus, physical access to a healthcare facility will almost certainly play a significant role in whether older adults in this region will be able to seek medical treatment (Ibid).

McLaren et al (2013) examined distance as a critical barrier to accessing health services in the whole of South Africa. The authors emphasized that even with free healthcare services, travel time and costs are seen as significant barriers, especially in rural communities. McLaren et al (2013) used the geographical coordinates of households and clinics to calculate the Euclidean distance as a measure of the distance travelled. To contextualize inequalities in accessing healthcare services, the authors began with a descriptive analysis of differences

in proximity to health services and patterns of caregiving behaviour by race, gender, and income at the national level (Ibid).

McLaren et al (2013) calculated the distances by road between homes and clinics using Global Positioning System (GPS) coordinates. A descriptive sample was generated using these variables to depict the nonlinear relationship between proximity to clinics and care-seeking behaviour.

The analysis of this study by McLaren et al (2013) found that poor people live far from the nearest clinics and that their inability to pay for transportation remains a barrier, resulting in poor-quality healthcare. In South Africa, 90% of the travel within 7km by road to the nearest clinic and quality care is available only to black South African citizens with a high household income (Ibid). This study by McLaren et al (2013) also highlighted that in South Africa, about 10% of the rural residents travel more than 10km by road to the nearest clinic and endure longer waiting times than those visiting private clinics.

Stellenberg (2015) examined the accessibility, affordability, and utilization of clinics. The survey was conducted in six residential areas in the northern and eastern regions of the Cape Metropolitan Area in the Western Cape (Ibid). Stellenberg (2015) used structured interviews to collect data, whereas the data accessed by the researcher were collected through the support of two registered nurses. The questions featured in the questionnaire required responses regarding the area of residence, income, occupation, type of health services used, accessibility and affordability of health care (Ibid).

The statistical chi-square test (2), with a 95% confidence interval, was calculated and used to determine the level of significance of the respective relationships between accessibility, affordability, and the utilization of health services (Stellenberg, 2015). The responses to the open-ended questions were classified and common themes were identified and quantified (Ibid).

This study by Stellenberg (2015) found that the unemployed and people living in informal housing in the northern and eastern regions of the Cape Metropolitan Area in the Western Cape face difficulties in accessing health services. The study used a road network to determine travel distance to healthcare services. Long queues, waiting times, poor conditions in government clinics and the poor quality of health care proved to be significant barriers (Ibid). Some respondents suggested introducing payment for services to prevent the collapse of the health services (Ibid). This study by Stellenberg (2015) also showed that inaccessibility to health services affects people from all socioeconomic backgrounds.

Faith and Egresi (2013) investigated the accessibility of healthcare institutions using GIS. Their investigation was focused on measuring the accessibility of people to various healthcare facilities (Ibid). The initial stage of their analysis was to identify the healthcare institutions that are located within the borders of the research region and data was then converted into a GIS system (Ibid). The road network was digitized using ArcMap 10.1's "street" base map and Google Earth, and the topographical state of the research region was evaluated using a Digital Elevation Model (DEM) acquired from Aster satellite images at a resolution of 30m (Ibid).

Faith and Egresi (2013) created a buffer zone at 1 and 3km from the healthcare facilities. The buffer was drawn since the study location is a densely populated sector where people are used to walking (shorter distances) to perform errands, which can be completed in about 15 minutes on foot (Faith and Egresi, 2013). The second buffer zone was set at 3km because it could be covered by automobile or public transportation in around 10-15 minutes under normal traffic circumstances (Ibid). Another spatial analysis was performed which was the "shortest distance" analysis between two remote places and the nearest healthcare institutions (Ibid).

This study by Faith and Egresi (2013) found that 89 square kilometres (56%) of the district's territory are within 3 km of health care facilities. The authors discovered no major accessibility issues in the district, since even those living the furthest from healthcare facilities can reach the nearest medical facility in less than 30 minutes (Ibid). The findings were predicated on the premise that people always go to the nearest healthcare facility, which is not necessarily true (Ibid).

Jamtsho and Corner (2014) investigated the spatial accessibility of primary healthcare using GIS. Their major goal was to assess the accessibility of healthcare services in Bhutan (Ibid). Bhutan was chosen as the case study location because its small size and population make it easy to collect and process data for the entire country (Ibid).

Their study used location data from population clusters and healthcare centers, as well as count data from the population and healthcare providers, to measure spatial healthcare accessibility (Jamtsho and Corner, 2014). The spatial accessibility of the population clusters was calculated using straight-line distances between the clusters and the healthcare facilities, as well as the provider-to-population ratio (Ibid).

Bhutan's census data only included population cluster data at the sub-district level, which is too aggregated for use in calculating accessibility indicators (Jamtsho and Corner, 2014). Population clustering at the disaggregated level was accomplished by integrating and collecting population point characteristics within a distance tolerance of 1000m (Ibid). The population point features were created from georeferenced housing and census data using a randomization technique, with individual population points generated at random around the settlement houses' locations (Ibid). The data for health centers and healthcare providers were gathered from the National Health Survey 2011 (NHS 2011) database, which includes both spatial and non-spatial information about healthcare facilities across the country (Ibid).

The study also looked at a variety of healthcare accessibility policy scenarios, which can help determine the most successful healthcare policy among several potential planning situations (Ibid). The findings revealed that the spatial accessibility measure of the 203 sub-districts shows notable variations in healthcare accessibility, with around 19 sub-districts attaining an excellent healthcare accessibility ranking (Ibid).

Yerramilli and Fonseca (2014) examined the geographical inaccessibility to healthcare services by utilizing GIS network-based approaches. Their research aimed to highlight areas with high concentrations of vulnerable populations who are facing challenges in accessing appropriate healthcare services due to geographic constraints (Ibid). They examined these characteristics in urban-rural landscapes (Ibid).

The healthcare status and outcomes of the population are mainly influenced by the distance to healthcare facilities and the time spent traveling to access the healthcare system (Yerramilli and Fonseca, 2014). A geographical analysis was conducted to examine the accessibility of healthcare facilities based on their size/number, type, and location, which affects the overall well-being of communities (Ibid).

The study evaluated the geographical accessibility of three essential healthcare facilities: obstetrician/gynaecology, paediatrics, and Trauma/Burn Centres (Yerramilli and Fonseca, 2014). The locations were geocoded, and service areas based on travel time were created, along with layers of relevant population data to evaluate geographic inaccessibility using GIS network analyst tools (Ibid). The findings highlighted areas with high numbers of vulnerable people living outside areas with the best services, with rural areas and pregnant women facing the brunt of healthcare challenges because of lack of access to care (Ibid). Around 30% of women of childbearing age are living beyond optimal travel times, with rural

areas bearing the majority (80%) of this population discrepancy according to the population data layer (Ibid).

Yerramilli and Fonseca (2014) found that 10% of women of childbearing age were in hot spots areas characterized by high population density and limited geographical accessibility. The study area features a balanced distribution of facilities across urban and rural areas, serving a large portion of the population (Ibid). The findings show that over 90% of children live within the ideal 30-minute travel distance, however, data on population distribution highlighted areas where children have limited access to healthcare due to high population density (Ibid). These hotspots were mainly in urban areas, providing important insight for health officials (Ibid). The study was conducted to assist healthcare administrators and policymakers gain comprehensive understanding of healthcare systems from a geographical perspective, allowing them to make more informed policy decisions (Ibid).

Roxanne and Martin (2022) studied healthcare accessibility in multi-island Micro States (MIMS). The aim of the research was to evaluate different GIS methods for measuring spatial accessibility to public healthcare (Ibid). The spatial accessibility to healthcare services was evaluated using demand, supply, and distance information (Ibid). The authors highlighted the location of the population, the location of healthcare facilities, and the travel time as factors users must navigate to access healthcare services (Roxanne and Martin, 2022). Locations of the public health facilities within the study area were collected using Global Positioning System (GPS) coordinates (Ibid).

The primary factors considered for the facilities included their location, healthcare services availability, physician availability, and operating hours, collected through facility-based survey to all facilities (Ibid). The Ministry of Health and Central Statistics Office provided general utilization data and population composition information to supplement this (Ibid).

Data on road transportation infrastructure (road network) and associated speed limits were obtained from Open Street Maps and built using ArcMap 10.6 (Roxanne and Martin, 2022). This was used to measure travel distance and travel time between healthcare facilities and the local communities (Ibid). A network dataset was then developed to measure the travel time and travel distance between the healthcare facilities and the location of the residents (Ibid).

A 10-minute travel time catchment was created based on the expected 3-mile radius between the population and the healthcare facility (Roxanne and Martin, 2022). This catchment region was chosen appropriate for the study area since it had at least one facility within the expected 10-minute travel time (Ibid). All datasets reflecting demand and supply were geocoded, stored in a geodatabase, and integrated into a GIS (Ibid). Geo-processing and data analysis were performed using ArcGIS Pro version 2.3 to produce the outputs required for evaluating spatial accessibility (Ibid). The spatial distribution for each GIS-based methodology was represented in the form of maps that showed the island's spatial and/or temporal dynamics (Roxanne and Martin, 2022).

Data on population location, location of healthcare facilities, the network transportation system and travel times were used to rank facilities based on proximity to each enumeration district (ED) and the number of facilities that could be accessed by each ED (Roxanne and Martin, 2022). This destination rank provided information on the facilities closest to each ED within the recommended 3-mile radial proximity of 10-minute catchment (Ibid).

The spatial accessibility to primary healthcare services was assessed using GIS-based methods, including the Gravity Model and two-step floating catchment area, and the findings were compared (Roxanne and Martin, 2022). This comparison was necessary to emphasize the importance of considering the context or environment where these methodologies are used (Ibid). This was especially crucial because the Gravity Model does not consider the temporal

changes in the study area (Ibid). Two aspects of accessibility were considered which was time (accessibility within 24 hours) and location (distance between health facilities and potential users' location) (Ibid). The Python script containing all GIS methodologies used in the research was utilized to incorporate the variations in healthcare schedules, services under analysis, and travel patterns within the study area (Roxanne and Martin, 2022).

Around 47% of households on the island have access to all five facilities, but households on Petite Martinique only have access to one facility within its catchment area (Ibid). In certain cases, certain communities had more options due to proximity based on the destination rank, while other Enumeration Districts (EDs) had to travel farther to reach the nearest facility (Ibid).

Lechowski and Jasion (2021) assessed the spatial availability of primary healthcare services in rural regions of Poland (Ibid). The study was conducted using distance models from rural statistical areas to the closest primary healthcare center, using network analysis and normal point distribution characteristics (Ibid).

The authors used PHC data acquired from the National Health Fund (NFZ) (Lechowski and Jasion, 2021). The data included details about all the service providers working under the NFZ agreement (Ibid). Population data was also sourced from the Local Data Bank of the Central Statistical Office (Ibid). The National Censuses data were combined at the level of statistical localities, but during years without censuses, municipalities were the smallest unit of division.

The road network data were sourced from OpenStreetMap (Lechowski and Jasion, 2021). Due to the size of the file, only the classes representing the primary road network system were chosen (Ibid). The selected dataset was subjected to a connectivity check and the removal of road fragments that were not connected to the network (Ibid). Following these efforts, the total length of roadways

considered in subsequent evaluations was 369,082.19km (Lechowski and Jasion, 2021).

The spatial accessibility to PHC facilities was evaluated by examining the spatial distribution of accessibility to the nearest medical services studied and highlighting areas where it deviated from the average (Lechowski and Jasion, 2021). The standard deviation method was utilized to show spatial variations in distance values, with outliers falling outside of one standard deviation from the mean (Ibid).

The Theil index was used to examine the spatial variation in the shortest distances from rural statistical localities to PHC facilities (Ibid). The results showed that 52% of primary healthcare facilities are located nearest to rural statistical areas (Ibid). The average distance from rural statistical localities to PHC facilities is approximately 5km (Ibid). Nevertheless, there are areas where people must travel over 20km to reach the nearest primary healthcare facility, although these locations make up less than 1% (Ibid).

Kemboi and Waithaka (2013) investigated the use of a GIS location-allocation model to improve access to healthcare services. The aim of the study was to identify the spatial distribution of healthcare services in Mt. Elgon Sub-County using GIS to recommend the best places for future healthcare facilities (Ibid). Various datasets were used, including the location of healthcare facilities from the Ministry of Health, population data from the Kenya National Bureau of Statistics, road networks from the Survey of Kenya, administrative boundaries from the Survey of Kenya, Landsat images from the USGS website, disease data from the Ministry of Health, and a digital elevation model (30m) RCMRD (Ibid).

Centroids were generated using demographic data from the 40 sub-locations that represented demand points (Kemboi and Waithaka, 2013). This was followed by the creation of a database containing all the layers (roads, population, and existing

health care facilities) (Ibid). A network analyst extension was activated to generate a new network geo-dataset and a new network dataset (Ibid). The analysis process was then initiated to generate the site allocation (Ibid). Several attributes were then filled in from where facilities, which in this case reflect existing health care facilities, were loaded into the model (Ibid). The second characteristic was filled with demand points, which in this case correspond to population centroids (Ibid). The digital elevation model was utilized to evaluate the optimal location for new healthcare facilities based on the analysis of three key factors such as the construction feasibility, slope, and aspect and relief (Kemboi and Waithaka, 2013). Environment for Visualizing Images (ENVI) was utilized to process the Landsat image (Ibid). The classes were generated using the maximum likelihood classifier (Ibid).

According to their findings, the entire area is served by 1 district hospital, a sub-district hospital, and 10 health centers (Kemboi and Waithaka, 2013). Almost 63% of people can reach healthcare facilities within a 5km distance (Ibid). Construction of 6 new healthcare facilities will enhance the availability of medical care by 90%, thereby lowering expenses, alleviating suffering, and decreasing the number of fatalities due to delays in receiving appropriate medical treatment in the region (Ibid). Kemboi and Waithaka (2013) suggested potential areas for future research, including incorporating hospitals located within a 5km radius into the healthcare model and examining dispensaries and private clinics in the analysis.

Mokgalaka (2014) used Geographic Information Systems (GIS) to evaluate primary health services using a GIS-based accessibility analysis for the City of Johannesburg. Mokgalaka (2014) used data such as those pertaining to a population dataset, a routable road network, and a clinic dataset. Because there was no database for the residential addresses of all patients attending the city's primary care clinics, the researcher used the 2011 Electronic Tuberculosis

Registry (ETR.Net data) (Ibid). A flowmap and ESRI's ArcGIS were used to determine accessibility (Ibid). In a first step, the distribution of the clinics within the study area, the location of the residential areas relative to the clinics, and the catchment areas of these clinics were presented independently of the distance (Ibid).

GIS tools were used to model the current situation of potential accessibility in terms of the capacity of the clinic and location (Mokgalaka, 2014). Based on a road network, a GIS-based form of service area allocation modelling was used to map the demand from each origin area (residence) to the nearest clinic (destination) (Ibid). Each source location had a value that represented demand for healthcare, and each destination location had a value that represented the maximum capacity or level of demand that it could service (Ibid).

The accessibility analysis was terminated when either the 5000 capacity of clinics or the maximum distance of 5km was reached using a road network (Mokgalaka, 2014). Access to the clinics was restricted to a road network 5km away (Ibid). The analysis then delineated the catchment areas around each clinic. Figure 2.3 shows the allocated demand in the distance band for the City of Johannesburg.

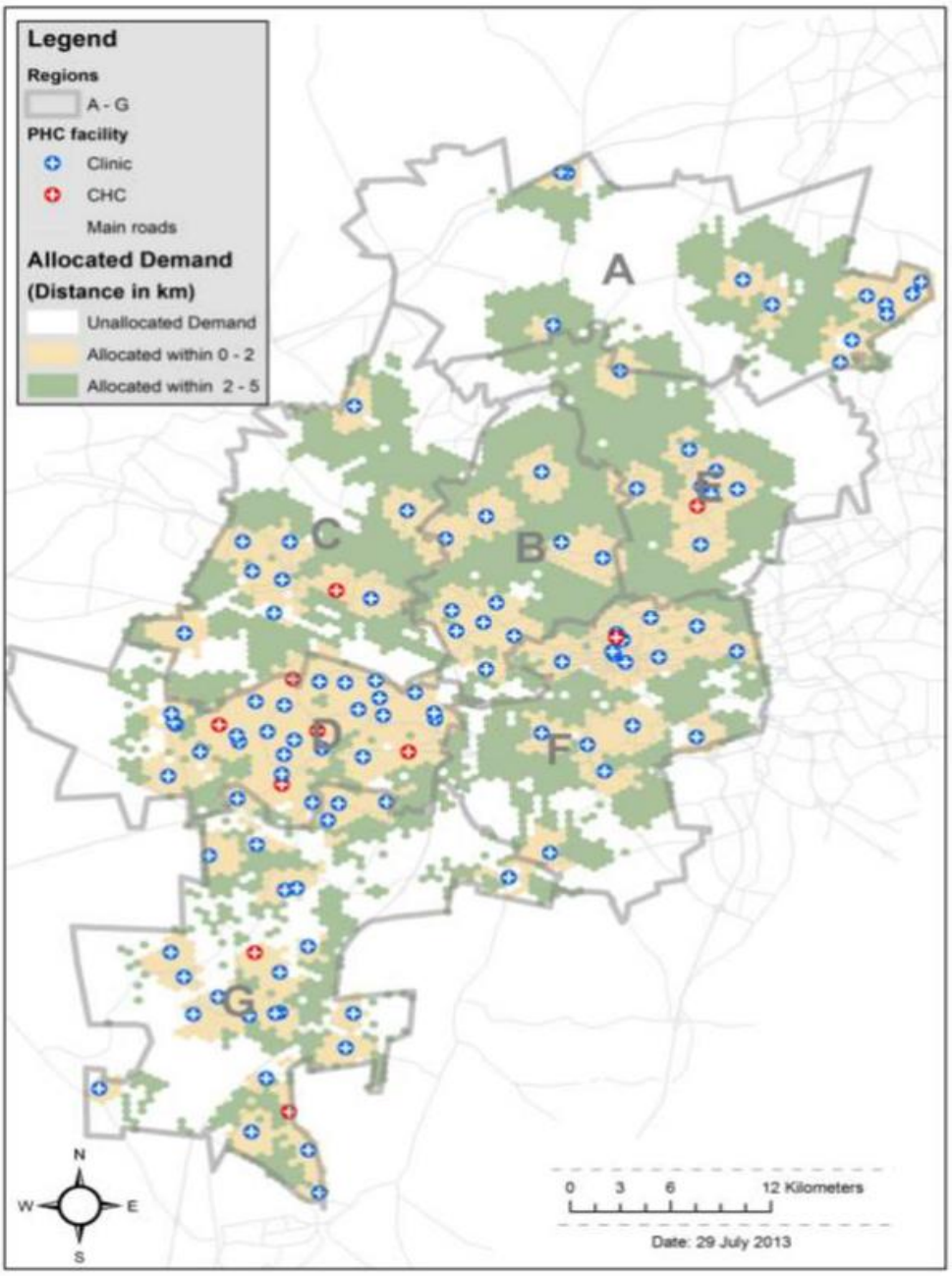



Figure 2. 2: Allocated demand in distance band (access and distance constraints)

Source: Mokgalaka, 2014.

Figure 2.2 depicts the allocated demand based on capacity and distance in a study conducted in the City of Johannesburg. The white area on the map represents areas that have not been assigned to a clinic owing to capacity and distance constraints. The findings of this study by Mokgalaka (2014) highlighted that the

city's clinics are well distributed and that travel distance by road is not a problem. The only issue encountered was a lack of service capacity.

The research for this dissertation is comparable to other research studies that have been conducted at both the local and international level. The focus was on identifying barriers to healthcare accessibility and presenting mitigation plans to improve access to these services. However, the research for this dissertation differs from that of other studies because it is focused more on densely populated rural areas with mountainous terrain. All research studies mentioned in the relevant literature for this study aimed at assisting policy makers to amend the laws and rules governing healthcare services and thus improving the living standards of community. The accessibility of all the research studies was Euclidian. This study followed the same process of using a road network to determine access to healthcare services.

## 2.9 Norms and Standards

### 2.9.1 Introduction

Norms and standards provide guidance on a wide range of health issues that are based on scientific evidence and expert advice (WHO, 2022). Health service delivery standards relate to the human resources required to meet the expectations at each level of care, while service delivery norms focus on the quantities of the resource inputs required to provide the service delivery package effectively and sustainably (Ministry of Health, 2006). The primary goal in incorporating norms and standards in this research study was to present an approach that would standardize the functions and activities in the delivery of healthcare services and establish a baseline against which health service delivery could be measured and gaps identified (KnowledgeHub, 2022).

An investigation into the prevailing norms and standards of the community/society in question served to elaborate upon the expected inputs

required to ensure the effective and efficient delivery of a defined set of healthcare services to the public. This was achieved by outlining the structure of the healthcare system needed, the expected service standards, the minimum human resources, infrastructure needed, and the processes for monitoring adherence (Ministry of Health, 2006). The norms and standards needed to be of a high quality, relevant, accessible, and able to keep up with rapid change during a health crisis (WHO, 2022).

This section of the research focuses on and reflects upon both the norms and standards from an international and a local perspective. It also compares the norms and standards from both perspectives to gain an understanding of the similarities and variations between countries and how each country strives to increase access to healthcare services.

## 2.10 Norms and standards from an international perspective

### 2.10.1 USA

The American Healthcare Act (ACA), also known as the Patient Protection and Affordable Care Act, is a healthcare reform law, with its amendments addressing healthcare costs, health-insurance coverage, and preventive care (Affordable Care Act 2010). The Act has three primary goals: ─ increasing the number of people eligible for low-cost health insurance to provide subsidies to consumers, expanding medical aid eligibility to include all adults, and encouraging innovative medical care delivery methods to reduce overall healthcare costs (Affordable Care Act 2010).

The overall approach to expanding access to coverage requires everyone, including the legal residents, to have health insurance, which will result in the establishment of state-based American Health Benefit Exchanges, where citizens can purchase coverage by paying a monthly premium and using the available cost-sharing credits (Affordable Care Act 2010).

All citizens and legal residents must have qualified health insurance, and those who do not have coverage, face a tax penalty (Affordable Care Act 2010). Exemptions are granted in cases of financial hardship, religious objection, American Indians, those without coverage for less than three months, undocumented immigrants, incarcerated individuals, and those whose lowest cost plan option exceeds eight percent (8%) of an individual's income (Ibid).

### 2.10.2 France

The French government passed Law No 2011-2012 on Strengthening Safety of Drug and Health Products with the intention to restore confidence and improve the safety of health services (Maillols-Perroy and Tillet, 2012). This new regulation affects all stakeholders, including health professionals (Ibid). It also provides for financial, administrative, and strengthening limits on the safety of health products (Ibid). The French government allows for the immediate implementation of major changes in the educational requirements for students, for changes to the finances of local hospitals and for expediting the transition to digital by massively deploying telemedicine and allowing healthcare professionals to practise through telecare (Allen & Overy, 2019).

According to France’s healthcare standards, there should be no discrimination in accessing preventive or healthcare treatments (Allen & Overy, 2019). Furthermore, a medical professional may not refuse to treat a patient for any reason (Ibid). The patient has the right to health-related information pertaining to any examinations, treatments, preventive care offered, the expected benefits of this care, whether urgent or not, and the common or serious risks that could normally be expected, as well as any other possible solutions and the foreseeable consequences should the patient refuse treatment (France Public Health Code, 2002). All healthcare professionals are required to inform patients as part of the services they provide and in accordance with the professional rules that apply to

them (Ibid). This requirement may be waived only if based on an emergency or when it is impossible to notify the patient (Ibid).

