INVESTIGATING THE DETERMINANTS OF USE OF HEALTHCARE SERVICES BY SOUTH AFRICAN ADULTS WITH NON-COMMUNICABLE DISEASES: AN ANALYSIS OF THE PROSPECTIVE URBAN RURAL EPIDEMIOLOGICAL (PURE) STUDY COHORT

A mini-thesis submitted in partial fulfillment of the requirements for the degree of Master in Public Health at the School of Public Health, University of the Western Cape

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DECLARATION

I declare that *"Investigating the determinants of use of healthcare services by South African adults with non-communicable diseases: an analysis of the Prospective Urban Rural Epidemiological (PURE) Study Cohort"* is my own work, that it has not been submitted before for any degree or examination in any other university and that all the sources I have used or quoted have been indicated and acknowledged as a complete reference.

Name: Nkosinathi Shange November 2020

Signed…….

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To Jesus Christ, Son of the Living God and my personal Lord and Savior, if it wasn't for you who gave me the desire to dream and achieve, I would have never taken the leap of faith in beginning and ending this chapter of life. I would like to appreciate my amazing mother (and family) who has endlessly supported me through the ups and downs, mom you have your share of glory in this output of research. My heartfelt and deepest gratitude to my pastor and life mentor (Apostle LV Mahlangu) who not only assisted me in prayer but wisdom and strength on how to use this research to benefit the lives of all African people. Last but not least, Professor Ehimario Igumbor, words are not enough to the lengths and depths you committed yourself into ensuring this work is finally completed, thank you. Professor Thandi Puoane it was never in my wildest dreams to have you oversee my work but faith indeed is a dare of the impossible, thank you for your contribution to public health and accepting the call to impart onto my work. To Africa, this is for you and I am of faith this research is a stimulant to the many work I am yet to contribute for the betterment of a prosperous Africa.

LIST OF ABBREVIATIONS & ACRONYMS

AIDS	Acquired immune deficiency syndrome
CHWs	Community health workers
CVD	Cardiovascular disease
COVID-19	Coronavirus disease 2019
DALYs	Daily adjusted life years
DHIS	District health information system
GHS	General household survey
HIC	High Income Country
HIV	Human immunodeficiency virus
LMIC	Low-middle income country
NCD	Non-communicable disease
OOP