### 2.10.3 Germany

The German government enacted the General Data Protection Regulation (GDPR) in May 2016 (Molnár-Gabor et al., 2022). The purpose is to provide a high level of personal data protection for individuals by emphasizing the applicable requirements for personal data processing and in so doing to harmonize the legal position across the country (Molnár-Gabor et al., 2022).

Social health insurance is required for self-employed and high-income employees in Germany (Greb, 2007). Coverage is virtually universal, with the statutory health insurance (SHI) system covering roughly 88% of the population (Busse and Riesberg, 2004). Employees and self-employed individuals who earn more than a specific amount of money have the option of continuing with SHI or of switching to private health insurance (PHI) (European Observatory, 2021). Middle- and low-income employees, pensioners, the unemployed, and students are also required to register for the German Social Health Insurance, while individuals who are eligible to opt out of the public system are persuaded through monetary and non-monetary incentives. (Busse and Riesberg, 2004).

The German Patients' Rights Acts were enacted to serve as a legal instrument that extends anti-discriminatory protection in accessing healthcare services (, 2013). The German Patients' Rights Acts refer to the ethical principles established through professional legal acts and codes of ethics that prohibit discrimination and make the care of medical personnel mandatory, regardless of personal circumstances (German Patients' Rights Acts, 2013). The Acts establish offices for managing patients' rights and assist them with claims relating to healthcare discrimination (Ibid). German The Patients' Rights Acts protect patients' liberties,

such as the right to privacy, confidentiality, intimacy, consent, information, and, to a varying extent, deal with the issue of equality (Ibid).

### 2.10.4 Australia

The government developed a health charter of healthcare rights to deal with access to healthcare services (The Australian Charter of Healthcare Rights, 2008). It is applicable to all citizens, including both public and private hospitals, as well as to daily procedures and services, general practice, and other community health services (The Australian Charter of Healthcare Rights, 2008). The charter underscores the tenet that a uniform statement of patient rights is a fundamental prerequisite for safe and high-quality care. It should in fact lead to a patient-centred health-care system (Trevena et al., 2017). The Charter enables patients, consumers, families, caregivers, doctors, and health-care providers to share an awareness of the rights of those receiving treatment (Ibid). This lays the groundwork for a true collaboration to achieve results with the greatest potential (Dunbar and Reddy, 2009). The Charter was supported by all healthcare ministers in July 2008, and it currently serves as Australia's national framework for patient rights (Trevena et al., 2017).

To promote equity in access to care, the Australian Charter includes three guiding principles, namely, that everyone has the right to health care, the commitment of government to international human rights treaties that recognize everyone's right to the best physical and mental health possible, and that Australia is a society made up of people from various cultures and lifestyles (Dooley, 2019). The Charter recognizes and respects these distinctions (Dooley, 2019).

The Australian Charter of Healthcare Rights (2008) stipulates that all people should have the right to access healthcare services and the right to safe and high-quality care (Ibid); all people should be treated with respect and dignity when accessing care (Ibid); the participation of healthcare users and communication

with them should be promoted so that they are included in all healthcare activities, are well informed about the services rendered, and should if needs be, be able to comment to raise their concerns; and finally, all patients should enjoy privacy in terms of their medical records (The Australian Charter of Healthcare Rights, 2008).

### 2.10.5 Mexico

The Mexican Federal Constitution recognizes health as a fundamental human right and lays the groundwork for the government to enact health-related legislation (Mexican Constitution, 1917). Article 73 of the Mexican Constitution grants the Mexican Congress the authority to pass health-related legislation (Ibid). The Health Insurance Portability and Accountability Act (HIPAA) was enacted in 1996 as a federal law that established a specific medical standard that aids in the protection and security of all patients' medical records and other personal health information (Health Insurance Portability and Accountability Act, 1996). All healthcare information records, including physical copies and electronic data, must be securely preserved. (Ibid). The Health Insurance Portability and Accountability Act of 1996 increases the transferability and continuance of healthcare insurance coverage, while also aiming to prevent waste, fraud, and abuse in the healthcare industry (Ibid). The act also encourages the use of medical savings accounts, enhances access to long-term care services, and streamlines insurance administration (Ibid).

The Seguro Popular (SP) programme was established in 2004 to improve access to healthcare and reduce catastrophic expenses among Mexicans (Colchero et al., 2022). In addition, Seguro Popular is a historic government programme that aims to ensure universal access to health care, particularly for the most vulnerable communities (Chemor et al., 2018). People who work in Mexico are automatically enrolled in the *Instituto Mexicano de Seguro Social* (IMSS) system and their contributions are deducted from their pay and those who are not

formally employed may voluntarily enrol in the IMSS system and pay an annual contribution fee (Allianz Care, 2023).

Unlike the situation in South Africa, the maximum travel distance to access medical care and the capacity per healthcare centre has not been specified. No scientific journals, official reports, and policies could be found.

## 2.11 Norms and standards from an African perspective

### 2.11.1 Botswana

Botswana's policy framework promotes a non-discriminatory approach to healthcare services in general and commits to providing equal access to healthcare services (SALC, 2017). Botswana Public Health Act does not include prohibitions against general discrimination in healthcare services, but does prohibit discrimination, based on health status, by clinic heads against healthcare providers (Botswana Public Health Act, 2013).

The coordination of patient care specifies that qualified healthcare professionals must be responsible for patient care, that professionals must bear the overall responsibility for the patient for a specific phase of care, as identified in the patient records, and that the patient be known to other members of staff (Botswana Public Health Act 2013).The users of health services who require healthcare treatment have the right to be treated competently and diligently, with respect and compassion (Ibid). Users must be informed about their own condition and be given alternative options for treatment (Ibid).

Based on the appropriate information and within the limits of those concerned, patients must be able to accept or refuse any treatment offered to them (Botswana Public Health Act 2013). Patients are also free to submit suggestions and/or complaints, or to protest regarding the services provided (Ibid). Furthermore, users must be issued with certificates indicating their health status, as well as a

written record of the nature and management of their treatment (Ibid). These conditions would apply should they make such a request, when such a request is deemed necessary, or for the general promotion or protection of their health (Ibid).

Users must always respect the rights and vulnerabilities of other patients or clients, as well as any rules governing the organization and operation of clinics (Botswana Public Health Act 2013). All are required to cooperate with the personnel of such a healthcare facility or establishment in terms of their own treatment, which should be based on all information received (Ibid). Furthermore, users must pay any fees prescribed by the government for treatment at a public health clinic (Ibid).

### 2.11.2 Zimbabwe

Section 76 (1) of the Zimbabwean Constitution stipulates that every citizen and permanent resident of Zimbabwe has the right to access basic healthcare services, which include reproductive healthcare services (Zimbabwe's Constitution, 2013). The state must take reasonable legislative and other measures with its limited resources to achieve the progressive realization of the rights of citizens outlined in Section 76 (1) (Ibid). According to the Constitution, any person may claim their right to healthcare if they are in a situation stipulated in terms of the provisions of Section 76 (1), (2) and (3). The Constitution further states that the government must put in place policies, laws, and resources for the right to basic healthcare to be enjoyed in Zimbabwe (Zimbabwe's Constitution, 2013).

Every citizen has an obligation to avoid harm to any primary healthcare system by exercising due diligence and taking reasonable precautions to avoid, control, and/or mitigate health risks (Zimbabwe Public Health Bill, 2017). The bill further stipulates that information relating to any harmful effects to the healthcare system that could be caused by any products people are intending to promote, must be

made available. People are required to report any suspected health risks to the relevant healthcare authorities and actively promote compliance with the regulations and the related code of practice, guidelines, or administrative orders (Zimbabwe Public Health Bill, 2017).

A healthcare practitioner in charge of a healthcare institution or establishment should not refuse a person emergency medical attention (Zimbabwe Public Health Bill, 2017). Any person who fails to comply with the code of conduct should be guilty of an offence and liable for a fine (Ibid). The user of a healthcare service must have full knowledge of the services rendered by various healthcare institutions; furthermore, it is the duty of the healthcare professionals to provide such information to the users (Ibid). Healthcare services must not provide services to a user without the user's informed consent (Ibid). Confidentiality must be maintained at all levels and people are welcome to lay any complaint regarding the services rendered to them (Zimbabwe Public Health Bill, 2017).

### 2.11.3 Namibia

Namibia developed and implemented its own patient rights policy, namely, the Patient Charter of Namibia, in July 1998, which was reviewed on 17 October 2016 (Shiindi-Mbidi et al., 2013). One of the Namibian government's responsibilities is to safeguard and promote the best possible standard of health (Ibid). Access to healthcare services, information, safe and effective service delivery, communication, participation, privacy, improved health, accountability, confidentiality, and being treated with integrity, respect, and dignity are the rights of patients that are outlined in Namibia's Patient Charter (Namibia Legal Assistance Centre, 2005).

All Namibians have the right to good health, which includes access to primary care facilities and referrals to higher-level treatment, when needed (The Namibian National Health Policy 2020). The Namibian National Health Policy Framework

ensures that health and social welfare services are affordable, and that equity and justice concepts underlie commitment to the health policy (Ibid). The health policy encourages and empowers residents to actively participate in activities that promote good health and prevent illness at the individual, family, and community levels, thus complementing the functions of the health and social welfare services (Ibid). The policy ensures that gender issues and other social determinants of health amongst women and men, boys, and girls should foster healthy lives and allow all people access to healthcare services that are tailored to their specific requirements (Ibid).

The assurance that patients' rights are protected and that they receive all the health education that they require goes beyond educating policymakers and health providers; it also includes educating citizens about what they should expect from their governments and healthcare providers (Upsana et al., 2017).

### 2.11.4 Mozambique

According to Article 89 of Mozambique's 2004 Constitution, all citizens have the right to medical and healthcare within the framework of the law; furthermore, it is the duty of the government to protect and promote public health (Constitution of the Republic of Mozambique, 2004). Medical and healthcare for citizens should be organized through a national healthcare system, which should benefit everyone (Ibid). The State should advocate for the expansion of medical and healthcare services, as well as the equal enjoyment of this right by all citizens (Ibid).

Human dignity, equality, and ethics are fundamental values propounded by the healthcare system of Mozambique (Mozambique Patient’s Right Charter 2006). The Charter prohibits discrimination based on health status and guarantees the confidentiality of patient information. It gives all patients the right to voice their suggestions and grievances, and the right to a timely response (Ibid). The Law on

the Protection of the Individual (2008) stipulates that the rights of the worker/candidate for employment living with a Human Immunodeficiency Virus (HIV) infection, and of people living with HIV be respected. These would include their rights to information, free treatment, and protection from discrimination (Ibid).

Mozambique has introduced several international agreements, including the Convention on the Rights of the Child, to eliminate discrimination against women and children and the rights of persons with disabilities (Feinglass et al., 2016). Despite these national and international legal instruments, the Ministry of Health has produced several effective policies and guidelines to deal with clinical practices (Ibid). However, the effectiveness of these laws and policies is hampered by ineffectual communication, weak enforcement, low literacy rates, and the playing out of power dynamics that obstruct those whose rights have been infringed from seeking recourse (Ibid).

The maximum travel distance to access medical care and the capacity per healthcare centre has not been specified in the countries discussed above. No scientific journals, official reports, and policies could be found.

### 2.11.5 South Africa

The Constitution of South Africa provides for every citizen to exercise his/her right to access medical care (The Constitution of the Republic of South Africa, 1996). The National Health Act (61 of 2003) stipulates that patients must be treated with respect and dignity and their rights respected. The clinics must be hygienic, accessible to people with disabilities and have short waiting times (Ibid). The DoH standards and regulations apply to all public hospitals, private acute-care hospitals, public clinics, community health clinics and primary health clinics (National Health Act, 2003).

Clinics must provide comprehensive primary healthcare to the public for at least eight hours a day and five days a week, and everyone should have access to a good clinic (The National Health Act, 2003). Health services should be available to all. Furthermore, communities should be involved in all such activities and be given the opportunity to provide feedback on the performance of the health services provider (Ibid). Clinics should be reviewed annually to ensure that they are responding to patients' needs and providing healthcare services and the Patient Charter should be posted in the local language (ibid).

According to the Department of Health's norms and standards, citizens should travel no more than 5km to access care, and the catchment area should have 5 000 residents to justify a clinic. The Council for Scientific and Industrial Research (CSIR) has conducted a scientific study on accessibility (Department of Human Settlements, 2019) proposing that a typical population threshold for justifying a primary healthcare clinic should accommodate between 5 000 and 60 000 people, with a maximum access distance of five to10km as the ideal standard. On the other hand, the typical population threshold for a community health centre (CHC) should be between 60 000 and 150 000 people, with a maximum access distance of 10km as the ideal standard (refer to Figure 2.1 below.) (Department of Human Settlements, 2019).

Table 2. 1: Population threshold and access distance to clinics

| Social facility type | Typical population threshold (number of people) | Ideal maximum access distance (km) |
|---|---|---|
| **Primary Health Care clinics**<br>Primary Health Care clinics are permanent facilities (public or private) at which a range of primary health care services are provided, for at least eight hours per day and four days per week. | 5 000 - 60 000 | 5 - 10 |
| **Community Health Centres (CHCs)**<br>CHCs are appropriately equipped permanent facilities that offer a broad range of primary health care services including observation beds, accident and emergency services, midwifery services, but not surgery under general anaesthesia. These facilities are operational 24 hours a day and seven days a week. | 60 000 - 150 000 | 10 |

Source: Department of Human Settlements, 2019.

## 2.12 Reflection and comparison of the norms and standards: from an international and African perspective

Each of the countries mentioned above has a constitution that states that citizens have the right to quality and affordable healthcare. All countries discussed above have developed healthcare acts and policies to deal with healthcare-related matters. The norms and standards were developed to provide guidance on a wide range of health issues which apply to specific types of healthcare facilities (Herrmann et al., 2018). Healthcare insurance has become a basic practice in all countries, providing citizens with comprehensive medical care (Sinha and Kohnke, 2009). Based on the appropriate information and within the constraints of those concerned, patients must be able to accept or refuse any treatment that is offered to them (Ibid).

Users must always respect the rights and vulnerabilities of other patients or clients, as well as any rules governing the organization and operation of a clinic. Due diligence measures and reasonable precautions are crucial in avoiding, controlling, and/or mitigating health risks (Rodziewicz et al., 2023). Anyone who

violates the code of conduct is guilty of an offence and subject to a fine. Users must be fully aware of the services provided by various healthcare institutions, and healthcare professionals are required to provide this information to the users (Ibid).

The provision of universal access to social health protection is an overriding goal set by countries (Kelsall et al., 2016). Finance, administration, and the performance of social health protection vary greatly across the afore-mentioned countries. In some countries, such as the USA, people are required to have health insurance, and those without it face penalties (Affordable Care Act, 2010). On the other hand, there are other countries, as discussed above, where it is not mandatory to have healthcare insurance, and there are, therefore, no penalties associated with the lack thereof (Naidoo, 2012; Yinusa and Okurut, 2012; Buchmueller and Couffinhal, 2004).

In South Africa, the introduction of National Health Insurance is still a work in progress (Heunis et al., 2019), while in other countries, such as Germany, Universal Health Insurance prevails (Busse et al., 2017). In France, telemedicine and the practice of telecare have been implemented, whereas in other countries, such as Botswana, South Africa, and Australia, there is neither telemedicine nor telecare to improve access to care. Mexican employees are automatically registered for IMSS, but employees in the other nations described above are required to register of their own accord. The German government has implemented the SHI for self-employed people to access care, whereas in other countries, such as South Africa, Botswana, and Mexico, self-employed people are responsible for deciding whether to join the health insurance of their choice or not to, and the governments concerned do not play a role in insuring self-employed citizens.

The countries discussed above all protect confidentiality, the right to privacy, the right to be informed, the right to dignity, and the freedom of individuals to register

any complaints about the services rendered. Every country faces difficulties that contribute to disparities and the allocation of financial resources to healthcare varies. In some countries, the national health insurance is funded by patrol taxes and shared amongst employees and employers, whereas in other countries it is funded by the government.

## 2.13 Summary

Access to basic healthcare services in rural communities has long been a worldwide problem. Equity in access to healthcare services was explored from an international perspective and African perspective. The ggeographical distribution of healthcare facilities has been identified as a significant barrier to healthcare access, especially in rural areas with the limited transportation options that they offer (Evans et al., 2022). In addition, the use of and access to healthcare services is primarily influenced by the geographical region in which people reside (Costa et al., 2020). Geographical distance to PHC facilities is a critical issue in areas where the transportation network is poor and non-motorized mobility is the primary method of transportation (Evans et al., 2022).

Various countries have developed and implemented norms and standards to guide healthcare service delivery, increase access to care, protect users' rights, and promote the safety and health of medical professionals. Despite the measures established and implemented to increase equity in access to care, a review of the literature revealed that imbalances in access to healthcare services persist, especially for persons living in rural areas. Lengthy travel distances, insufficient healthcare resources, and a lack of medical personnel are the biggest barriers to achieving equity in access to healthcare services. Interventions must be developed to address these challenges to realise equity in access to care to improve and enhance people's lives (Richard et al., 2016). This study also used a road network to determine travel distance to access healthcare services.

The following chapter discusses the methods that were used in collecting and analysing the data central to this study.

# CHAPTER 3: METHODOLOGY

## 3.1 Introduction

The preceding chapter reviewed the literature on access to healthcare services from both an international perspective and African perspective. This chapter discuss the research approach. It includes information about the methods used in conducting this research as well as the justification for using the selected method. This chapter also discusses the research stages, such as the types of data used, software used, spatial analysis method, data collection, and the selection of participants. The chapter concludes with a review of validity and reliability in quantitative research and how these two conditions were achieved.

Lack of access to healthcare, particularly in rural areas, has been well documented (Franco et al., 2021). However, the impact of access to healthcare services in mountain areas is not well researched. The aim of this study was to evaluate the accessibility of clinics in SDMA, which is largely characterised by its mountainous terrain. This study focused only on clinics because clinics are the first access points to healthcare facilities for people in SDMA.

## 3.2 Research paradigm

A conceptual framework or research paradigm is an established research model of what the researcher intends to study (Tamene, 2016). This research paradigm is shaped by positivism and interpretivist approach (Ryan, 2018). Each of these approaches uses a research paradigm as a guide for developing research methods to ensure that the research process is conducted in the most ethical and appropriate manner (Khaldi, 2017). This study used the positivist research paradigm over the interpretivist research approach because it is based on measurement, and the information is disclosed through measured activity, action, or reaction (Park et al., 2020). Studies around the world that incorporate government statistics use the positivist research paradigm because of the

reliability of using statistics in quantitative research (Ibid). The positivist paradigm has long been considered the dominant quantitative research paradigm (Patel, 2015).

### 3.3 Study Area.

Sekuhkhune district municipal area was founded in December 2000 and is one of Limpopo's five districts located in the southeast of Limpopo province, approximately 300km north of Johannesburg (Sekhukhune District Municipality IDP, 2020). The study area is bordered by Gauteng province to the south, Mpumalanga province to the east, and Waterberg District Municipality to the west (Ibid). The study area consists of four local municipalities which is Fetakgomo Tubatse, Makhuduthamaga, Elias Motsoaledi, and Ephraim Mogale (Ibid). The study area covers 13 527.73 square kilometres of land and is home to 1 076 840 people, or 20.4 percent of the province's total population with only 5% of the district’s population estimated to live in urban areas (Ibid).

The study area is characterized by scattered pattern of human settlement and contains 740 rural villages (Ibid). There are 74 traditional authorities, with the majority located in the Fetakgomo Tubatse, Makhuduthamaga, and Elias Motsoaledi municipalities (Sekhukhune District Municipality IDP, 2020).

Sepedi is the most widely spoken language in SDMA, with 83% of the population speaking it (Sekhukhune District Municipality IDP, 2020). There are 85 clinics throughout the district. Out of a total of 85 clinics, Fetakgomo Tubatse has 36, Ephraim Mogale, 13, Elias Motsoaledi, 15, and Makhuduthamaga, 21 (Ibid). The study area is named after the Pedi King Sekhukhune, who succeeded King Sekwati (Ibid).

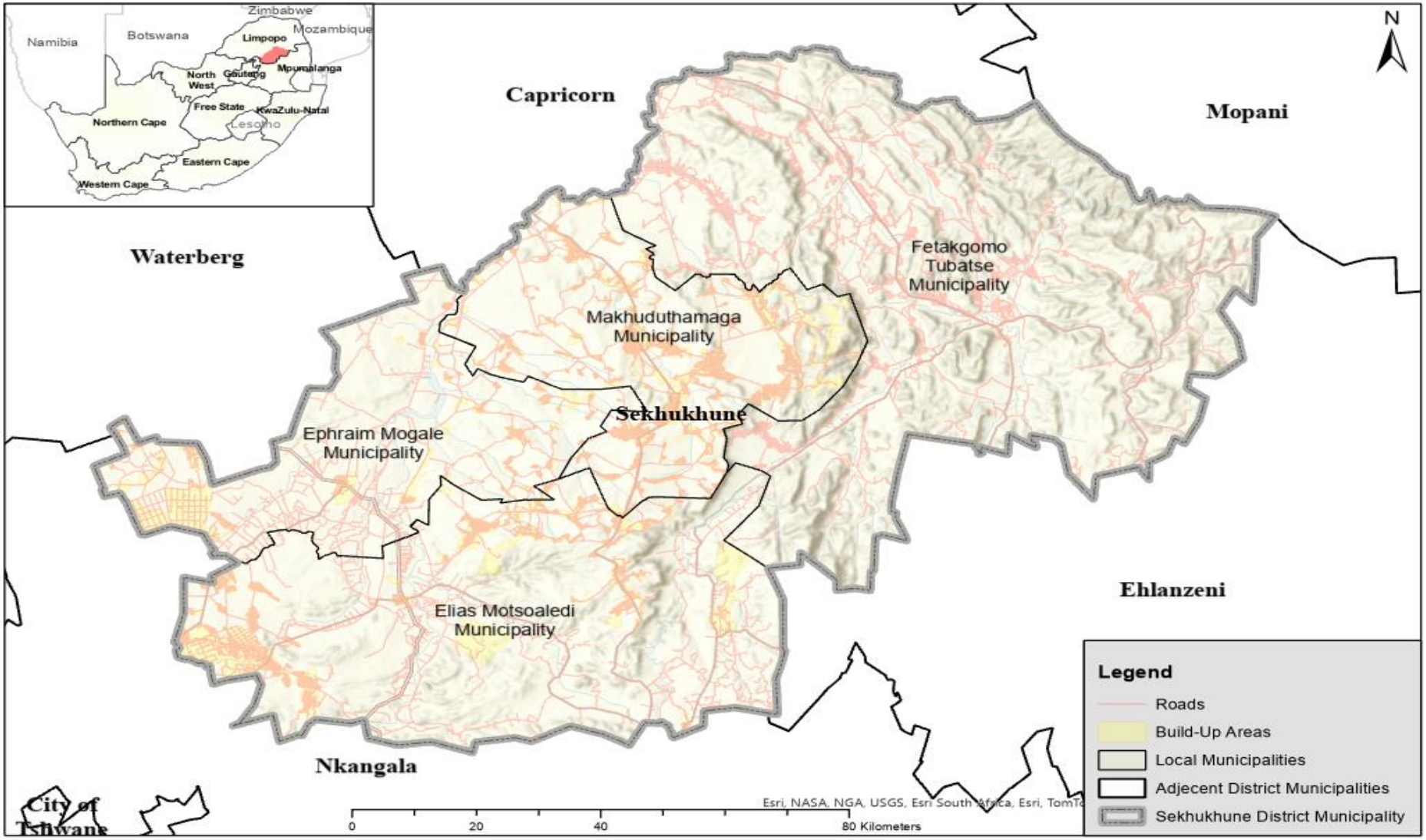



Figure 3. 1: Study area (Source: Student, 2023).

## 3.4 Data and study preparation

### 3.4.1 Datasets

The study relied on the following primary types of secondary data, which are critical to accessibility analysis. The necessary data for this study was sourced from various entities comprising of road network, Spot Building Count, location of clinics, population data, ward boundary, and district boundary. More information about each of these datasets is discussed in the subsequent paragraphs.

Road network.

A detailed road network was used. This was the road centreline data obtained from AfriGIS (2014) representing the potential routes people use to access clinics. This is the routable vector layer of the provincial and major roads and includes the detailed road centrelines of the study area. A road network was used because it considers the natural and built environment of the study area and can therefore accurately simulate how people would travel to a clinic rather than use a straight-line distance.

Spot Building Count.

The Spot Building Count (SBC) was obtained from Eskom (2017) and was used as a proxy layer for population distribution. The attribute table contained different building classes (e.g., dwellings, schools, mines, resorts, industrial, and commercial). Only dwellings were used because they are representative of residential areas.

Location of clinics

The locations of the relevant clinics were sourced in the form of spreadsheet from the Department of Health (2014). The spreadsheet contained the names of the clinics, the names of the settlements, and the associated geographical coordinates.

The spreadsheet was loaded into ArcGIS to plot the clinics based on the coordinates; it was then converted to a shapefile format and superimposed on the respective transport network, capacity of clinics, population data, ward boundaries, and the district boundary layers. The data was checked if there were additional clinics or not and coordinates were also verified.

Capacity of clinics

The Council for Scientific and Industrial Research (CSIR) (2009) had previously conducted a scientific study to determine the capacity of each clinic. The study was published in the CSIR Redbook (Department of Human Settlements, 2019).

Population data

Statistics South Africa (Stats SA) provided the 2011 census data. The census data for the SDMA and settlements within the 10-km buffered zone of the study area were used. The 2011 data were used because these statistics are the most recent official population data available, as the 2022 census data has yet to be released.

Ward boundaries

The ward boundaries were obtained from municipal demarcation board (2009) used in the analysis. The census data that came in the form of spreadsheets with ward ID as the unique identifier were linked to the ward boundaries by using ward unique identifiers (ID) as the primary keys. The 2009 ward boundaries were used because the researcher was required to use the 2011 census data as the official population data for South Africa to perform capacity analysis and they reflect the Census 2011

Questionnaires

The researcher developed the closed and ended questionnaires to be used to gather information on community perceptions regarding access to healthcare services

The district boundary

The district boundary was obtained from municipal demarcation board (2009) to analyse accessibility to clinics within the district. As shown in Figure 3.2, a 10-kilometer buffer zone was created around the SDMA boundary to accommodate those who live outside the district but are near to SDMA clinics using a road network. Parts of the road network that are not within the municipal jurisdiction but are used by persons traveling to various clinics in the SDMA were also included in the 10km zone.

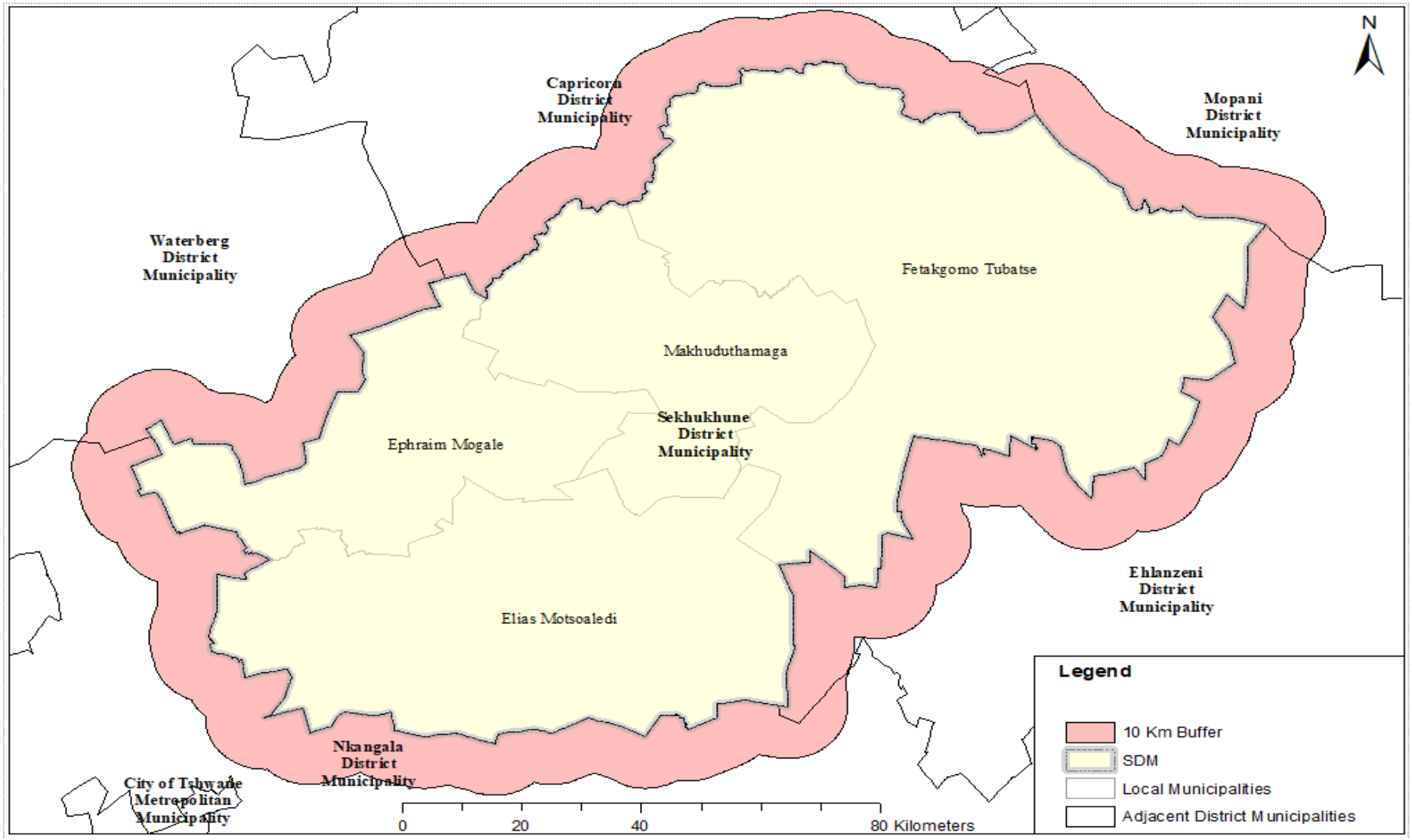



Figure 3. 2: 10km Buffer Zone

### 3.4.2 Software used

ESRI's ArcGIS Pro desktop version 3.0 and Flowmap version 7.4.2 were the primary software applications utilized. The primary use of the ArcGIS software was to create data for the study's analysis and to display the results. Flowmap was used to perform the accessibility analysis due to its capability to analyze and model catchment data for the study to be successful.

Flowmap system displays two sets of data concurrently: location and volume (Steiner, 2019). Flows of goods, persons, information, etc., are classified into three types: network, distribution, and radial flows (Nana, 2020).

In radial flow maps, features are mapped with one location serving as a common origin or destination (Buckley, 2011). In radial flow maps, the connection lines radiate from the origin node to single or multiple destinations (refer to Figure 3.3 (A)) (Ibid). As shown in Figure 3.3 (B & C), network maps are used to show the interconnectedness of locations based on transportation routes, whereas distribution maps depict the distribution of goods that spread from the point of origin to various destinations (Buckley, 2011). Because this study dealt with accessibility analyses of clinics by focusing on the distribution of healthcare services from the point of origin to the respective destinations, it used distribution maps.

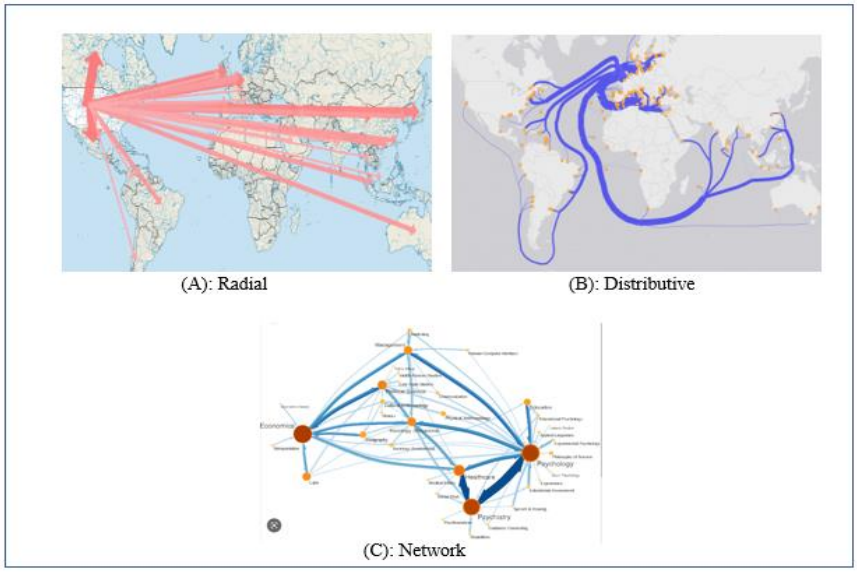



Figure 3. 3: Types of flows

Source: GISGeography, 2022

### 3.4.3 Hexagonal tessellation – Creating analysis units

Figure 3.4 shows the tessellation of the study area, including the 10km buffer area. The existing data such as main places (MP), sub-places (SP), small area level (SAL), and wards boundaries, vary greatly in sizes, making it less useful to perform accessibility analysis. To address the issue of size-distortion, smaller uniform zones had to be created. The process of creating a smaller regular region is referred to as tessellation, in which the entire research area including the buffered area was divided into hexagons of 20 hectares each. The tessellation depicted the surface area for analysing both demand and supply. Hexagons were seen as suitable for assessing accessibility due to their ability to provide more precise distance measurements than other types of tessellations with uniform shapes. They also enable more detailed outputs to be generated in specific locations compared to working with sub-places or wards.

Since the study area is large, with scattered settlement patterns and no scientific guidelines regarding the size of the hexagons for a given population or study area, a 20-hectare hexagon was deemed ideal to ensure equal allocations of inhabitants

accessing the respective clinics, as well as to reduce the computing time (De Jong & Van der Vaart, 2013). Hexagons were used in this study because the analysis included aspects of connectivity and movement paths, and they allow for better sampling point distribution (ESRI, 2022). Hexagons do not leave open spaces or overlaps as would be the case with circles. A tessellation consisting of 7894 units was created including the buffer zone and population information was then related to these hexagons for surface analysis.

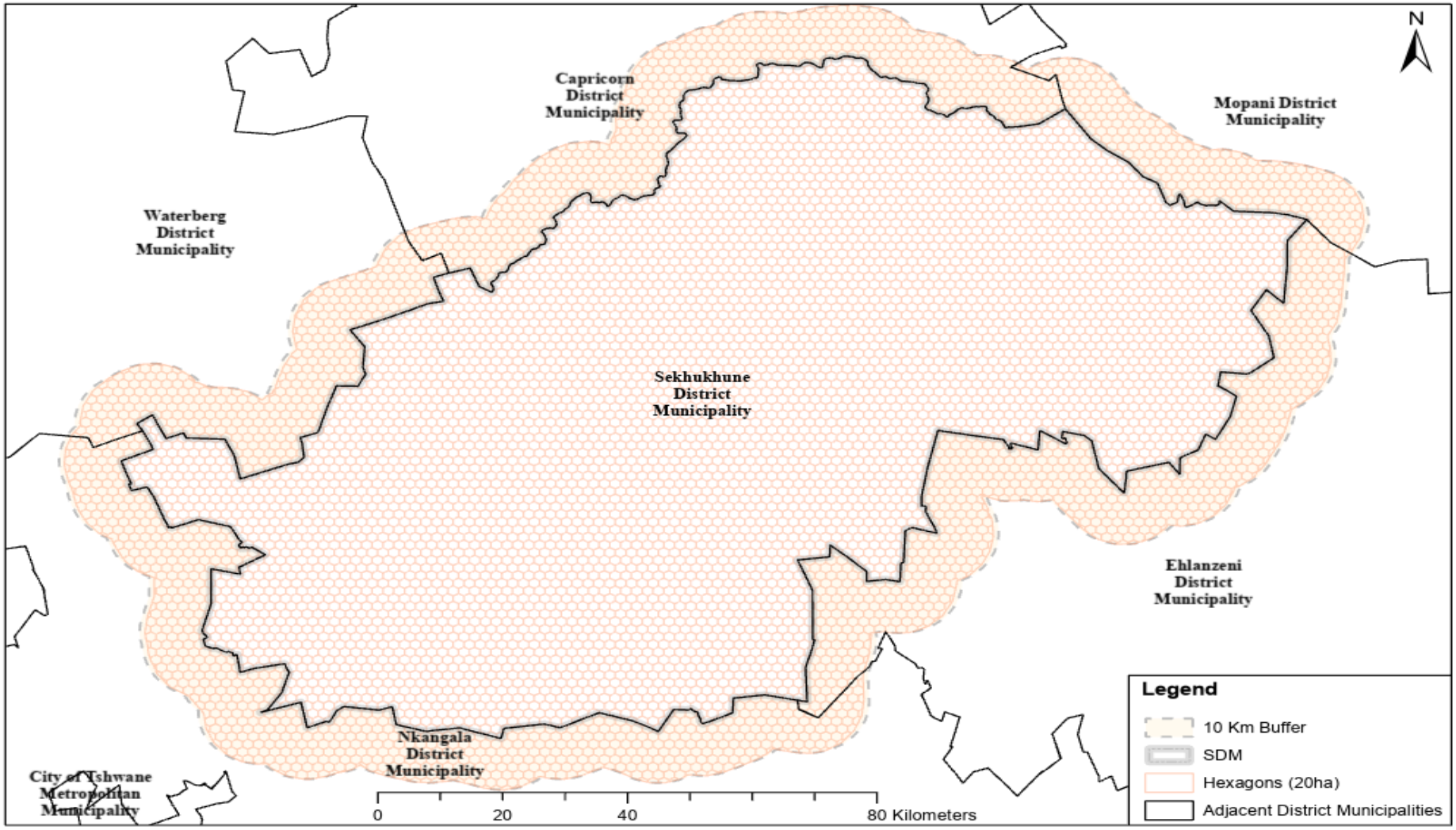



Figure 3. 4: Tessellation of the study area including the buffered zone

### 3.4.4 Adding demands to analysis units (Hexagons)

For accessibility analysis, demand is defined as the number of persons living in each analysis unit (Maritz et al., 2016). The method of assigning population information to units is based on the dasymatric mapping concept, which is defined as a process of depicting the underlying statistical surface by transforming data from the arbitrary zones of the aggregate dataset (Eicher and Brewer, 2001). The total population for SDMA as well as the buffered zones were used to calculate the demand for services. The procedure of assigning population information to the analysis units entails the following processes:

SBCs, ward boundaries, and hexagons were loaded into ArcMap to determine the number of people per hexagon. Each ward came with a unique ID from the Municipal Demarcation Board. Clip tool in ArcGIS Pro was used to clip the ward boundaries, SBCs, in the buffered zone of the study area and merged with those in SDMA. The hexagons were joined to the SBC-points by using the ArcGIS Pro spatial join tool. The number of SBC points per hexagon was then counted using the hexagon's unique identification number. To consider the SBC as a representation of population distribution, a weight was calculated for each SBC. This signifies the impact that each SBC point has on the overall population. Population statistics from Stats SA (2011) in the form of a spreadsheet were loaded into ArcMap and linked with the ward shapefile using the ward ID.

A new shapefile was then created from the linked data and extracted to Microsoft Excel. The weight was determined by dividing the population of each ward by the total SBC points to determine the number of health consumers per hexagon. This assumed an equal distribution of the number of people per SBC, which may not be true. In Excel, the number of people per SBC was multiplied by the total number of SBCs in each hexagon to determine the total population per hexagon. The same Excel spreadsheet was then linked to a hexagon spatial layer in ArcMap

by using a unique ID.  A new spatial layer containing the number of healthcare consumers per hexagon could then be created.

## 3.5 Methodology to achieve the research objectives.

### 3.5.1 Methodology to achieve objectives 1 and 2.

The following methodologies were established to achieve the research objectives, as discussed in Chapter 1.

Objective 1: To determine the requirements for equal access to clinics in accordance with the norms and standards of the Department of Health.

The aim of this objective was to determine the parameters established to achieve equity in access to healthcare services. Research was done on several studies that were conducted regarding the population threshold and the capacity per clinic to achieve equity in access to healthcare services. The norms and standards as set out by the department of health were also assessed. This research followed the CSIR's criteria, which was appointed by the department of Human Settlement to determine the capacity and population threshold for different healthcare facilities to achieve equity in access to healthcare services and to justify the existing and proposed new locations of clinic(s).

Objective 2: To determine the current distribution of clinics and measure them against the prevailing norms and standards as set by the Department of Health.

The purpose of this objective was to determine and obtain various datasets central to this study. The current distribution of clinics was measured against the norms and standards and not all healthcare facilities. Data had to be verified to maintain accuracy and to reduce the possibility of human and instrument errors. Flowmap system was used to perform a catchment area analysis to determine accessibility in access to healthcare facilities. A constraint catchment area analysis was done to reflect a more realistic accessibility analysis. In the catchment area analysis,

two constraints were applied, which was the travel distance and capacity for each clinic. Using the catchment area analysis, the acceptable access distance was set to 10km, and the capacity constraint was set to 10 000 people per clinic as prescribed by the CSIR (2009).

The catchment area analysis was done by calculating the travel distance from the demand (population) to the nearest supply (clinic). The process allocated all areas of the study area to the nearest facility using a road network approach, thereby creating a catchment area for each facility. The accessibility analysis ended when the clinic reached its capacity or when a travel distance of 10km was reached. After performing the constraint catchment area, the following 3 stages were performed:

Stage 1: The outcomes were analysed to determine equity in access to healthcare and were compared to the DoH norms and standards for equal access to clinics.

Stage 2: Entailed analysing the results of Stages 1 to determine ─ based on the clinic's capacity ─ which hexagon populations are served or not served by a clinic.

Stage 3: Was concerned with mapping the results of Stages 2, depicting areas that are served by a clinic and areas that are unserved.

3.5.2 Methodology to achieve objective 3.

Objective 3: To propose appropriate locations for new clinics to improve accessibility and ranking them for implementation. The methodology for achieving Objective 3 entailed identifying unserved areas based on the results of the analysis performed for Objective 2 and proposed new clinic locations using

Flowmap software. Unserved areas and remaining demand were used to identify the possibility of constructing additional new clinics to enhance accessibility.

The expansion analysis was performed in Flowmap using unserved data. The expansion model only considered the distance to clinics and not their capacity. The system placed a new clinic every 10km regardless of capacity constraints. A constraint catchment area analysis was repeated using unserved population as origin and proposed clinics as destination to identify potential locations for additional clinics based on a 10km travel distance and a 10 000 population threshold.

### 3.5.3 Methodology to achieve objective 4.

Objective 4: To assess the community's perceptions of the dynamics of healthcare accessibility.

To achieve the fourth objective, probability sampling was used for this study. Probability sampling ensures that the results of the study can be generalised in respect of the target population, which means that everyone in the population has an equal chance of being selected (Acharya et al., 2013). Probability sampling is further classified as simple random sampling, systematic random sampling, stratified random sampling, multiphase sampling, cluster sampling, and multistage sampling (Ibid). Since this study used many respondents, the random sampling method was used. The random sampling method allows for randomisation in the sample selection process and the results can be applied to the entire population (Rahman et al, 2022).

Slovin's formula was used to determine the total number of participants for this study. It used population of 1 076 840 for SDMA (SDM IDP, 2020), a 95% confidence level, and a +/- 5% confidence interval (margin of error).

$$n = \frac{N}{1 + Ne2}$$

Where:

n = sample size

N = total population

e = error tolerance (level)

Therefore:

$$n = \frac{N}{1 + Ne^2}$$

$$= \frac{1076\,840}{1 + 1076\,840\ (0.5^2)}$$

$$= \frac{1076\,840}{1 + 1076\,840\ (0.0025)}$$

$$= \frac{1076\,840}{1 + 2692.1}$$

$$= \frac{1076\,840}{2693.1}$$

= 400

This study required 400 people over the age of 18 to be interviewed as research participants while visiting a clinic or a healthcare facility convenient to them. The participants were split evenly between the four local municipalities.

Questionnaires were distributed to determine the responses of the research participants and thus the community perspectives on the accessibility of clinics. Community perspectives were classified based on the patients' needs and

accessibility assessments, as well as the current distribution of clinics in the municipal area, in accordance with the Department of Health norms and standards. A needs analysis was then conducted to develop accessibility criteria that would assist in the delivery of services.

As mentioned, the data for the needs analysis were collected from the responses to the structured questionnaires, which included both closed and open-ended questions (refer to Appendix A). The open-ended questions allowed for the researcher to pitch unrestricted questions and participants could provide additional information not covered by the questionnaire. Participant leaflet was given to potential participants detailing the processes and procedures of the study to answer any further questions to allow them to give informed consent (refer to Appendix B). Each questionnaire included an informed consent form (refer to Appendix C), which was signed by the researcher and the participant.

The questionnaires were divided into three sections: Section A consisted of seven questions and collected personal information supplied by the participants. Section B included eight questions on measures of access to care, such as travel distance, mode of transport, convenience of the clinic, and the need for a new clinic. Section C included questions regarding affordability of travel (or having access to a clinic) ─ e.g., transport costs.

The data gleaned from the closed-ended questions were organised and analysed using Microsoft Excel. Descriptive statistics were used to analyse the data. The processed data were then presented in frequency tables, especially created for that purpose, and from there, extracted and presented in the form of pie charts and bar graphs. The researcher used quantitative content analysis to quantify the characteristics and concepts that emerged from the open-ended questions.

The survey took place from June to November 2022, targeting individuals over 18 residing in SDMA. The sample population studied were the healthcare

consumers using clinics. The research participants were split evenly among the four local municipalities. Subjects were recruited from different clinics with no geographical preferences.

The procedures and safety precautions described in the South African COVID-19 regulations were followed by the researcher. Both the researcher and the volunteers complied with the regulations regarding social distancing and the wearing of masks and sanitised frequently.

## 3.6 Reliability and validity

### 3.6.1 Reliability

Reliability and validity are the most important and essential criteria for evaluating any measuring instrument for effective study (Mohajan, 2017). Even though reliability and validity have different meanings, they are closely connected (Ahmed and Ishtiaq, 2021).

Reliability refers to the degree to which an analytical measure produces the same numerical value or the same results each time it is administered, while the object being measured remains constant (Frost et al., 2007). The primary concern in respect of reliability is measurement error, that is, how well a measuring instrument measures what it is supposed to measure (McDowel and Newell, 1996). Reliability can also be ensured by minimising the error sources around measurement (e.g., data collection bias) (OpenLearn Create, 2017). Bias in data collection implies a deviation from the truth in gathering and analysing data, interpreting the results, and publishing the resultant information. Bias can be intentional or inadvertent (Simundic, 2013). Researchers should be aware of all potential causes of bias and make serious attempts to minimise deviation from the truth (Ibid).

The completed questionnaires revealed consistency in the responses given by the respondents. The researcher was the only one who administered the questionnaires and standardised the conditions around the interviews by showing the same personal interest in all the respondents. As such, friendliness and support helped to reduce data collection bias. Furthermore, the physical and psychological environment was conducive to the collection of data because privacy, physical comfort, and confidentiality were maintained. Participants were advised not to write their names on the questionnaires to ensure confidentiality.

### 3.6.2 Validity

The extent to which a notion is accurately evaluated in quantitative research is referred to as its validity (Heale and Twycross, 2015). For example, a study which aims to explore depression, but analyses anxiety instead, would not be deemed valid (Ibid). The validity refers to how well the findings among study participants correspond to true findings among similar individuals outside of the study (Patino and Ferreira, 2018). Content validity assesses how well an instrument (such as a test) covers all relevant aspects of the construct being measured (Ibid). In addition, once a measuring instrument has been shown to be dependable over time, it should be examined to determine whether it reliably measures what we want it to measure (Bannigan and Watson, 2009). The interpretation and significance of the findings issuing from an instrument are critical to its validity (Ibid).

To ensure content validity, the questionnaires included a variety of questions about patients' access to clinics. Questionnaires were based on information gathered during the literature review to ensure that they would represent what patients know about the accessibility of clinics. The consistency with which the questionnaires were administered added to the content validity. The researcher personally distributed all questionnaires to the participants. The questions were written in simple language to ensure clarity and comprehension. The participants

were given clear instructions, and the researcher completed the questionnaires for those who couldn't read or write. The questionnaires were completed by all subjects in the presence of the researcher to prevent participants from delegating others to complete the questionnaire on their behalf. Some questions were rephrased for clarity and more appropriate alternative response options were added to the closed-ended questions to allow for meaningful data analysis.

External validity is the extent to which inferences obtained from a given study's sample are generalised to a larger population or other target populations (Findley et al., 2021). The questionnaires were completed by whoever had been approached to participate in the study. No one who was approached declined to take part and generalising the findings to all members of the population was justified. It should be noted that finding participants willing to participate in a study can be difficult, especially if the study makes significant demands on time or other types of investment from them. Should the number of people approached to participate in a study be limited, it would then be difficult to justify the generalisation of the findings to all members of the population.

Another issue to point out is that the number of people who were approached but refused to participate should be reported to assess external validity threats.

## 3.7 Research limitations and delimitations

### 3.7.1 Limitations

Time and cost constraints determined the efficiency of the data collection methods (e.g., distribution of questionnaires). The second limitation was data quality. The quality of the data needed to be verified as the researcher could not guarantee the accuracy of the information gleaned from data collected from a variety of sources. The third constraint was that the results from a small group drawn from the general population were compared to an equivalent set of individuals from the general population.

The fourth limitation was the lack of honesty that might have presented in some of the participants in completing the questionnaires: they might not have been truthful in their answers, thus affecting the study results. The fifth constraint embraced the incorrect assumptions made regarding population distribution throughout the four local municipalities. Finally, the sample was drawn from people using SDMA's clinics; therefore, the results of this study cannot be extrapolated to other districts in Limpopo Province.

### 3.7.2 Delimitations

The study was limited to clinics in the SDMA, Limpopo Province, South Africa. Only clinic users of the age of 18 and older were targeted. The study focused on clinics and not all healthcare facilities as this is the entry point into the healthcare system.

## 3.8 Ethical considerations (2020/CAES_HREC/073)

Conducting a study necessitates not only due diligence and expertise, but also integrity and honesty to recognise and protect participants' rights. To complete the study in an ethical manner, confidentiality, self-determination, anonymity, and informed consent must be addressed.

The researcher received ethical approval from the University of South Africa (refer to Appendix D). This study was conducted in accordance with the guidelines for ethical and professional conduct established by UNISA’s Ethics Committee. The DoH Research Committee gave permission for the researcher to continue with the study (refer to Appendix E).

The purpose of the study was explained to each participant. All participants were advised that their information would be kept strictly confidential and that they would remain anonymous. Personal data and the names of the institutions would

also be treated confidentially. Respondents were also informed that they could opt out of the survey at any time should they feel uncomfortable.

The participants were informed about the purpose of the study, the procedures to be followed to collect the data and that there would be no risks or costs associated with the study. Confidentiality and anonymity were maintained throughout the study. Anonymity was maintained by not revealing the participants' names on the questionnaires and by separating the written consent form from the questionnaires.

Confidentiality ensures participants that their information will not be reported publicly, in a way that would reveal their identity. Confidentiality was maintained in this study by keeping the data collected confidential and not revealing identities when reporting or publishing the results.

Furthermore, the ethical principle of self-determination was upheld by informing participants about the research and allowing them to voluntarily choose whether to participate or not. The researcher’s contact details were shared with the participants should they require further clarity on the research study, need to report their complaints, or question other related issues.

In conducting research, scientific honesty is regarded as a critical ethical responsibility. It is indeed a fact that manipulation in respect of the research design, methods, and data retention are examples of dishonest behaviour (Jacobsen et al., 2018). Apart from ensuring the integrity of his approach and actions in all areas of the research, analysis and presentation of his findings, the researcher also avoided any form of dishonesty by accurately recording the responses of the participants who could not read or write. The survey was conducted in accordance with the guidelines set by the South African COVID-19 Committee.

## 3.9 Summary

This chapter focused on the methods used to conduct the research. Research paradigms were discussed. The positivist research paradigm was considered the appropriate one for this study as it deals with the measurements (data) emanating from observation or actions. The proposed methods and approaches were in line with the quantitative research paradigm. A discussion was presented on the methodology to support this approach and how these methods were adapted to meet the project requirements, the sampling method, data analysis and the statistical approach to be used. The concepts, reliability, and validity were also discussed, in terms of the effectiveness of the measurement instruments used in research to accurately record details about the relevant aspects under investigation. Reliability and validity are concerned with the consistency and accuracy of the measuring instruments used in a research study. Also discussed were the ethical considerations that in this research study dealt with the guidelines of the research pertaining to the research design and procedures, anonymity, confidentiality, informed consent, and voluntary participation. The following chapter presents a discussion on the analysis and interpretation of the data central to this research.

# CHAPTER 4: RESULTS AND DISCUSSIONS

## 4.1 Introduction

This chapter includes the analysis, interpretation, and presentation of the results of this research study, for which a detailed methodology, outlining the process towards these ends was presented in Chapter 3. The aim of this study was to evaluate the accessibility of clinics in the Sekhukhune District Municipal Area, which is largely characterized by its mountainous terrain.

Chapter 4 presents the analysis and interpretation of the data by differentiating these processes into three phases. The first phase discusses the spatial analysis applied by focusing on the geographical distribution of clinics and their accessibility. The first phase intended to calculate the travel distance from people's homes to the nearest clinic using a road network to evaluate equity in access to healthcare.

The second phase is based on the results of questionnaires and deals with quantitative analysis. The phase intended to collect information from communities about access to healthcare. The information gathered aided in evaluating community needs and attitudes toward access to healthcare services.

The third phase involves a comparison of the findings of the spatial analysis against the results of the questionnaires to evaluate access to healthcare services. The comparisons allowed for reflection and examination of healthcare systems pertaining to accessibility in SDMA.

The research objectives were combined by calculating accessibility based on objective 1 highlighting population thresholds and capacity per clinics using the current distribution of clinics (objective 2) and proposing the new locations of clinics (objective 3) based on the results of accessibility analysis (objective 3) and

community views (objective 4). The results are discussed in this chapter and presented as a follow-up on this three-phased approach.

## 4.2 Phase One: Spatial analysis

Although a framework for data analysis was discussed in Chapter 3, Table 4.1 summarizes the processes and criteria used to perform the analysis, as discussed in Chapter 3, Section 3.4.

Table 4. 1: Processes of clinic accessibility analysis

| | |
|---|---|
| Description | The clinics used in this study are those that provide PHC services and act as the first point of contact. Each clinic has its own unique capacity. |
| Clinics | 85 permanent clinics, including community health centres |
| Demand | Persons not assigned to any clinic |
| Supply | Each clinic has its own unique capacity, as used in the analysis. |
| Travel distance and access | Transport via a road network and a travel distance of 10km to the clinic was used in the analysis based on the scientific study conducted by the CSIR (2009). |
| Analysis | Measuring access to clinics and comparing the unallocated demand to the allocated population |

The findings discussed the general accessibility of clinics to the entire population of the SMDA, considering the capacity of the clinics and the travel distance

involved and the proposals for new clinics to support the existing clinics and thus to improve access to health care.

The results, in line with the research objectives, are discussed below.

### 4.2.1 Objective 1: To determine the requirements for equal access to clinics in accordance with the DoH's norms and standards.

The Constitution of South Africa grants every citizen the right to access medical care (The Constitution of the Republic of South Africa, 1996). The DoH norms and standards state that citizens should not travel more than 5km to access health care and that the catchment area should have 5 000 residents to justify a clinic (National Health Act, 2003).

A scientific study was conducted by the Council for Scientific and Industrial Research (CSIR) on accessibility (Department of Human Settlements, 2019). According to the study, a typical population threshold to justify a clinic should be between 5 000 and 60 000 people residing in an area, and the ideal maximum access distance should be 10km.

A study by Green and Argue (2016) provided guidelines for the provision of health services, particularly in rural areas. In their study, the authors point out that a population threshold that warrants a clinic in a rural area must allow for it to treat 5 000 to 10 000 residents. This study used a population threshold of 10 000 inhabitants and a maximum access distance by road of 10km by road. These parameters are also in line with the scientific research conducted by the CSIR on equal access to healthcare services. Furthermore, the study sheds light on the classification of catchment area sizes and settlement types for PHC service delivery (Department of Human Settlements, 2019).

The focus of the CSIR study was to provide guidance on the provision of housing and social facilities to assist decision-makers in determining the type and extent

of services to be provided and in selecting the most appropriate service, based on the context of the proposed development. The CSIR study focused on South African settlements, regardless of the settlement patterns and topography of the area. Even though the standard accessibility norms will be used in this study, the mountainous terrain and scattered settlement patterns will influence the distribution of and accessibility to the clinics.

### 4.2.2 Objective 2: To determine the current distribution of clinics and measure them against the DoH norms and standards.

The objective focused on the spatial distribution of clinics in relation to the DoH's norms and standards to determine equity of access to health care. Figure 4.1 shows the travel distances by road for the respective populations closest to the nearest clinic irrespective of clinic size or service capacity. The term "travel distances" with regards to the modelling refers to distance travelled by road network. The map shows the distance, using a road network, from the place of residence to the nearest clinic, with the respective distances differentiated into different classes.

The distance travelled is displayed in km and in distinct colour bands with different gradations. According to the map (refer to Figure 4.1), areas south of the Fetakgomo Tubatse and Elias Motsoaledi municipalities and areas north of the Ephraim Mogale Municipality are marked by people travelling more than 12km by road to reach a clinic. The areas shaded in white are unpopulated or mountainous areas. The map shows that healthcare seekers travelling over 12km to access healthcare services dominate the area.

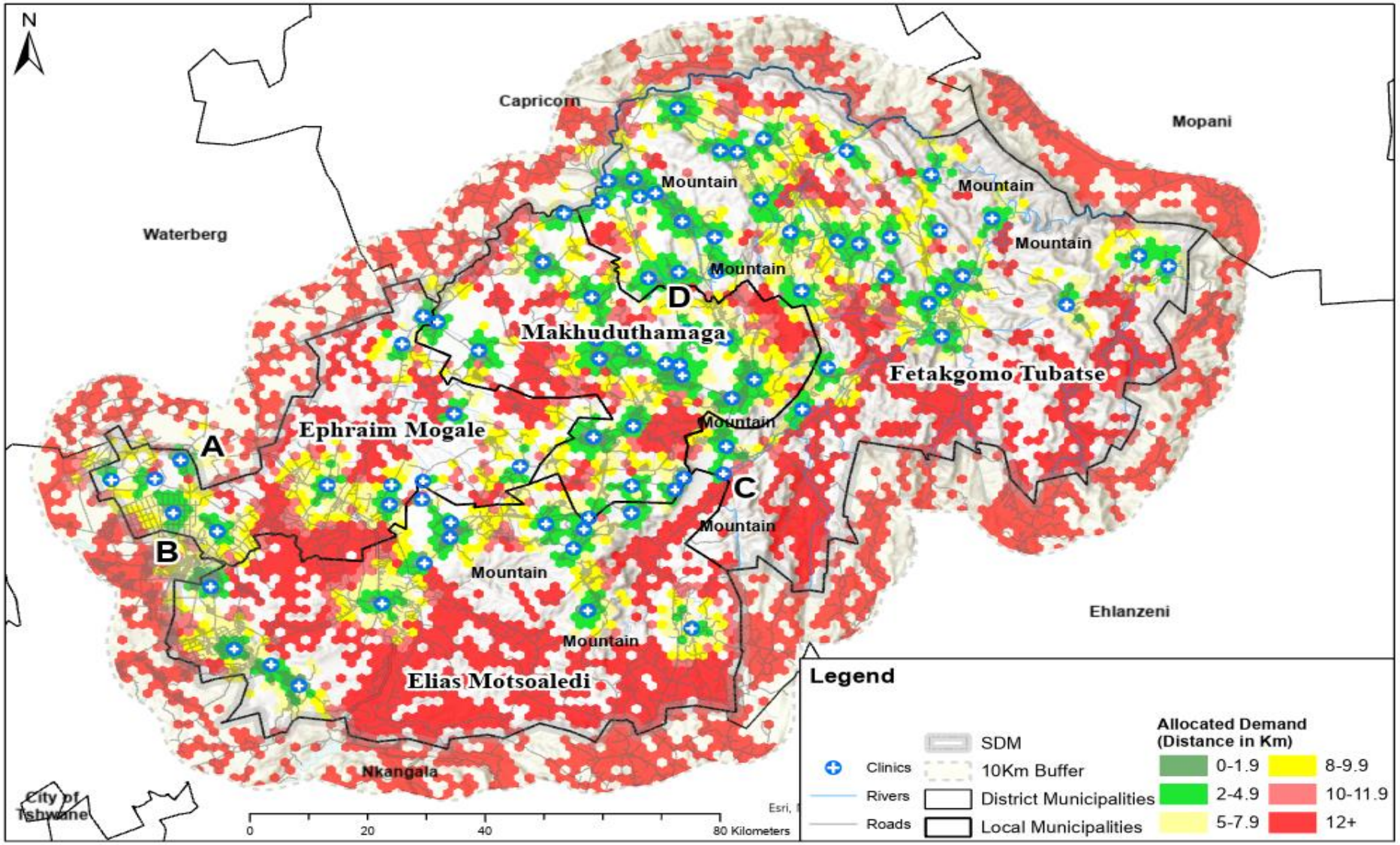



Figure 4. 1: Travel distance to the nearest clinic using a road network.

Table 4.2 presents a summary of the occupied area and as indicated in Figure 4.1, the population numbers, and percentages relative to the respective allocations to the nearest clinic.

Table 4. 2: Travel distance to clinics using the road network (SDMA and buffered zone)

| Travel distance(km) | Population | Percentage | Extent (square km) |
|---|---|---|---|
| 0 - 4.9 | 429 046 | 31 | 1,958.94 |
| 5 - 9.9 | 199 306 | 14 | 2,605.87 |
| 10 + | 761 968 | 55 | 7,076.87 |
| Vacant area | No population | 0 | 8,255.50 |
| **TOTAL** | **1390320** | **100** | **19,897.18** |

Table 4.2 shows the respective travel distances to the respective clinic locations, the number of people served, also expressed as percentages, and the area in which people reside. The calculations, as presented in Table 4.2, consider the buffered zone of the study area. According to Table 4.2, more people (55%) travel more than 10km to the nearest clinic, 31% between 0 to 4.9km, and 14% between 5 and 9.9km. Table 4.2 shows the population figures and the area occupied by healthcare seekers, but all in the context of access to clinics. A matter of concern is that the population travelling 10km or further to the nearest clinic and from the largest area (7000 square kilometres) amounts to 55% of the population of that area (almost 770 000 people). Unpopulated areas, where there are no people,

(and therefore, where no clinics are needed) occupy an area of 8000 square kilometres (refer to Table 4.2 for exact figures).

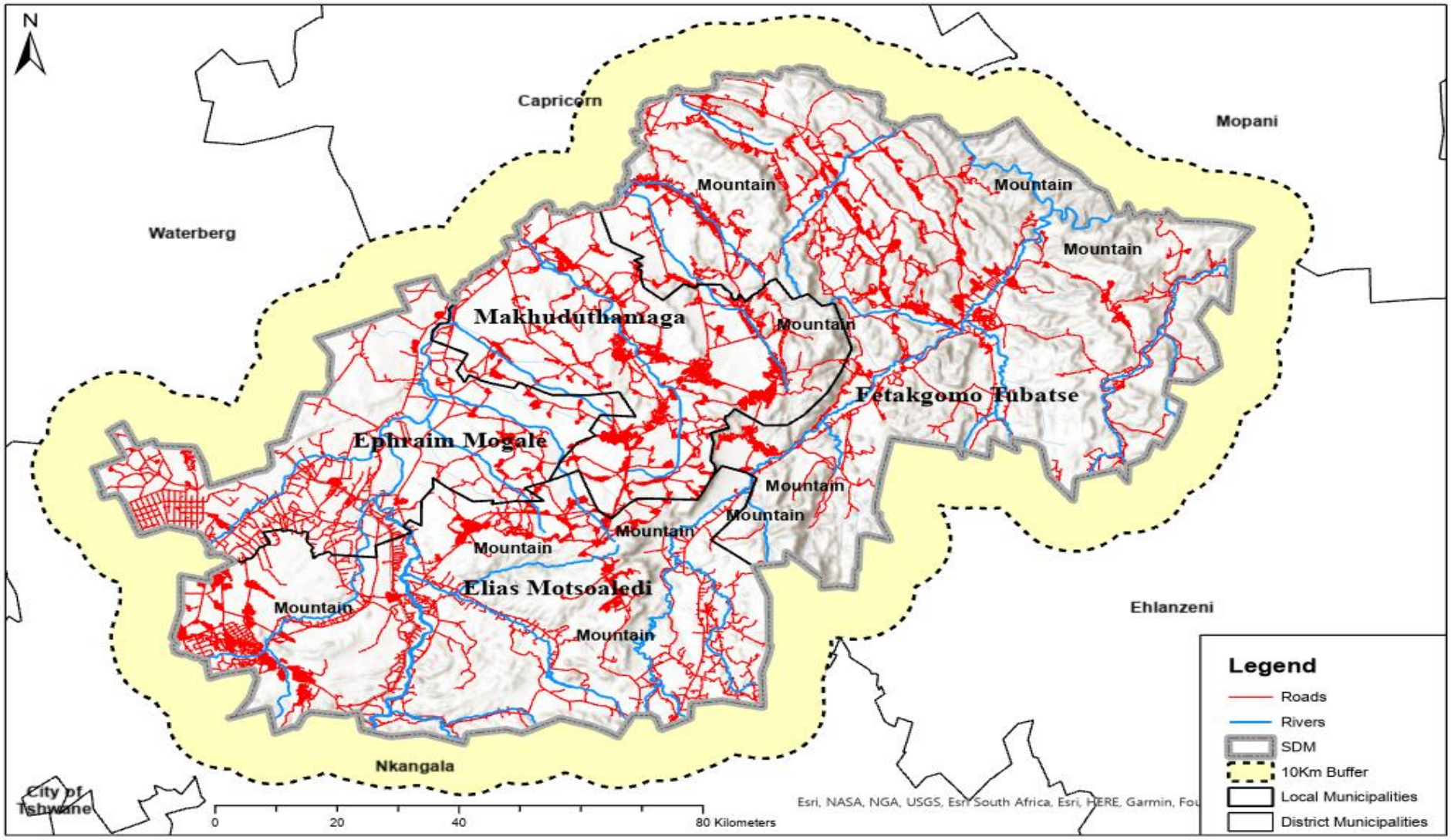



Figure 4. 2: Roads, rivers, and mountains in SDMA

Residents in the area marked A in Figure 4.3 were extracted and zoomed in from Figure 4.1. They reside in the Waterberg District Municipal Area, north of SDMA travelling 2 to 5km to visit clinic in SDMA. Residents in the area marked B were also extracted and zoomed in from Figure 4.1. They reside in the Nkangala District Municipal Area. The accessibility analysis shows that the distance to the nearest clinic, which is in SDMA, is between 5 and 8km. The travel direction using a road network from Waterberg (area marked A) and Nkangala (area marked B), district municipalities to clinics in SDMA is shown in the form of arrows. This supports the notion that people living outside the SDMA may use SDMA clinics because they are closer to them (refer to Chapter 3, Section 3.4.1.1).

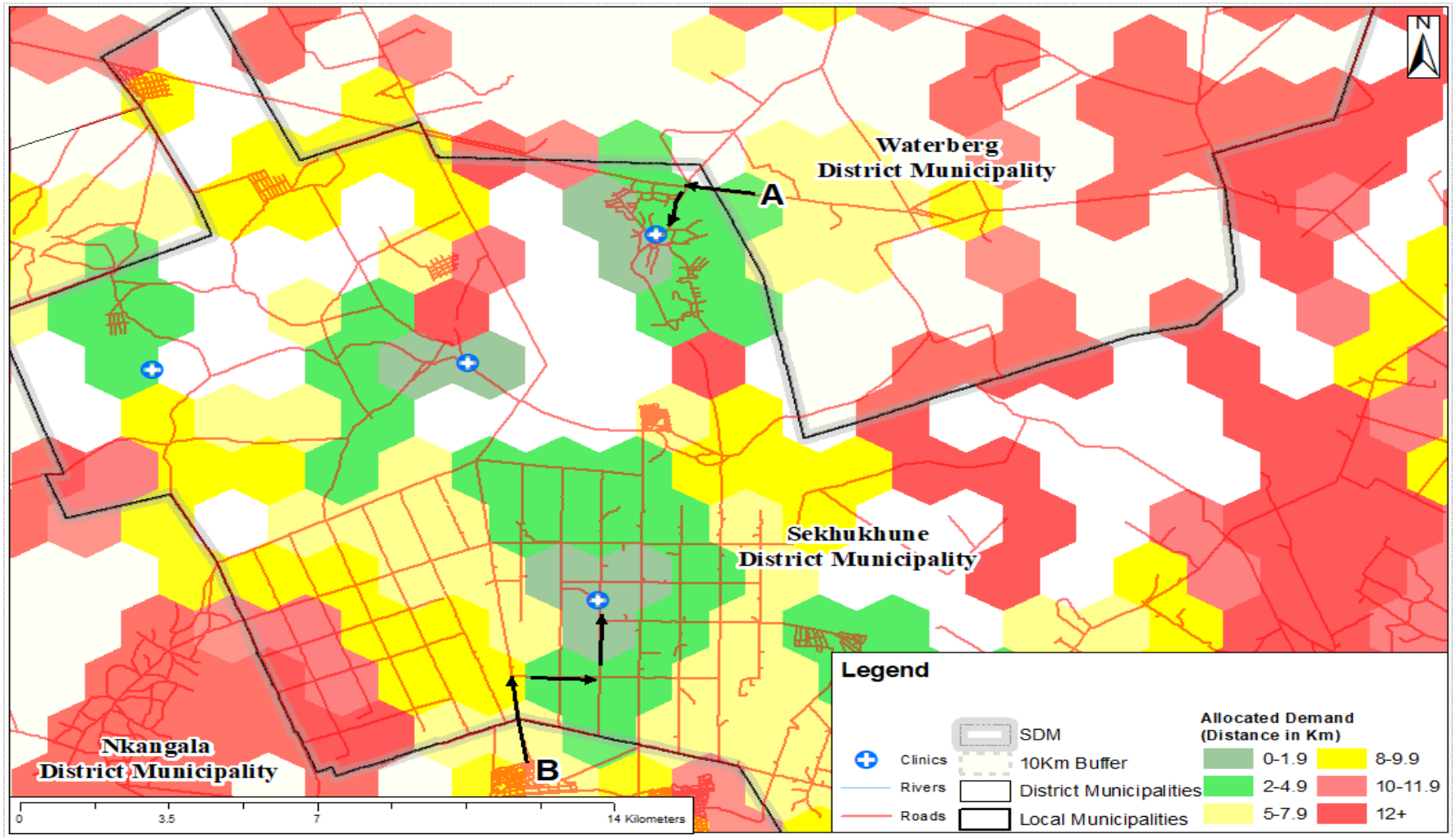



Figure 4. 3: Different travel scenarios using a road network (areas marked A and B)

The residents in the area marked C, as shown in Figure 4.4, were extracted, and zoomed in from Figure 4.1. They live near the clinic. However, as can be seen on the map, the river acts as a barrier to their movements. They must head northeast, turn left onto the D2219 road, and cross the river to access a clinic in Ga-Masha Village. These factors increase their travel distance. The flow direction of the clinic users is shown in the form of arrows. The analysis shows that people must travel more than 10km to access health care even though the clinic at Maseven is closer.

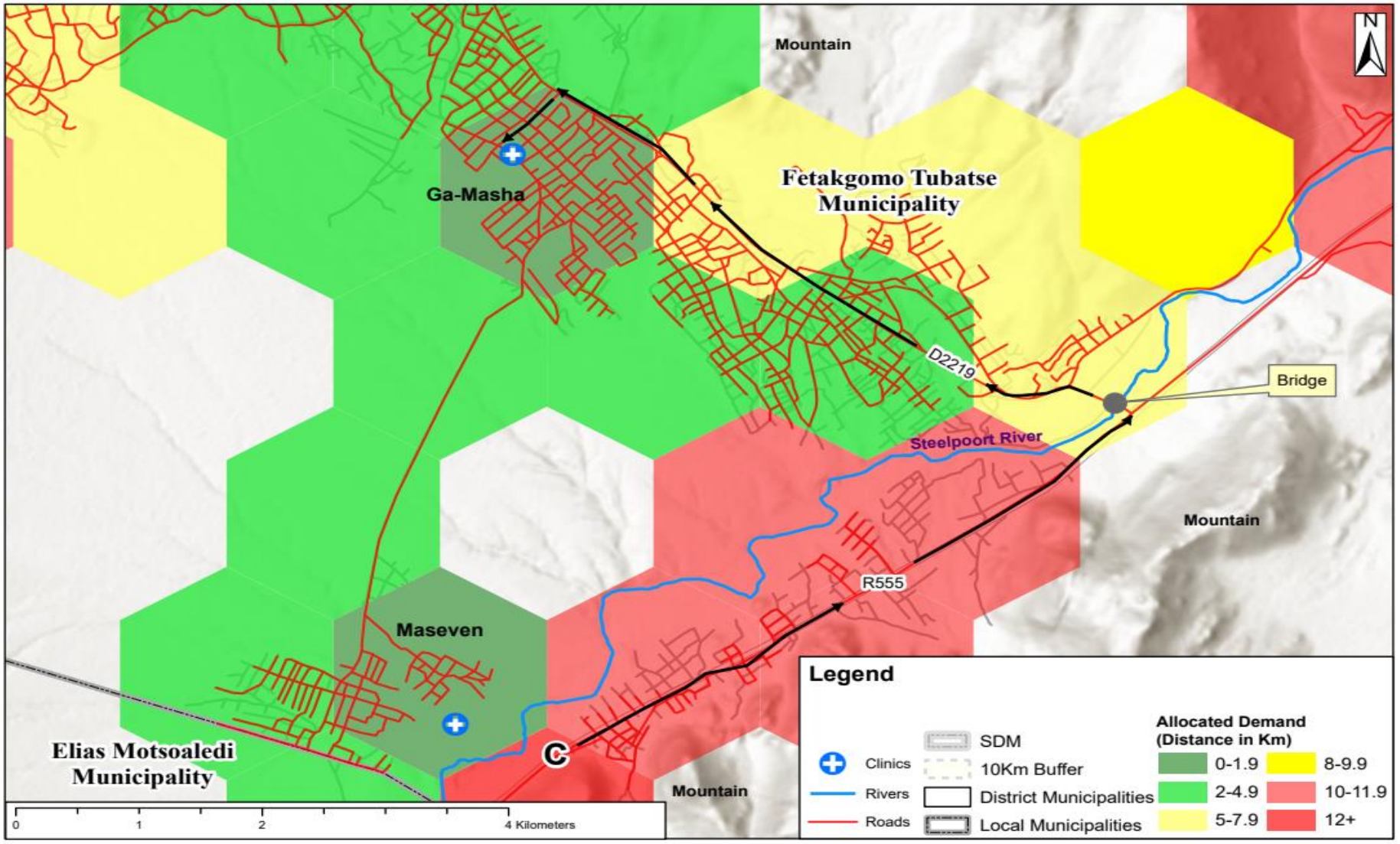



Figure 4. 4: Different travel scenarios using a road network (area marked C).

The residents in the area labeled D in Figure 4.5, were also extracted, and zoomed in from Figure 4.1. Because of the mountains in their vicinity, they must travel more than 10km to seek medical care. Using the road network, they must drive around the mountain, which increases the travel distance. As indicated by the arrows in Figure 4.5, they must head southeast and turn left northbound, or right westbound, and travel north after circumnavigating the mountain to access their nearest clinic.

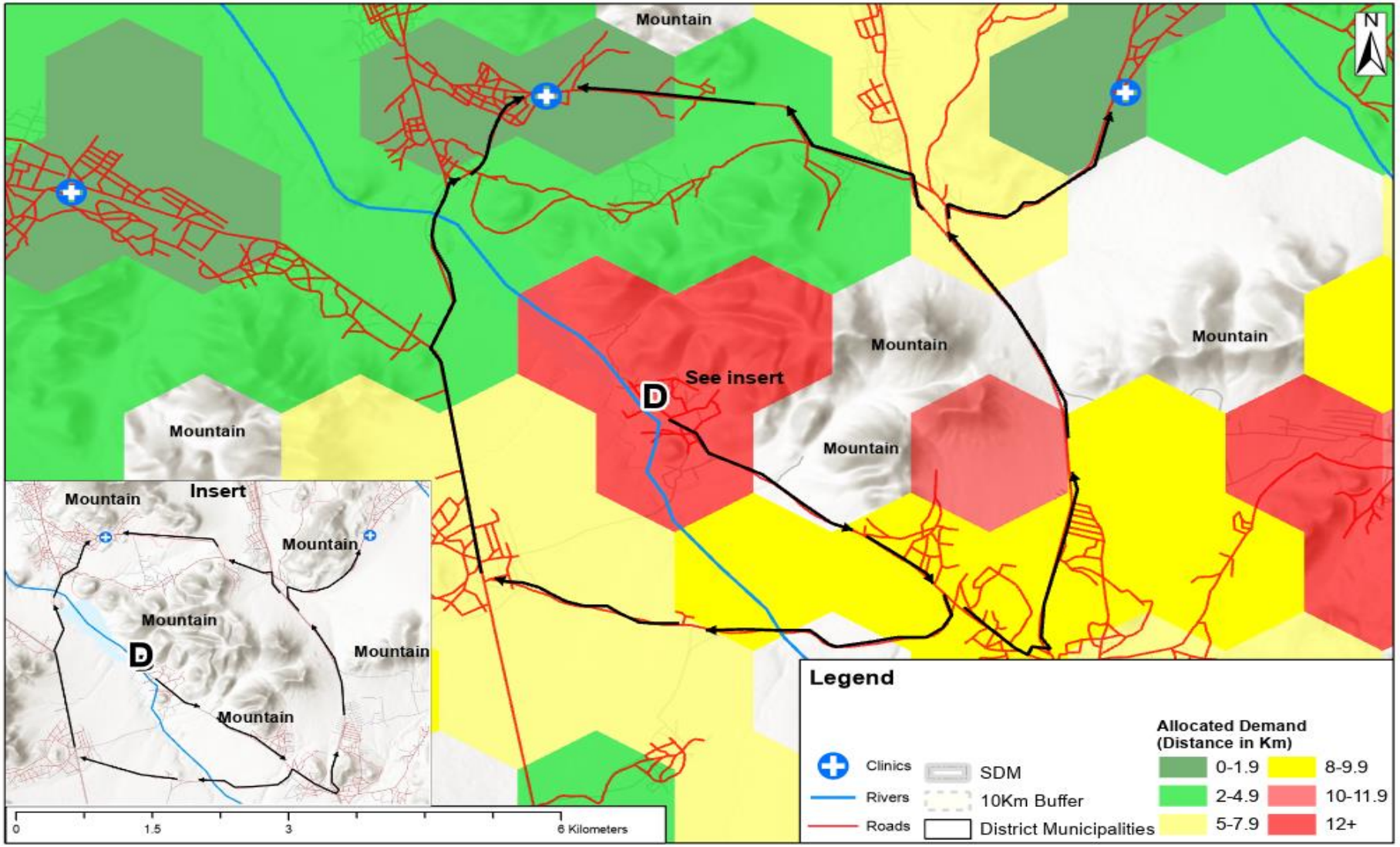



Figure 4. 5: Different travel scenarios using the road network (area marked D).

Figure 4.6 shows the catchment area when using a road network. This is irrespective of the respective travel distances to the clinics and the capacity of the clinics. Even if a clinic has unlimited capacity and no distance measure is considered, the entire population of that area would still be allocated to the nearest clinic. The area occupied by the allocated number of people to the available clinics is 8000 square kilometres, with a total population of 1 076 840 inhabitants. Unpopulated areas account for 5 000 square kilometres of land (refer to Table 4.3 for the exact numbers). However, owing to the uneven distribution of the population and of clinics, these calculations do not mean that the clinical services will be adequate and equitable as some clinics will be overwhelmed with patients, and the quality of their services affected.

Table 4. 3: Catchment area, using the road network, but independent of travel distance to a clinic and the capacity of the clinic.

| Allocation to clinics | Population | Extent (square km) |
|---|---|---|
| Allocated | 1076840 | 8,525.29 |
| No Population | 0 | 5,002.44 |
| **TOTAL** | **1076840** | **13 527.73** |

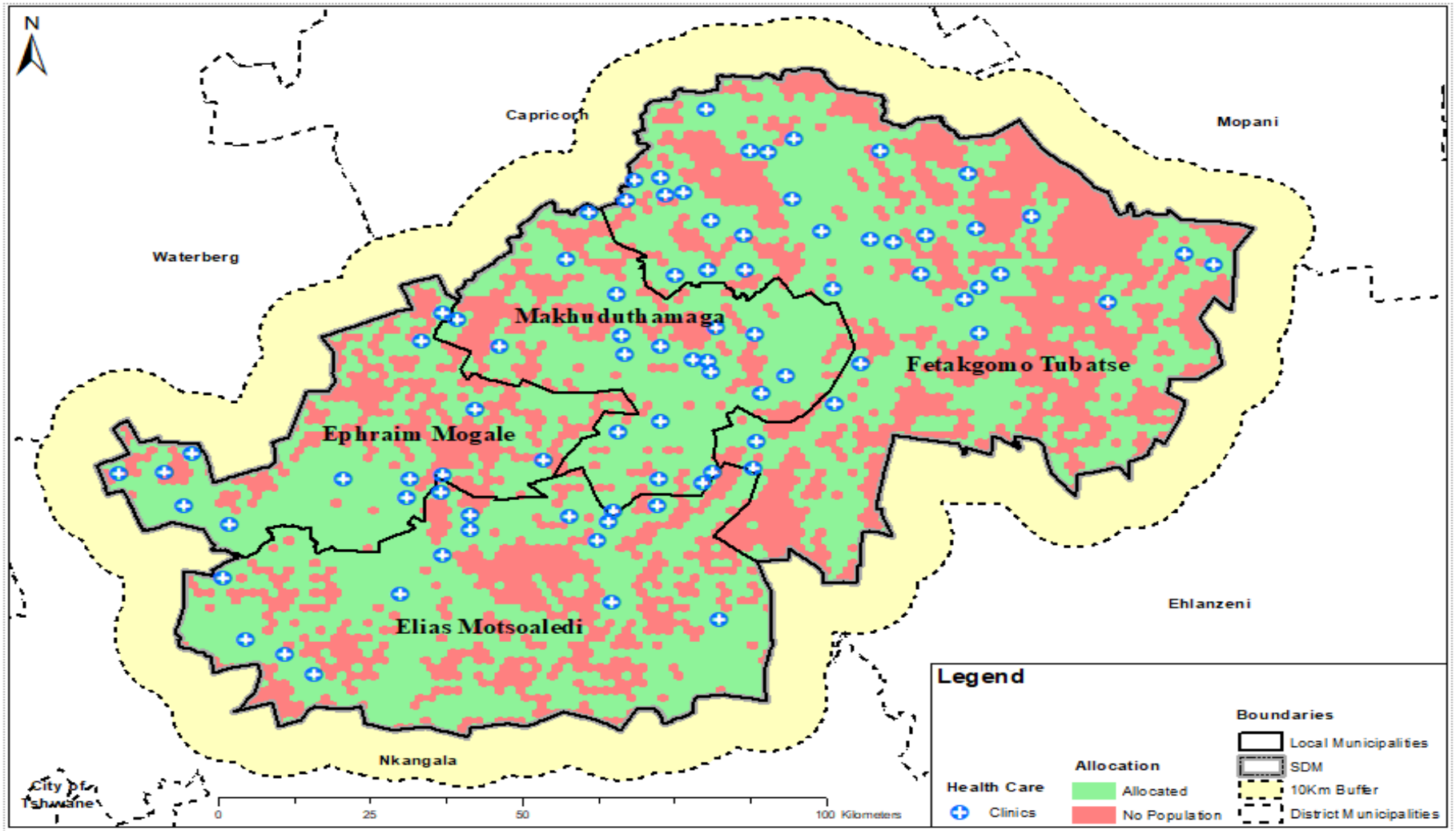



Figure 4. 6: Catchment area, using the road network, but independent of travel distance to a clinic and the capacity of the clinic.

Figure 4.7 shows the catchment areas of the clinics using a road network and considering the 10km distance to a clinic and the 10 000-patient capacity of the clinic. Out of 85 clinics, Fetakgomo Tubatse has 36 clinics covering an area of 5000 square kilometres, followed by Makhuduthamaga, with 21 clinics covering an area of 2 000 square kilometres, Elias Motsoaledi, with 15 clinics covering an area of 4 000 square kilometres, and finally, Ephraim Mogale, with 13 clinics covering an area of 2 000 square kilometres.

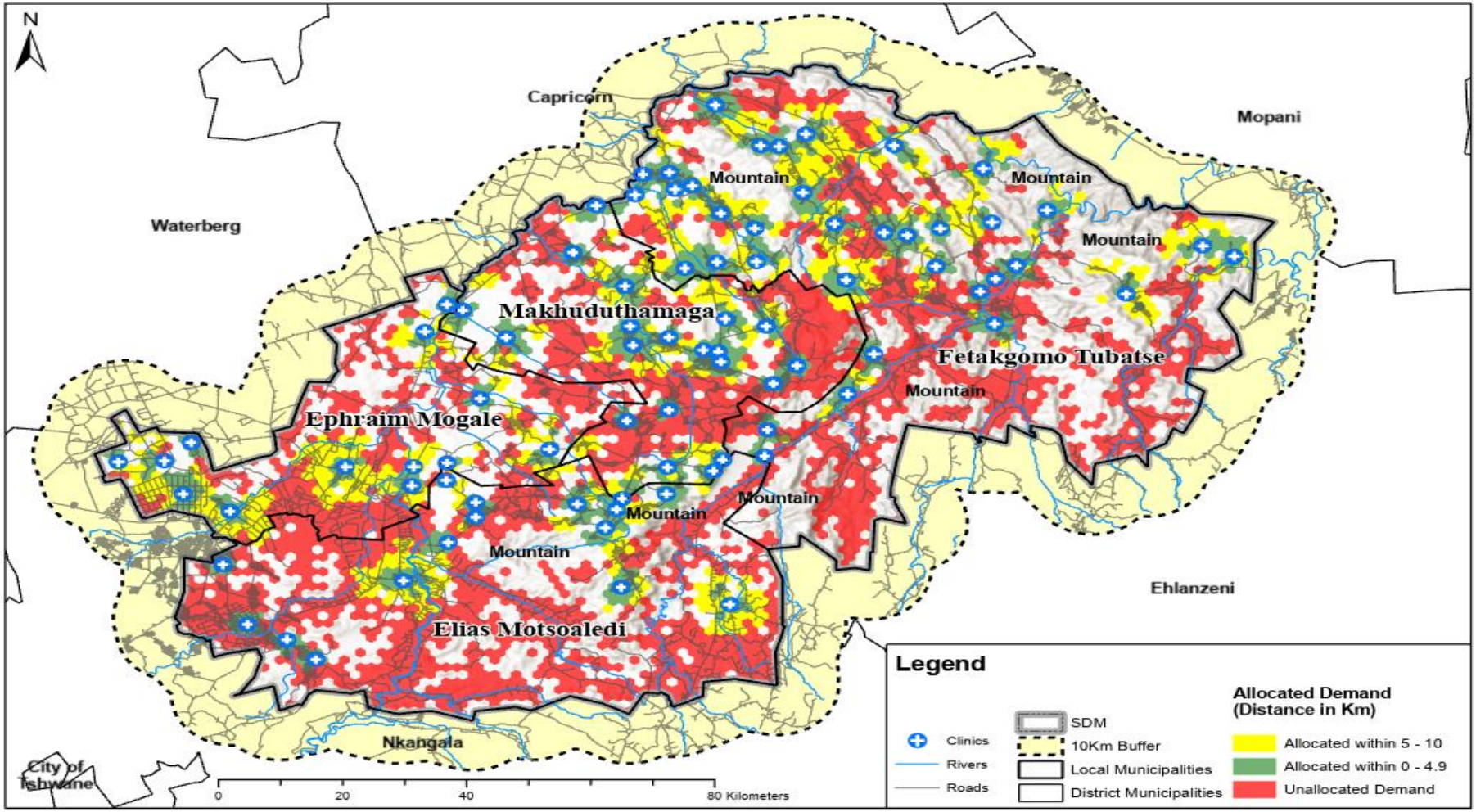



Figure 4. 7: Catchment area analysis using a road network (capacity and distance constrained)

Based on the principle of 10 000 visitors per clinic, with a maximum travel distance of 10km to access medical care, Table 4.4 shows the catchment area analysis for SDMA. Of the 1 076 840 people residing in SDMA, 574 000 (53%) are not allocated to any clinic. The unallocated clinic visitors occupy an area of 5000 square kilometres. Approximately 407 000 (38%) residents, occupying an area of 2000 square kilometres are allocated to a clinic within a 0-4.9km distance of their homes, while 95 000 (9%) of the clinic visitors occupying an area of 1000 square kilometres are allocated to a clinic within a five to 10km distance of their homes. The uninhabited area is 5000 square kilometres (refer to Figure 4.4 for exact numbers).

Table 4. 4: Summary of catchment area analysis

| Allocation to existing clinics | Population | Percentage | Extent (square km) |
|---|---|---|---|
| Unallocated | 573946 | 53% | 5,210.50 |
| Located within 0-4.9 km | 407253 | 38% | 1,704.99 |
| Located within 5-10 km | 95641 | 9% | 1,609.80 |
| Vacant area | No population | 0% | 5,002.44 |
| **TOTAL** | **1076840** | **100** | **13 527.73** |

Figure 4.8 depicts the population numbers across the study area according to the Census 2011 data. The population numbers range from 0 inhabitants to 35 691 inhabitants. According to Figure 4.8, there are 29 clinics assigned to areas with population numbers ranging from 0 to 1 710 residents, 36 clinics in areas with population numbers ranging from 1 711 to 5 022, 17 clinics in areas with population numbers ranging from 5 023 to 15 669, and finally, three clinics in areas with population numbers ranging from 15 670 to 35 691. The areas with high population are Ga Marota and Motetema. These facts also support the findings of the accessibility analysis to the effect that the clinics are not optimally aligned to the population to provide equitable access to clinics.

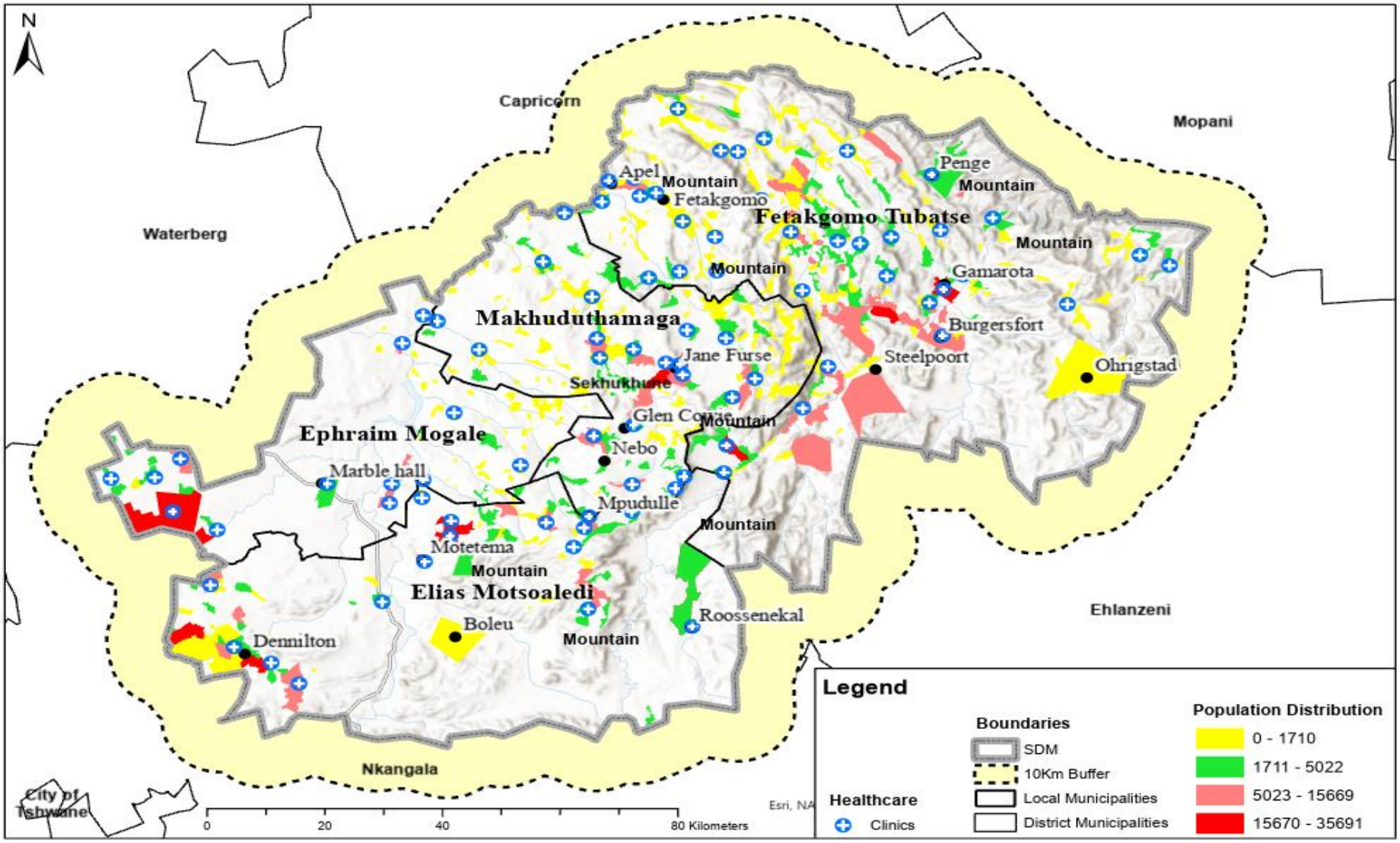



Figure 4. 8: Population numbers in relation to the respective locations of the clinics

### 4.2.3 Objective 3: To propose appropriate locations to assist the existing clinics in improving accessibility and to rank them for implementation.

The accessibility analysis revealed that the current distribution of clinics within the SDMA is not optimal to serve the population of the area. Flowmap software was used to propose additional clinics to support the current clinics in their quest to improve access to health care. The proposal for additional clinics was based on a travel distance of 10km and a threshold of 10 000 people. In its proposals to establish new clinics, the Flowmap software only considered the distance to the clinics and not their capacity. The system proposed 245 new clinics and, in each case, placed a new clinic every 10km, regardless of capacity.

A catchment area analysis of the 245 proposed clinics was conducted and 10 clinics out of the 245 that had a threshold population of 10 000 or more individuals within a 10km distance of each were selected. The proposed clinics were allocated as follows: Elias Motsoaledi with five proposed clinics, followed by Fetakgomo Tubatse, with three clinics, and finally Makhuduthamaga, with two clinics. The newly proposed 10 clinics were also each offered a priority date in terms of their implementation. As shown in Figure 4.9, the options ranged from 1 to 10, with 1 being the highest and 10 being the lowest priority for implementation. The ranking criteria were based on population figures, capacity requirements and road distance. The ranking criteria were categorized according to the demand for a clinic. Densely populated (of more than 10 000) enjoyed the highest priority, followed by areas of smaller populations of less than 10 000.

The proposed 10 clinics were combined into five groups of two clinics each. The proposed clinics, namely, 1 and 2, 3 and 4, 5 and 6, 7 and 8, and 9 and 10, would serve approximately 20 000 people per cluster. This equates to 10 000 people per clinic which aligns with the norms as set out by the CSIR study. Figure 4.9 shows the newly proposed clinics and their respective ranks on the prioritized implementation scale.

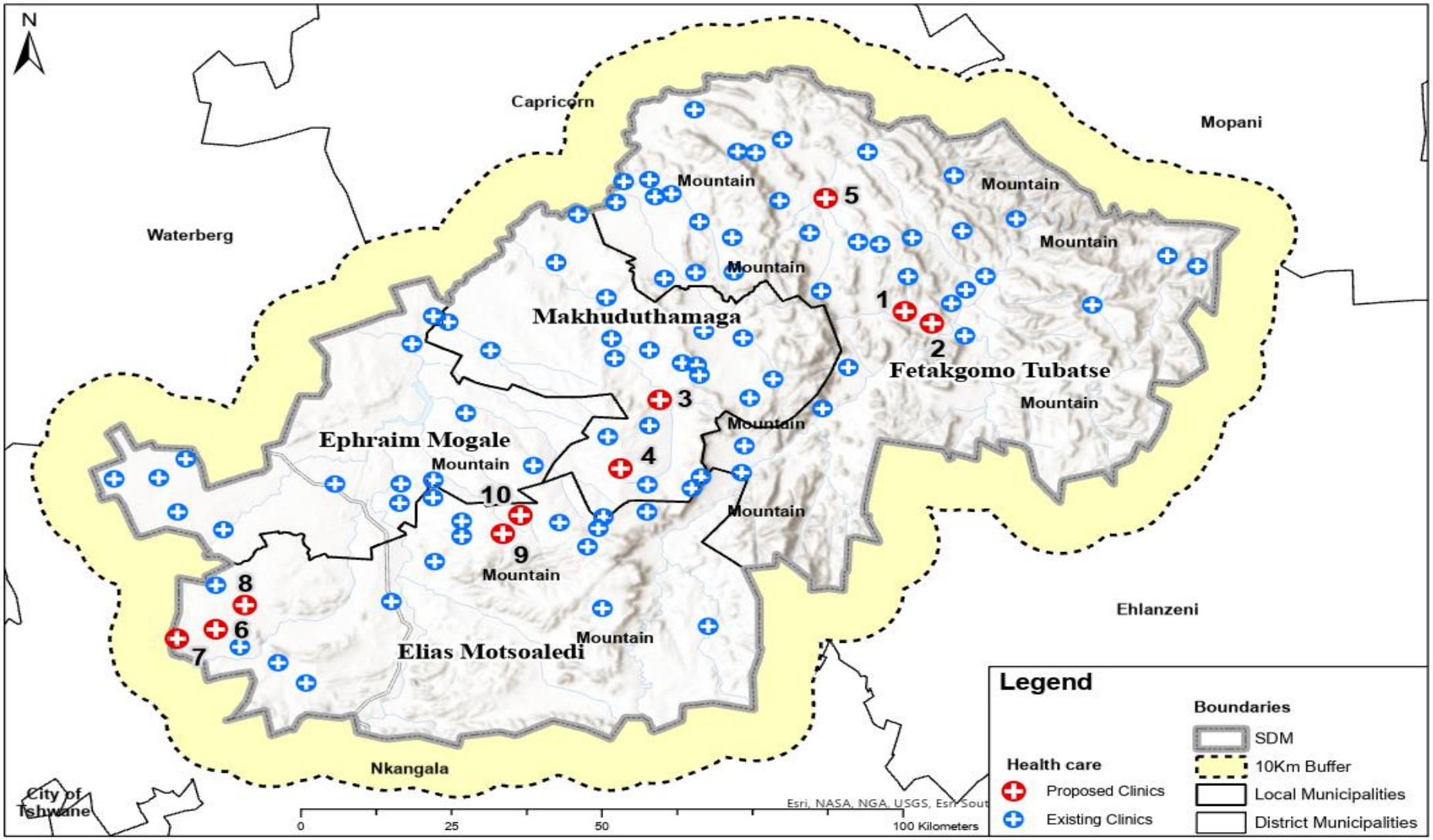



Figure 4. 9: Proposed new clinics using road network and ranking for implementation

Figure 4.10 depicts the spatial distribution of the population numbers allocated to the existing and proposed clinics, and, in accordance with the proposals, those who were not allocated to a clinic. Unfortunately, owing to distance and population restrictions, not all unassigned individuals seeking health care could be accommodated in the newly proposed clinics. Such individuals would then need to travel more than 10km to access medical care at a clinic.

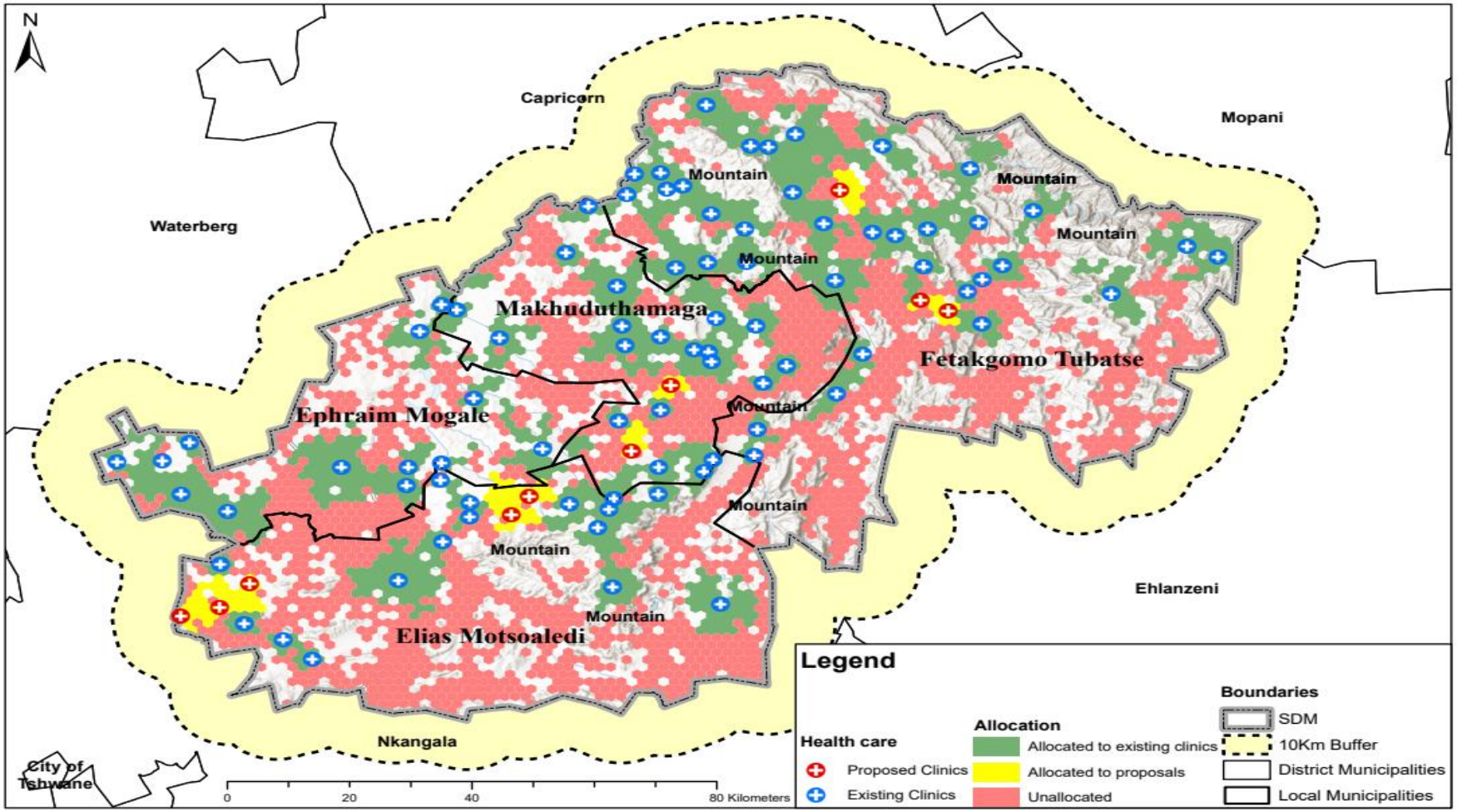



Figure 4. 10: Allocation to existing and proposed clinics using a road network

The current and proposed clinics do not serve most of the inhabitants in the central and southern parts of the Fetakgomo Tubatse Municipal Area, (refer to Figure 4.4). The existing clinics are currently catering for individuals in the central area of Makhuduthamaga, while the proposed clinics would be caring for residents in the centre and towards the south of SDMA. The existing clinics do not serve most of the people who live in the eastern, northern, and western areas of the Makhuduthamaga Municipal Area. Neither will the proposed clinics do so.

The proposed clinics in the Elias Motsoaledi Municipality plan to serve residents in the northern and southwestern portions of the municipal area, while the existing clinics are serving the residents in the northern, northeastern, and western areas of the municipality. Unfortunately, the Ephraim Mogale Municipality has no proposed clinics in the offing as the 10km travel distance and 10 000 capacity conditions are not being met. The existing clinics serve most of the residents in the southern and western areas.

Table 4.5 shows the allocations to the existing clinics and the proposed clinics in terms of the use of the local road network. Table 4.2 reveals that, prior to the proposals, the existing clinics were serving 45 % (628 352 persons) of the total population in the SDMA and the buffered zone across an area of approximately three-square kilometres.

Table 4. 5: Allocation to existing and proposed clinics using a road network. (SDMA)

| Allocation (Within 10 km) | Population | Percentage | Extent (square km) |
|---|---|---|---|
| Allocated to existing clinics | 502 894 | 47 | 3314.79 |
| Allocated to proposed clinics | 100 766 | 9 | 262.29 |
| Unallocated | 473 180 | 44 | 4 948.21 |
| Vacant area | No population | 0 | 5002.44 |
| **TOTAL** | **1076840** | **100** | **13 527.73** |

Only 100 000 (9%) of the 573 946 unassigned residents will be served by the newly proposed clinics, leaving 44% (473 000) of the residents settled in an area covering almost 5 000 square kilometres unassigned to any clinic. The proposed clinics will provide health care to people residing in an area of 262 square kilometres. The vacant area covers 5 000 square kilometres. The area is dominated by those not assigned to any clinic, followed by those assigned to the existing clinics. Together, the proposed and existing clinics will serve more than half the population, that is 603 000 people (56%), within an area of 3 500 square kilometres, leaving (44%), that is 473 000 persons, within an area of 5 000 square kilometres (refer to table 4.5 for exact numbers). The newly unserved population are too scattered to justify a clinic within 10km and 10 000 capacity of clinic and unfortunately, they must travel more then 10km to the nearest clinic.

## 4.3 Phase Two: Analysis of the questionnaires

A total of 400 participants took part in the data collection process which covered the study area in the SDMA. The data collected through the questionnaires were subjected to frequency counting, meaning that the data emanating from the participants' responses to each question were summed to determine the variable/phenomenon with the highest frequency. For some answers, there might not have been a maximum of 400 responses, as certain questions depended on the respondent's answer to the previous question. For example, respondents who showed that they were satisfied with the distribution of clinics might not have needed to answer the next question about providing motivations for additional clinics. As such, the total number of responses differed for each individual question.

The quantified responses to the questionnaires are presented in the form of tables, graphs, and charts, and are discussed under Objective 4, Section 4.3.1.

### 4.3.1 Objective 4: To assess the community's perceptions of the dynamics of healthcare accessibility.

The analyses of the responses to the questionnaires facilitated the collection of the respondents' views on the accessibility of health services. Community input and involvement in healthcare issues is vital, as it allows participants to act and be informed in developing a responsive system that efficiently serves them (Haricharan et al., 2021). The focus of the questionnaire was primarily on the accessibility of the clinics in SMDA. Connecting with communities is critical to developing trust, respect, and positive relationships in dealing with accessibility issues and developing remedial plans to address challenges (Carlisle et al., 2018). Enabling community participation also addresses accessibility issues.

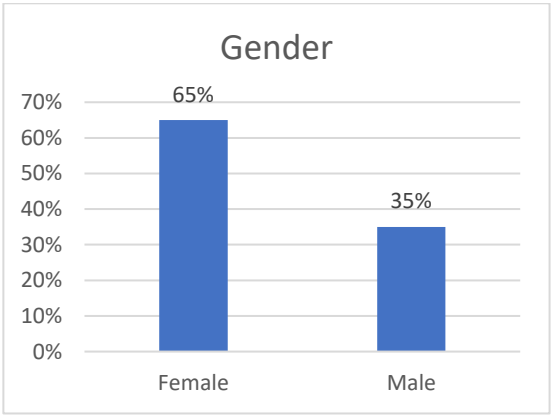
The questionnaire was divided into three sections. Section A focused on population demographics such as gender, age, native language, employment

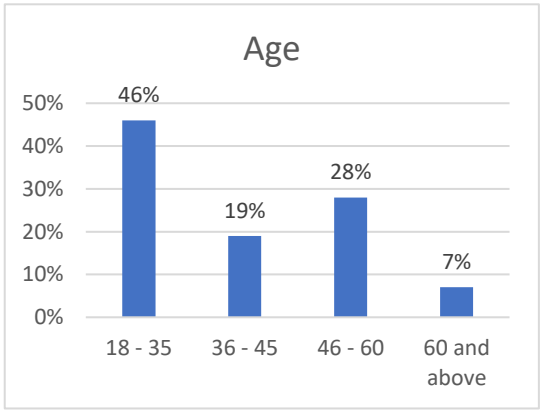
status, educational level, and residential area. Section B focused on access to clinics when visits are made to them, the location of the clinics, travel distance, means of transportation, and the need for new clinics. Section C focused on affordability of access to clinics. (refer to A D for the questionnaires used to collect the information).

**Section A**

### 4.3.2 Demographic information

Figure 4.11 (A) shows the gender and different age groups of the respondents. The findings show that about two-thirds (65%) of the respondents in this study were women and approximately a third (35%) were men.



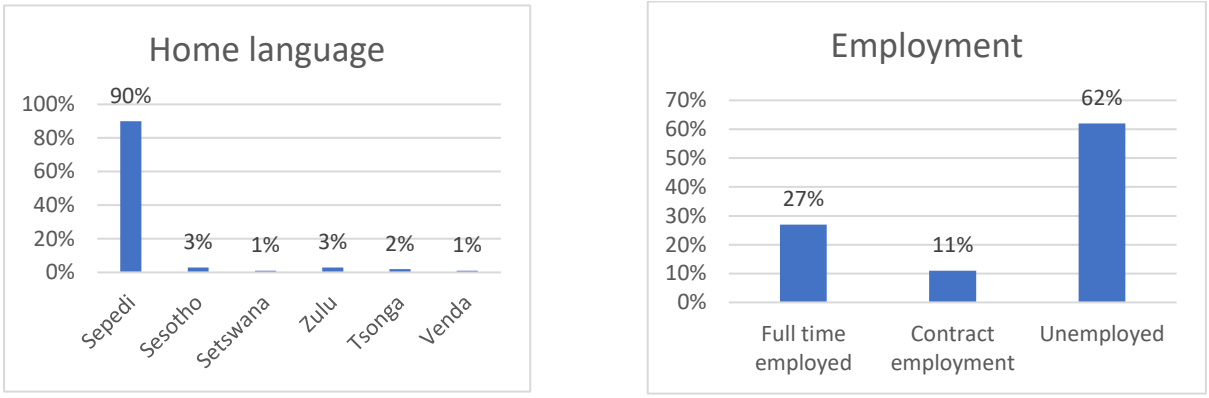

(A) (B)

Figure 4. 11: Gender and Age

Figure 4.11 (B) shows age groups, the age category of the respondents varied from 18 to 60 years and older. The findings indicated that nearly half of the respondents (46%) were between the ages of 18 and 35 ─ the youth. The total number of respondents aged between 18 and 35 years was 184, of which 121 respondents (66%) were women and 20 (34%) were men. The proportion of respondents between the ages of 36 to 45 was 19%, the total number of

respondents between the ages of 36 and 45 was 76, of which 56 respondents (74%) were women and 63 (26%) were men.

The proportion of participants between the ages of 46 and 60 was 28%. The total number of respondents aged between 46 and 60 years was 112, of which 71 respondents (63%) were women and 41 (37%) were men. Lastly, participants over 60 years of age made up seven percent (7%) of the total number of respondents. The total number of respondents over 60 years old was 28, of which 13 respondents (46%) were women and 15 (54%) were men.

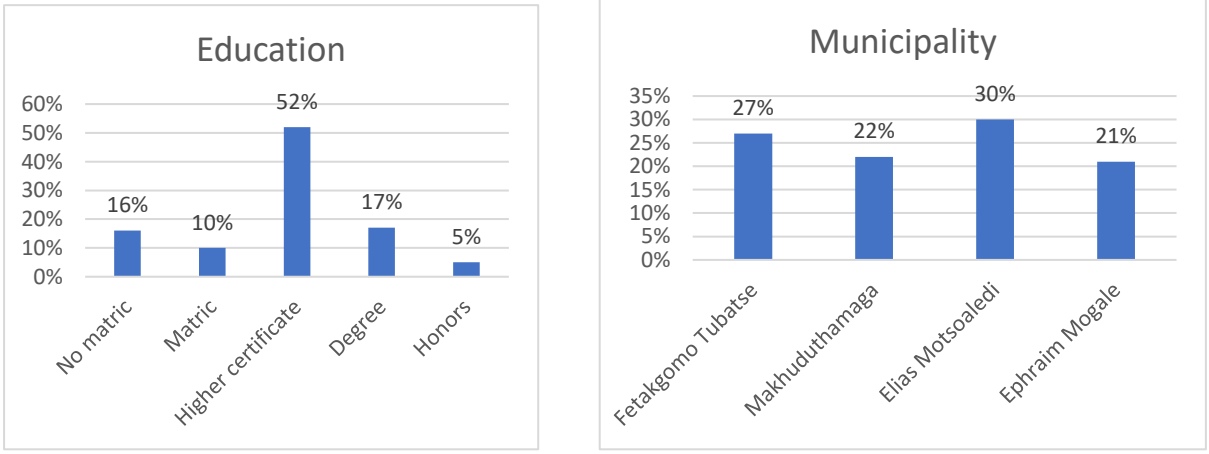



(A) (B)

Figure 4. 12: Home language and employment

Figure 4.12 (A) shows the native language and employment status of the respondents. Participants were requested to reveal their native language to identify the dominant language of the sampled group. According to the results, 90% of the respondents speak Sepedi, followed by Sotho, at three percent (3%), Zulu, at three percent (3%), Tsonga, at two percent (2%), Venda, at one percent (1%) and finally, Tswana, at one percent (1%). The languages spoken in the Sekhukhune district are in order of prevalence, namely, Sepedi (80.9%), English (13.6%), IsiNdebele (2.3%), and Afrikaans (1.5%) (Stats SA, 2011). The findings of this research are consistent with Stats SA data, indicating that the Sepedi-speaking residents predominate. The results show that 90% of the respondents

who have visited different clinics in SDMA speak Sepedi. The average annual increase in the number of unemployed people in SDMA is 0.70%, which is higher than the provincial average for Limpopo and continues to be a reason for concern (SDM IDP, 2021). Figure 4.12 (B) shows that out of 400 respondents, unemployed people account for 62%, followed by those with full-time employment at 27% and lastly, contract employees at 11%. The study area's unemployment rate is above the national average of 26.9% even though South Africa's graduate unemployment rate remains relatively low compared to other educational levels. However, youth unemployment remains a burden regardless of educational attainment (Stats SA, 2011). The unemployment rate in SDMA is 29.3% (SDM IDP, 2023). The high percentage of unemployed people confirms the need for access to public health care.




(A) (B)

Figure 4. 13: Educational level and municipality

Figure 4.13 (A) shows the level of education of the respondents and the municipalities from which they come from. Education is one of the basic human rights and one of the most important socio-economic developments (Sida, 2001). The results show that 52% of respondents have higher educational certificates, followed by those with university degrees at 17%, 16% without a matric, 10% with a matric, and finally five percent (5%) with an honours degree. Sekhkhune

district municipal area has the fewest highly qualified people in Limpopo. As such, these low skills reduce the district's ability to be innovative and economically productive (SDM IDP, 2021). The findings show that of the 60% unemployed respondents, 45% hold a higher certificate, 23% have degrees, with 11% having an honours degree, eight percent (8%) with matric, and 13% with or without matric.

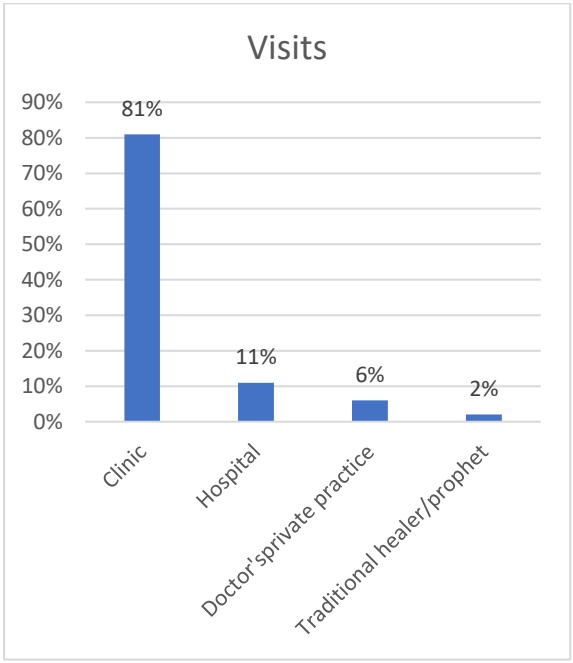
The participants in this research study came from four local municipalities. Figure 4.13 (B) shows that most respondents came from the Elias Motsoaledi Municipality, at 30%, followed by Fetakgomo Tubatse, at 27%, Makhuduthamaga, at 22%, and Ephraim Mogale, at 21%. Compared to the other local municipalities, Fetakgomo Tubatse Municipality has the largest population. Fetakgomo Municipality has 429 471 residents, followed by Makhuduthamaga, with 274 358, Elias Motsoaledi, with 249 363, and Ephraim Mogale, with 123 648 (Municipalities, 2022). The number of respondents is evenly balanced across the municipalities to provide general views on accessibility. The population numbers across the district are shown in Figure 4.13.

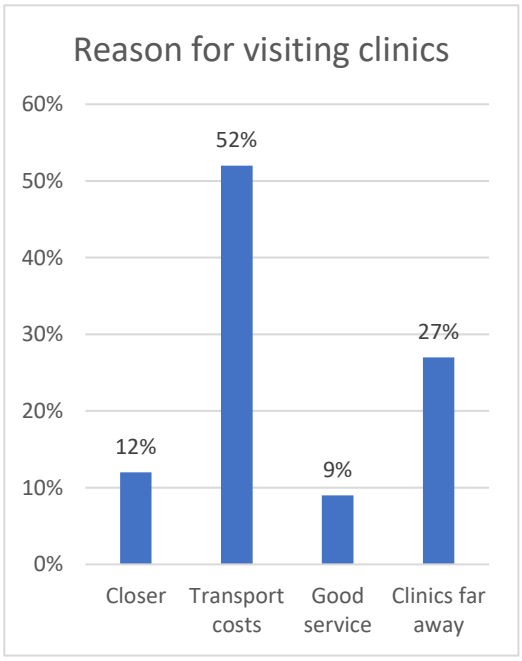
**Section B**

### 4.3.3 Measures of access to health care

Figure 4.14 (A) shows various healthcare facilities the participants prefer to visit when they are not feeling well. Clinics serve as the primary entry point into the healthcare system in that they provide the care needed to achieve a healthy community. Most of the respondents (81%) said they prefer to go to clinics when they are not feeling well, 11% of the respondents prefer to go to hospitals, six percent (6%) prefer to go to a doctor’s private practice, and finally, two percent (2%) stated that they prefer to visit a traditional healer or prophet. The use of clinics as a first point of access by communities is seen as a strategic move to reduce the unnecessary burden borne by hospitals and enable healthcare workers

to attend to emergencies efficiently and effectively (Moodley and Roos, 2015). The figure shows that people prefer to go to clinics when unwell, thus lightening the hospital burden and confirms the relevance of this research.

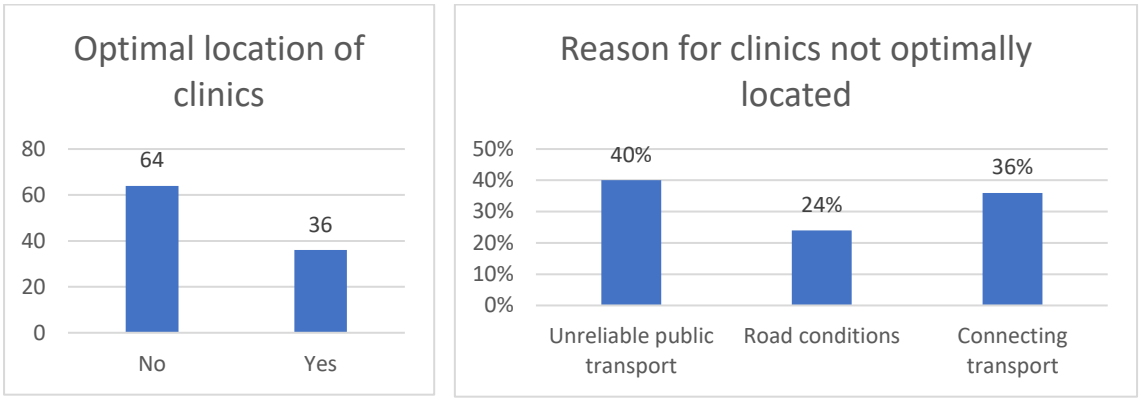



(A) (B)

Figure 4. 14: Visits to the respective healthcare facilities and reasons for accessing a specific clinic.

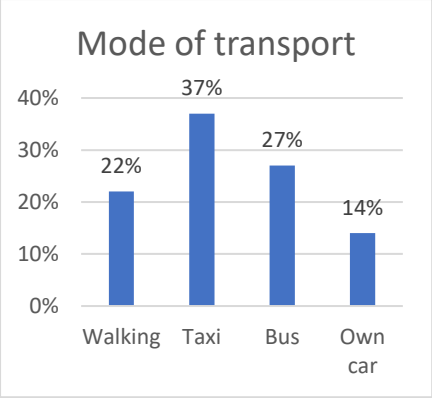
Figure 4.14 (B) indicates the reason(s) why participants prefer to visit a certain healthcare facility over others when not feeling well. Out of 400 respondents, 52% said that transportation costs are the main factor influencing them in their choice of the clinic they visit when sick. Those who indicated that clinics are far from their residential area and prefer to use other facilities such as hospitals, private clinics, or traditional healers accounted for 27% of the respondents. A low percentage of 12 said they use a preferred clinic because it is closer to where they live, and finally, nine percent (9%) indicated that the service that they receive from clinics is very good. It is evident that clinics are not strategically placed to provide healthcare services and that, generally, people must travel more than 10km to access a clinic.

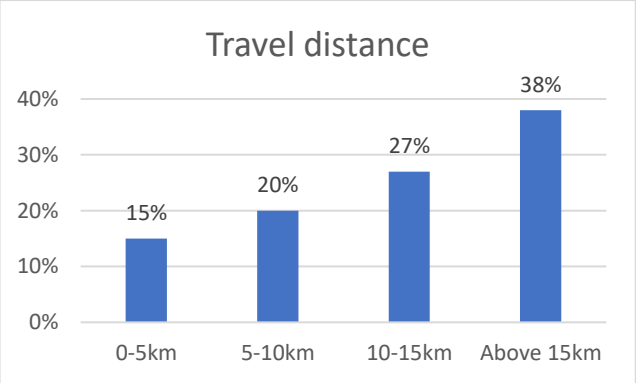



(A) (B)

Figure 4. 15: Perspectives on optimal location (or otherwise) of clinics and reasons behind such assessments

Figure 4.15 (A) shows whether clinics are viewed as optimally located and the reasons why. Out of 400 participants, more than half, that is 64%, said that the current health clinics are not optimally located, while 36% said that they have no problem with the current distribution of the clinics. Figure 4.15 (B) shows that out of 249 participants who indicated that they believe that the clinics in their municipal area are not optimally located, 40% pointed to the challenge of accessing the clinics in the light of the unreliable transportation system: ─ they wait for lengthy periods to access transport, 36% highlighted that they use connecting transport (e.g., more than one taxi to access the clinics), and lastly, 24% complain about the condition of the roads causing ineffective transport systems and increasing maintenance costs since poor roads often cause vehicle breakdowns. The remaining 151 participants were not required to answer the question about the need for a new clinic since they indicated that they considered the current distribution of clinics to be optimal.




(A) (B)

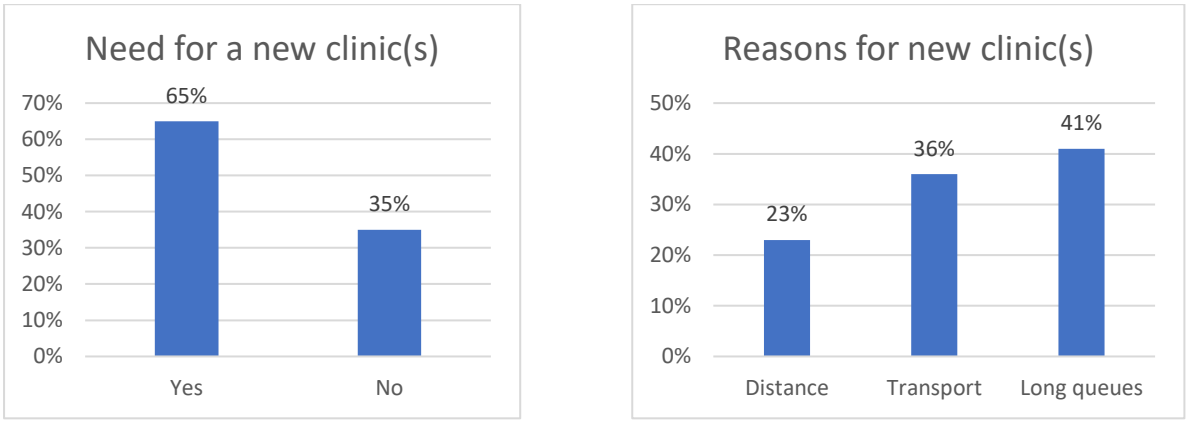
Figure 4. 16: Mode of transport and travel distance

Figure 4.16 (A) indicate that 37% of the respondents use taxis to access health care, 27% rely on buses, and 14% use their own car. Owing to the proximity of clinics to the area where 22% of the respondents reside, they merely walk to the nearest clinic. Figure 4.16 (B) shows travel distance to the nearest clinic, 15% of the participants travel 5km and less to the nearest clinic, 20% travel between five and 10km, 27% travel between 10 and 15km, and lastly, 38% travel more than 15km to the nearest clinic.

Availability and affordability of transportation may pose issues that delay access to healthcare (Varela et al, 2019). Obstacles to transportation result in postponed or missed appointments, delayed care, and missed or delayed use of medication (Syed et al, 2013). Sekhukhune District Municipal Area is experiencing inadequate re-graveling of the district and access roads, with potholes on some of the main roads (SDM IDP, 2021). The findings show that most people rely on public transport to access health care so that they are hampered by the negative aspects around the availability of transport.

The findings show that out of 400 respondents, 38% travel more than 15km to the nearest clinic, 27% between 10 and 15km, 20% travel between five and 10km, and finally, 15% travel less than 5km to access medical care. Out of 400

respondents, 35% travel less than 10km to access health care, and there is equal access to healthcare within a range, while approximately two-thirds of the respondents, that is 65%, travel more than 10km to receive medical care. According to the findings, communities generally live far from their nearest clinic and struggle to access medical care when they are unwell.




(A) (B)

Figure 4. 17: New clinic(s) and the reasons behind the need for them

The results in Figure 4.17 (A) show that approximately two-thirds, that is, 65% of the respondents, indicated that new clinics were needed for them to gain better access to health care. The accessibility analysis revealed that services are not evenly distributed and that new clinics are required to support the current population numbers and to improve access to healthcare. Others, that is 35%, indicated that they are comfortable with the current geographical distribution of clinics and that there is no need for any new clinics. Access to health care for people living in SDMA remains a challenge, especially for those living in rural areas.

The findings in Figure 4.17 (B) show that of the 400 respondents, 65% (259 people) indicated that there is a need for new clinics. Their responses included their complaints about the long and devastating waiting periods that contribute to their perspectives of a deteriorating medical environment that leaves them

stressed and lacking in confidence as to the efficiency of the healthcare system (Alrasheedi et al., 2019). The research findings reveal that 23% of participants travel more than 10km to clinics, necessitating the establishment of new clinics; 36% stated that transportation is the most important factor working against their access to health care; and 41% stated that the queues at the various clinics are long.

**Section C**

### 4.3.4 Affordability of access to health care

Figure 4.16 indicates that out of 400 participants, 311 people rely on transportation services, while 89 walk to access health care. Those relying on transportation to access health care account for 65% of the respondents, who highlighted that they cannot afford the cost of transportation to access clinics because they live far from the nearest clinic and rely on the local transportation services to get there; 35% said that although the clinic is far from them, they can in fact afford the cost of transportation to it. Transportation costs are a key barrier to accessing health services, particularly in the case of low-income and geographically isolated healthcare seekers (Jang et al., 2020). The findings also show that people depend on public transport to access medical care and emphasize that the cost of transport is a barrier to accessing medical care. This is because most people are unemployed and unable to bear the transport costs.

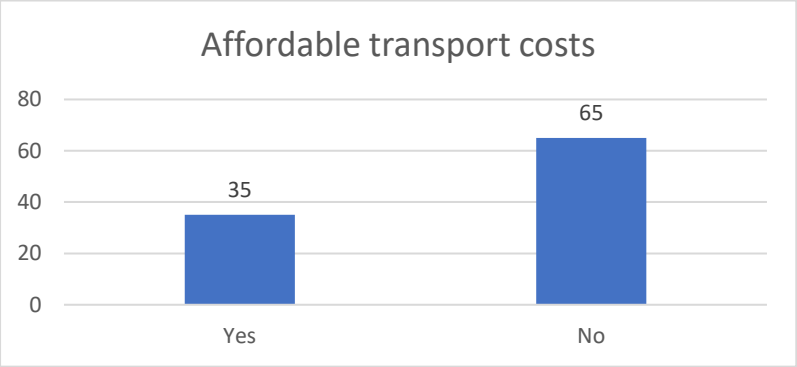



Figure 4. 18: Affordability of transport costs to access health care.

## 4.4. Phase Three: Comparing the modelled results with the findings in respect of the participants' responses.

This section deals with the results of a comparative analysis to examine the spatial distribution of clinics in terms of their accessibility, together with community insights on access to health care. Flowmap software was used to determine the results of the accessibility analysis, while the responses to the questionnaires were used to gather data regarding community insights into the accessibility of healthcare services. This section compares the spatial analysis results with community feedback on issues of accessibility and evaluates the similarities and differences between the two components. The comparative analysis ensures that effective decisions are made to improve access to healthcare, thus eventually improving people's lives.

As indicated by 36% of the participants, the costs associated with transportation were highlighted as major factors thwarting proper access to healthcare; furthermore, the non-availability of transport was considered a critical barrier to accessing medical care. The other 23% showed that they travel long distances to access care. This was identified as a threshold for the utilization of clinics and correlates with the results of the accessibility analysis conducted through Flowmap that access to equitable care is still a major issue in SDMA.

According to the questionnaires, 65% of the participants travel more than 10km to the nearest clinic. The findings are consistent with the Flowmap analysis, which shows that more than half of the population as indicated in figure 4.4 considering in SDMA excluding the buffered zone, 53% (573 946 people), travel more than 10km to the nearest clinic. The clinics within SDMA are not optimally located. More than half of the participants, that is 64%, said that the current healthcare clinics are not optimally located. This correlates with the findings that clinics are not strategically located, as shown in Figure 4.8, which highlights the larger area accommodating the unserved population.

The findings show that 65% (259 people) indicated that they need new clinics because the queues are so long; they wait for hours before getting into a consulting room, and this could also be exacerbated by capacity constraints. This correlates with the results of the accessibility analysis, as shown in Table 4.4, that more than half of the population does not have equal access to health care and must travel more than 10km to their nearest clinic.

Figure 4.19 presents the proposed new clinics using a road network. The proposed new clinics will help the existing clinics promote access to healthcare services. Fetakgomo Tubatse Municipality has three proposed new clinics, Makhuduthamaga has two, Elias Motsoaledi has five, and Ephraim Mogale has none. Two new clinics are proposed for the Fetakgomo Tubatse Municipality; they are near the geographical centre in areas accommodating populations ranging in number from 15 670 to 35 691. The third proposed clinic is meant to serve areas with population numbers ranging from 1711 to 15 669 people.

### 4.4.1 Comparative analysis of the newly proposed clinics with population numbers per municipality

In the Makhuduthamaga Municipality, the two proposed clinics are in areas with population numbers ranging from 5 023 to 15 669 people. Elias Motsoaledi Municipality has five proposals: ─ two in the north of the municipal area and in areas with population numbers ranging from 1 711 to 15669 people, and three in the west with population numbers ranging from 5 023 to 15 669 people. As depicted in Figure 4.19, the proposed clinics are in line with the population numbers for the area and would serve areas where there are more than 10 000 inhabitants.

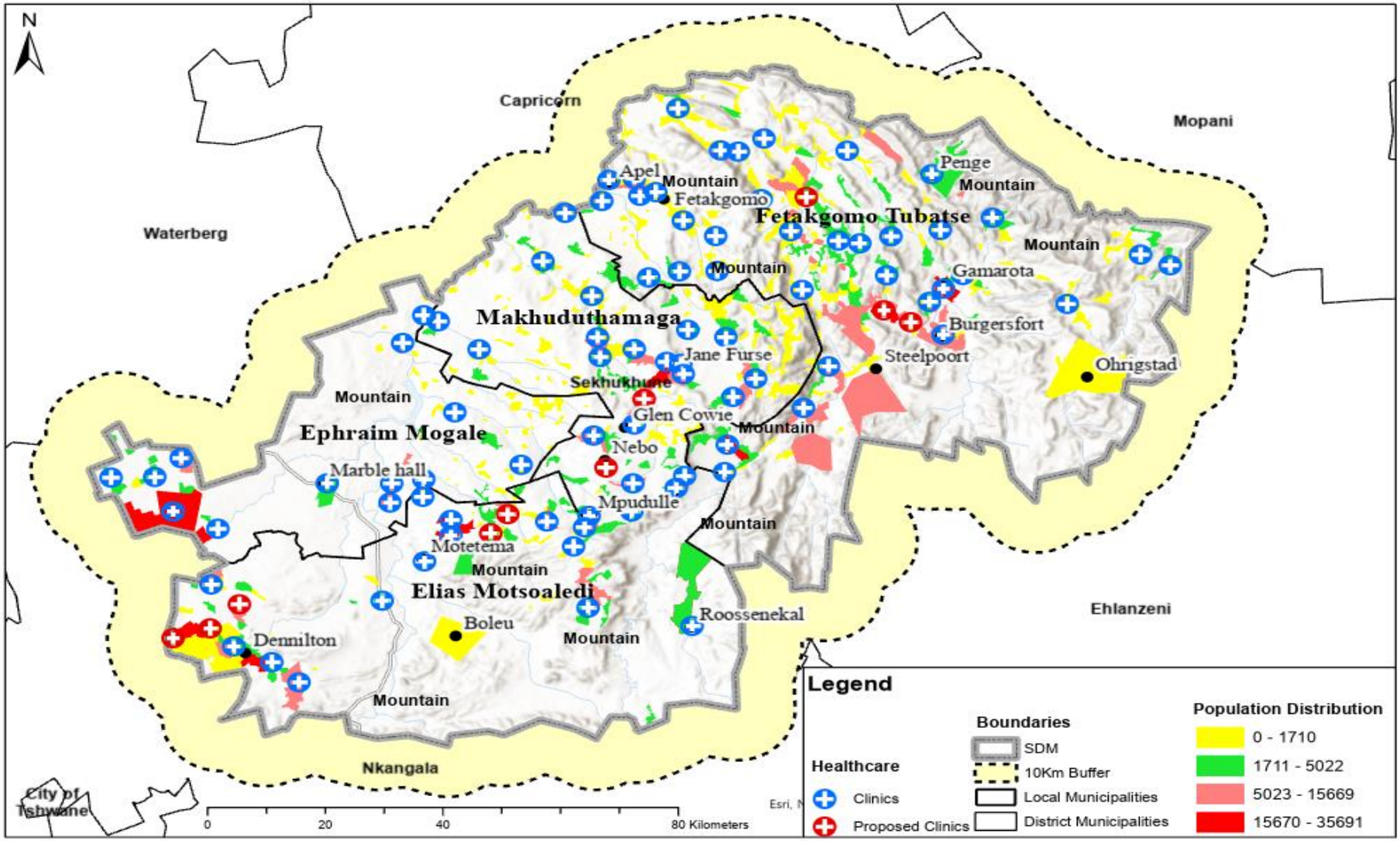



Figure 4. 19: Population numbers and proposed new clinics using a road network

### 4.4.2 Comparative analysis of the newly proposed clinics with the results emanating from the questionnaires per municipality.

In the Fetakgomo Tubatse Municipality, 65% of the respondents indicated that they travel more than 10km to the nearest clinic, while 35% said they travel 10km or less. In terms of the necessity for a new clinic, 71% said that a new clinic would indeed be needed to minimize the travel distance and waiting time at the existing clinics. On the other hand, 29% said they were satisfied with the current distribution of clinics. Out of the 71% participants who indicated that there is a need for new clinics, 56% stated that they travel more than 10km to the nearest clinic; 32% stated that they cannot afford the transportation costs to access clinics because they are too far away to walk; and 12% stated that the queues at the various clinics are long and may be exacerbated by capacity issues.

The findings show that nearly half of the population, that is 46%, is not assigned to any clinic on account of the travel distance and capacity issues, while 54% of the population travel 10km or less to the nearest clinic. The three proposed new clinics will serve 15% of the 198 000 unserved population, leaving 168 000 people unserved. As revealed by the accessibility analysis, this also emphasizes the lack of equity in access to health care and more clinics need to be built.

In the Makhuduthamaga Municipality, 44% of the respondents said that they travel more than 10km to the nearest clinic, while 56% said that they travel 10km or less. In terms of the need for new clinics, 33% said that there is a need for a new clinic to minimize travel distances and waiting times at the existing clinics, while 67% said that they are satisfied with the current distribution of clinics. Out of the 33% participants who indicated that there is a need for new clinics, 41% stated that they travel more than 10km to the nearest clinic; 25% stated that they cannot afford the transportation costs to access clinics because they are too far away to walk; and 34% stated that the queues at the various clinics are long which may also be aggravated by issues of capacity.

The accessibility analysis revealed that just more than half of the population in Makhuduthamaga municipality, that is 51%, is not assigned to any clinic owing to travel distance and capacity issues, while 49% of the population travels 10km or less to the nearest clinic. The two newly proposed clinics will serve 14% of the 139 378, which is 86% of the unserved population, leaving 119 343 people unserved. The findings of the questionnaire and accessibility analysis concur, indicating that people continue to travel more than 10km to the nearest clinics and that the current clinics are not optimally located to ensure equity in respect of access to health care and the need for more clinics to be built within Makhuduthamaga Municipality.

In the Ephraim Mogale Municipality, 58% of the respondents said that they travel more than 10km to the nearest clinic, while 42% said that they travel 10km or less. In terms of the need for new clinics, 61% said that there is a need for a new clinic to minimize travel distances and waiting times at the existing clinics, while 49% said that they are satisfied with the current distribution of clinics. Out of the 61% participants who stated that there is a need for new clinics, 53% stated that they travel more than 10km to the nearest clinic; 36% stated that they cannot afford the transportation costs to access clinics because they are too far away to walk; and 11% stated that the queues at the various clinics are long, which may also be aggravated by issues of capacity.

The catchment area analysis did not propose any new clinics within the Ephraim Mogale Municipality because of the 10 000-capacity threshold and the 10km travel distance to access health care. According to the accessibility analysis, 79 027 patients in this municipality are not assigned to any clinic because they did not comply with the travel distance requirement of 10km to warrant a clinic. The unassigned persons will have to travel more than 10km to the nearest clinic.

In the Elias Motsoaledi Municipality, 46% of the respondents said that they travel more than 10km to the nearest clinic, while 54% said that they travel 10km or

less. In terms of the need for new clinics, 39% said that there is a need for a new clinic to minimize travel distance and waiting times at the existing clinics, while 61% said that they were satisfied with the current distribution of clinics. Out of the 39% who indicated that there is a need for new clinics, 44% stated that they travel more than 10km to the nearest clinic; 35% stated that they cannot afford the transportation costs to access clinics because they are too far away to walk; and 21% stated that the queues at the various clinics are long, which may also be aggravated by issues of capacity.

The accessibility analysis in Elias Motsoaledi Municipality showed that owing to the travel distance and capacity issues, more than half of the population, that is 124 000 (64%), is not assigned to any clinic, while 36% of the population travels 10km or less to the nearest clinic. The five proposed new clinics will serve 40% of the respondents, leaving 60% unserved. This is in line with the accessibility analysis which shows that equity in access to care prevails. People travel more than 10km to the nearest clinic.

### 4.5 Summary

This chapter presented the results pertaining to the geographical distribution of clinics alongside accessibility to them in SDMA. The findings were compared to the norms and standards for accessibility specified by the CSIR in determining equal access to medical care. The accessibility analysis was carried out in three steps. The first step was to determine the geographical distribution of health clinics alongside population numbers to determine access to health care. Flowmap was used to determine access to health services using the parameters of 10 000 people and a travel distance of 10km to justify a clinic. The Flowmap results were then converted into an ArcGIS shapefile and loaded into ArcMap to create analytical maps.

The analytical maps show the respective distances from the place of residence to the nearest clinic. These include travel distances, ranging from 0 to 4.9km, from 5 to 9.9km, and more than 10km for those visiting their nearest healthcare facility. Out of 1076 840 people, 573 946 (53%) do not have access to healthcare, whilst 502 894 (47%) have access to care. The Flowmap analysis proposed 10 new clinics, based on the criteria of 10 000 people and a 10km travel distance for the unserved areas. The placement of 10 new clinics would provide healthcare services to an additional 100 766 (9%) people based on accessibility analysis considering the 10km travel distance and 10 000 capacities of clinics to justify a clinic. Together, the existing and additional 10 clinics will serve 56% of the population.

The second phase in this research used questionnaires to collect data pertaining to community views on access to healthcare. The information collected addressed demographic information, measures of access to health care, the mode of transport respondents use to access health care, the distance they travel, and the affordability of access to health care relative to the cost of transportation. The results were recorded and presented in the form of graphs. More people, that is 64% (256 persons), rely on public transportation to the nearest clinic. Negative transportation aspects and transport costs have been identified as crucial issues affecting proper access to care, with 36% of the participants citing transportation as a critical barrier to receiving medical care. A percentage of 65 participants travel more than 10km to the nearest clinic.

The third phase in this research presented a comparative examination of the accessibility outcomes modelled by the Flowmap software and the community perceptions regarding issues of access to health care. The findings in respect of the responses to the questionnaire (e.g., transportation and its cost, travel distance, the need for additional facilities, and the motivations for new facilities) were compared

to the modelled results from Flowmap to examine the parallels and contrasts between the two components. The resultant similarities and differences that emerged from the comparative analysis were discussed. The findings reveal that the district is still far from achieving health equity and that the people continue to face barriers to medical care. The unequal distribution of clinics and transport issues have been listed as a hindrance to receiving medical care, which is exacerbated by the unreliable public transportation service. Eliminating transport barriers that lead to delayed or missed care is important not only to mitigate the adverse healthcare consequences for patients, but also to avoid the additional costs that the healthcare system must bear, and that result from the increased use of emergency departments and hospital stays (Cochran et al, 2022).

To achieve equitable healthcare services, policies must be discussed and reviewed. The following chapter presents a summary of the main findings, the contribution to science and/or society, the limitations of the study and further prospects for research.

# CHAPTER 5: CONCLUSION

## 5.1 Introduction

The findings of this study were presented, interpreted, and supported by the relevant literature as discussed in Chapter 4. Data from the users of clinics in SDMA which is characterized by mountainous terrain and relevant spatial information were collected to determine the accessibility of clinics. Self-administered questionnaires were used to collect data, while GIS data such as the road network, district boundary, municipal boundaries, SBC, and ward boundaries were used to perform spatial analysis. The main findings, conclusions and recommendations pertaining to this study are discussed in this chapter.

## 5.2 Summary of the main findings

The summary of the main findings is based on the four objectives and presented as follows:

Research Objective 1 investigated the requirements for equal access to clinics in accordance with the norms and standard of the Department of Health. The findings are as follows:

The DoH is mandated by the National Health Act of 2003, which articulates that the department should provide a framework for structured and uniform access to care. The DoH dictates that citizens must travel 5km to access care and there should be a population of 5 000 to warrant the establishment of a clinic. In cases of fewer than 5 000 inhabitants, the clinic users would have to travel to neighboring areas to access medical care.

A scientific study was conducted by the CSIR (2009) in support of the DoH criteria. It indicated that to achieve equal access to healthcare services, the ideal clinic location for satisfactory access should be between 5km and 10km from the resident's home; furthermore, a threshold population of 5 000 to 6 000 would be required to justify a primary healthcare clinic and a threshold population of between 60 000 and 150 000 to justify a community health centre (Department of Human Settlement, 2019).

This study used the scientific analysis from the CISR to determine equity of access to the selected clinics. It used a 10km travel distance and a 10 000 resident population to determine accessibility to a clinic. The above parameters were ideal for the study area because it is rural, with scattered settlement patterns that have been largely determined by the mountainous terrain. These considerations are in line with the findings of the study conducted by Green and Argue (2016), who provided guidelines for the provision of health services, particularly in rural areas. Objective 1 was achieved.

Research Objective 2 investigated the current distribution of clinics and measured them against the prevailing norms and standards as set by the Department of Health.

Inequality in access to healthcare is far from having been resolved as most people still travel long distances (more than 10km) to access clinics in SDMA which is largely characterized by the mountainous terrain. Of the 1 076 840 population, more than half, that is 573 946 people, were not assigned to any clinic based on the 10km travel distance and the 10, 000 population threshold, as stipulated in the study conducted by the CSIR (Department of Human Settlements, 2019). The current spatial distribution of clinics is not effective in rendering equitable healthcare

services to the people. The norms and standards indicated that to warrant a clinic, there must be a 10 000-population threshold and a 10km travel distance. Objective 2 was achieved.

Research Objective 3 examined the possibilities of proposing locations for new clinics to improve accessibility and rank them for implementation

Additional health clinics are needed to ensure social health protection and equity of access to quality care that would then significantly positively impact on individual public health and economic growth. The locations of the proposed new clinics are optimal and comply with the 10km distance and the 10 000-population threshold as defined by the CSIR study. Ten (10) new clinics were optimally proposed. These proposals were based on the afore mentioned criteria to support existing clinics in promoting equity in healthcare to ensure that resources are effectively allocated, received, and maintained according to people's needs. More clinics are needed, but they are not financially feasible due to the cost of building and operating a clinic given the travel distance and population to warrant a clinic. SDMA communities are so dispersed due to mountainous terrain that most of the population does not comply with the DoH's norms and standards to warrant a clinic. Objective 3 was achieved.

Research Objective 4 assessed the community’s perceptions of the dynamics of healthcare accessibility. The analysis of the data led to the following findings:

Clinics serve as the primary entry point into the healthcare system by providing the care needed to achieve a healthy community. Most people prefer to visit clinics when they are not feeling well. Community participation is a vital component of primary health care (PHC) and in line with a human rights-based approach to health, which is structured through health committees linked to all clinics (Haricharan et al., 2021).

Community participation and its contribution to primary health care have been regarded as an important aspect and thus as a critical component in public health care (Heritage and Dooris, 2009)

Transportation and its associated costs have been identified as critical barriers to receiving medical care. Participants indicated that they cannot afford the transport costs to visit the clinics closest to them. They also must rely on public transportation, which is largely unreliable, and on connecting transport to access care because many of the clinics are not optimally located. Because most of the respondents are unemployed, they cannot afford the costs of the transportation. Many also must travel more than 10km to access a clinic. The respondents indicated that additional clinics would be extremely beneficial to them in that the former would relieve the pressure on the existing clinics, reduce travel distances, and shorten the waiting times in the clinic queues. Furthermore, a reduction in the waiting time would prevent patients from losing faith in the healthcare system. Although these are serious considerations and could play an important role in improving the capacity of clinics, the proposals on reducing waiting times and increasing the capacity of the clinics fall outside the scope of this dissertation. Objective 4 was achieved. All the objectives were achieved, thereby confirming the successful attainment of the study's aim.

## 5.3 Limitations

The sample size, data collection methods, and outdated census data were the limitations inherent to this study. The impact of the limitations on the results of this research are discussed in the sections that follow:

### 5.3.1 Sample

This study targeted people over the age of 18 who use clinics as an entry point into the healthcare system to access medical care. The focus of this research was on the Sekhukhune District Municipal Area; therefore, the results cannot be generalized to all other districts in the province. Similar research in other parts of the country may produce different results.

### 5.3.2 Data collection method

Questionnaires were used as the preferred method of data collection. Had it been a qualitative study, some of the questionnaire items, such as the respondents' attitudes and habits in respect of the overall healthcare system, could have been investigated further. Allowing people to freely express themselves may have opened new avenues for further investigation. This type of probing for responses could have been carried out using the qualitative research method, and different findings could well have been obtained.

### 5.3.3 Outdated census data

Since the 2021 census has not yet been published, 2011 Census data were used for the study as they are currently the only official data available.

### 5.3.4 Potential self-reported bias from participants

Participants may choose the more socially acceptable answer over being truthful.

## 5.4 Recommendations

Although municipalities and metropolitan councils have done much to improve access to healthcare, little has been done in rural areas, which are often located in mountainous terrain and thus characterized by scattered settlement patterns. From

the results of this study, the researcher derived the following recommendations for improving access to healthcare and for further research.

### 5.4.1 Recommendations to improve access to care.

Many participants indicated that clinics are their first point of entry into the healthcare system; they depend on public institutions for healthcare. The researcher recommends the following:

1. The DoH should use GIS technology to achieve greater population centricity by monitoring and responding to the diverse health needs of the respective communities. This researcher recommends that the department should consider demographic data in conjunction with locational information to better understand the community needs and in which areas the department can best serve in meeting those needs.
2. There is a need for additional clinics to reduce travel distances and put less strain on the existing clinics, and in so doing, to allow equitable access to health care, thereby promoting the health and well-being of communities. The researcher recommends that the Department of Health should investigate the feasibility of establishing at least the 10 identified new clinics, as presented in this study.
3. The DoH norms and standards state that a clinic is justified in the case of a population threshold of 5 000 and a travel distance of 5km. The CSIR conducted a study and recommended that a typical population should be between 5 000 and 60 000 people and that the ideal would be for a clinic to be at a maximum distance of five to 10km from the respondents' homes. A population threshold of between 5 000 and 60 000 and a maximum distance of five to 10km to the nearest clinic would be ideal for rural settlements, especially those displaying scattered settlement patterns because of scattered resources and mountainous terrain. However, the DoH norms and standards will not benefit rural communities in this

respect. To compare rural communities to their urban counterparts in deciding on the norms and standards applicable to them to justify the locations of new proposed clinics will serve no purpose. The researcher recommends that the DoH norms and standards be aligned with those of the CSIR to improve equity in access to healthcare or, alternatively, to establish other norms and standards to address equity in access to health care in the case of rural communities.

### 5.4.2 Recommendations for areas for further research

The study drew attention to several areas of interest that could be explored in the future. Examples of possible avenues of research to explore in future studies are listed below:

1 Transportation has been considered as a significant barrier to healthcare delivery. The study recommends that transport be studied as a barrier to accessing medical care, particularly in rural communities residing in mountainous regions.

2. Social determinants of health play a crucial role as they can affect ─ either positively or negatively ─ equitable healthcare services. The study recommends that assessments be carried out to establish social determinants that could lead to inequalities in access to healthcare services.

3. Patients visiting different clinics are required to wait for lengthy periods before they can obtain medical assistance. This reduces the quality of the customer's experience and leads to stressed individuals. As such, this study recommends investigations into the lengthy waiting times and the implementation of corrective actions to improve the customer experience.

4. Rural communities continue to face more healthcare challenges than is the case with their urban counterparts; this is due to a lack of resources and a reliable transportation system. The prevailing norms and standards that have been

developed are the same for both rural and urban communities. The researcher recommends further research into the development of appropriate norms and standards in rural areas, especially in those dominated by mountainous terrain.

5. The researcher used 2011 census data in this study as the 2021 census data have yet to be released. As such, the official population statistics used in this study are the latest available data. The researcher recommends that a similar study be conducted using the yet-to-be released census data to compare the results and thus to gain further insights and potentially provide directional plans that will improve access to healthcare services.

## 5.5 Conclusion

This chapter examined the geographical distribution of clinics in mountainous regions in SDMA, Limpopo Province, South Africa. Health equity promotes the opportunity to realize our human potential in all aspects of health and well-being. The results showed that the district is far from achieving health equity and that people still face difficulties in accessing health care. The study concludes that as the healthcare system is restructured, more needs to be done to improve access to health care, particularly in mountainous regions. The biggest challenge in accessing healthcare is compounded by distance, unreliable public transportation, and mountainous terrain, which make the delivery of healthcare services difficult. Policies need to be discussed and reviewed to achieve equitable healthcare, especially in mountainous regions.

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## 7. APPENDICES

### 7.1 APPENDIX A: RESEARCH QUESTIONNAIRES

**ACCESS TO HEALTHCARE**

**Dear Sir/Madam**

This study investigates access to healthcare services. The findings of this study will aid in the development and formulation of programs to improve access to primary healthcare services. There is no correct or incorrect answer. You will remain unidentified, and your contribution is greatly appreciated.

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**SECTION A: DEMOGRAPHICS**

1. **Gender**
   - Male ☐
   - Female ☐
2. **Age**
   - 18-35 ☐
   - 36-45 ☐
   - 46-60 ☐
   - Above 60 ☐
3. **Home Language**
   - Sepedi ☐
   - Sesotho ☐
   - Setswana ☐
   - Zulu ☐

Tsonga ☐

Venda ☐

4. **Employment Status**

Unemployed ☐

Permanent Employed ☐

Contract Employment ☐

5. **Educational Level**

No Matric ☐

Matric ☐

Higher Certificate ☐

☐

Degree ☐

Honors

6. **Municipality**

Fetakgomo Tubatse ☐

Makhuduthamaga ☐

Elias Motsoaledi ☐

Ephraim Mogale ☐

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## SECTION B. MEASURES OF ACCESS TO CARE

7. **Where do you usually go to when you are sick?**

Clinic ☐

Hospital ☐

Doctor's Private Practice ☐

☐

Traditional Healer/Prophet

8. **What is the reason for your choice in question 8?**

Closer ☐

Transport Costs ☐

Good Service ☐

Clinics far away ☐

9. **Is the location of the clinic convenient for you?**

Yes ☐

No ☐

10. **If no to question 10, what is the reason?**……

……...

……...

11. **How do you get there?**

Walking ☐

Taxi ☐

Bus ☐

Own car ☐

12. **How long does it take you to get there?**

0-5km ☐

5-10km ☐

10-15km ☐

Above 15km ☐

13. **Is there a need for a new clinic?**

Yes ☐

No ☐

14. **If yes to question 14 above, what is the reason?**.....

……...

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## SECTION C: AFFORDABILITY

15. **Do you afford transport costs to access care?**

Yes ☐

No ☐

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**THANK YOU FOR YOUR TIME AND PARTICIPATION!**

## 7.2 APPENDIX B: PARTICIPANT LEAFLET

PARTICIPANT LEAFLET

Ethics clearance reference number: 2020/CAES_HREC/073

Research permission reference number: LP_2022-06-009.

Title: analysing patterns of geographic distributions of healthcare services alongside accessibility in Sekhukhune District Municipality, a GIS case study.

**Dear Prospective Participant**

My name is Rramfolo John Malepe and I am doing research with Peter Schmitz, a professor, in the Department of Geography towards a MSc at the University of South Africa. We are inviting you to participate in a study entitled: Analysis of the geographic distribution patterns of healthcare services, along with their accessibility, in Sekhukhune District Municipality: a GIS case study.

**WHAT IS THE PURPOSE OF THE STUDY?**

I am conducting this research to analyze the geographic distribution of clinics in relation to the provision of healthcare services.

**WHY AM I BEING INVITED TO PARTICIPATE?**

You are asked to take part in this research project because you use the clinics. The information you provide will help the researcher understand the geographic patterns of clinics and the factors that contribute to inaccessibility of those services. The study requires approximately 400 participants to assess communities' perceptions of healthcare accessibility dynamics.

**WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?**

The study involves questionnaires. The questionnaires were divided into three sections: Section A consisted of seven questions and collected personal information supplied by the participants. Section B included eight questions on measures of access to care, such as travel distance, mode of transport, convenience of the clinic, and the need for a new clinic. Section C included questions regarding affordability of travel (or having access to a clinic) ─ e.g., transport costs. It will take approximately 15 minutes to complete the questionnaires.

**CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?**

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. While completing questionnaires, you can withdraw at any time and without giving reasons, but a withdrawal is no longer possible after the questionnaire has been submitted.

**WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?**

The information you provide will help the researcher understand the geographic patterns of clinics as well as the factors that contribute to inaccessibility.

**ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?**

No inconvenience, discomfort risks of harm, or side effects are anticipated from participating in this study.

**WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?**

The confidentiality of the information provided is maintained. No name is stored anywhere and only the researcher will know of your participation in the study. No one will be able to associate you with the answers you provided. Your answers will be provided with a code number or a pseudonym and will be mentioned in this way in the data, any publications, or other methods of research reporting such as conference proceedings.

Anonymous data can be used for other purposes, e.g., for a research report, journal article and/or conference proceedings. Privacy is protected whenever the information is published, and no one is identifiable in the publication.

A focus group is a process of collecting information about participants' ideas, opinions, and beliefs about a topic. While every effort will be made by the researcher to ensure that you will not be connected to the information that you share during the focus group, I cannot guarantee that other participants in the focus group will treat information confidentially. I shall, however, encourage all participants to do so. For this reason, I advise you not to disclose personally sensitive information in the focus group.

**HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?**

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet at work or home for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies will be shredded and/or electronic

copies will be permanently deleted from the hard drive of the computer using a relevant software programme.

**WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?**

Participation is voluntary and no payments or rewards are offered.

**HAS THE STUDY RECEIVED ETHICS APPROVAL?**

This study has received written approval from the Health Research Ethics Committee of the College of Agriculture and Environmental Sciences, UNISA. A copy of the approval letter can be obtained from the researcher if you so wish.

**HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?**

If you would like to be informed of the final research findings, please contact Rramfolo John Malepe on 072 103 3842 or maleperj@yahoo.com. The findings are accessible for period of five years starting March 2024. Should you require any further information or want to contact the researcher about any aspect of this study, please contact 072 103 3842 or maleperj@yahoo.com.

Should you have concerns about the way in which the research has been conducted, you may contact Prof Peter Schmitz at 082 784 2007 or schimpmu@unisa.ac.za. Contact the research ethics chairperson of the CAES Health Research Ethics Committee, Prof MA Antwi on 011-670-9391 or antwima@unisa.ac.za if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

_____

Rramfolo John Malepe

## 7.3 APPENDIX C: PARTICIPANT CONSENT FORM

## CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits, and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the questionnaires.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname…… (please print)

Participant Signature……Date……

Researcher's Name & Surname…… (please print)

Researcher's signature……Date……

## 7.4 APPENDIX D: ETHICAL CLEARANCE

UNISA university of south africa

**UNISA-CAES HEALTH RESEARCH ETHICS COMMITTEE**

Date: 07/06/2022

Dear Mr Malepe

| |
|---|
| NHREC Registration # : REC-170616-051 |
| REC Reference # : 2020/CAES_HREC/073 |
| Name : Mr RJ Malepe |
| Student #: 46341730 |

**Decision: Ethics Approval Confirmation after First Review from 02/04/2020 to completion**

---

**Researcher(s):** Mr RJ Malepe
46341730@mylife.unisa.ac.za

**Supervisor (s):** Prof PMU Schmitz
schimpmu@unisa.ac.za; 011-471-2622

Ms SP Carow
sanetpc@unisa.ac.za; 011-471-2011

**Working title of research:**

Analysing the geographic patterns of health care centres in relation to primary health care provision in Fetakgomo Tubatse local municipality: A GIS case study

**Qualification:** MSc Geography

---

Thank you for the submission of your yearly progress report to the Unisa-CAES Health Research Ethics Committee for the above mentioned research. Ethics approval is confirmed to continue for the originally approved period, subject to submission of yearly progress reports. **Failure to submit the progress report will lead to withdrawal of the ethics clearance until the report has been submitted.**

**The researcher is cautioned to adhere to the Unisa protocols for research during Covid-19.**

**Due date for next progress report: 31 May 2023**

The progress report form can be downloaded from the college ethics webpage:

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

*The reference number **2020/CAES_HREC/073** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

**Prof MA Antwi**
**Chair of UNISA-CAES Health REC**
E-mail: antwima@unisa.ac.za
Tel: (011) 670-9391

**Prof SR Magano**
**Executive Dean: CAES**
E-mail: maganSR@unisa.ac.za
Tel: (011) 471-3649



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## 7.5 APPENDIX E: PERMISSION LETTER FROM LIMPOPO DoH

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

**Department of Health**

Ref : LP_2022-06-009
Enquires : Ms PF Mahlokwane
Tel : 015-293 6028
Email : Phoebe.Mahlokwane@dhsd.limpopo.gov.za

Rramfolo Malepe

**PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES**

Your Study Topic as indicated below;

**MAPPING PATTERNS OF GEOGRAPHIC DISTRIBUTIONS OF HEALTHCARE SERVICES ALONGSIDE ACCESSIBILITY IN SEKHUKHUNE DISTRICT MUNICIPALITY**

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
    a. Present this letter of permission to the office of District Executive Manager a week before the study is conducted.
    b. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
    c. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
    d. The approval is only valid for a 1-year period.
    e. If the proposal has been amended, a new approval should be sought from the Department of Health
    f. Kindly note that, the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated

pp **Head of Department** **Date** 25/07/2022

**Private Bag X9302 Polokwane**
**Fidel Castro Ruz House, 18 College Street. Polokwane 0700. Tel: 015 293 6000/12. Fax: 015 293 6211.**
**Website: http/www.limpopo.gov.za**

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## 7.6 APPENDIX F: TURN IT IN REPORT

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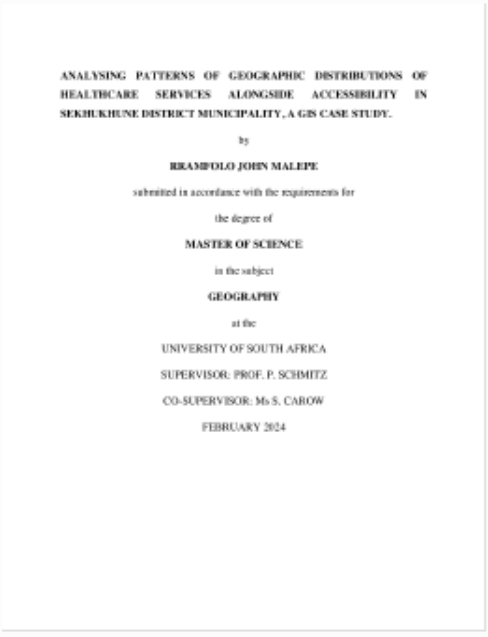

ANALYSING PATTERNS OF GEOGRAPHIC DISTRIBUTIONS OF HEALTHCARE SERVICES ALONGSIDE ACCESSIBILITY IN SEKHUKHUNE DISTRICT MUNICIPALITY, A GIS CASE STUDY.

by

RRAMPOLO JOHN MALEPE

submitted in accordance with the requirements for

the degree of

MASTER OF SCIENCE

in the subject

GEOGRAPHY

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: PROF. P. SCHMITZ

CO-SUPERVISOR: Ms S. CAROW

FEBRUARY 2024

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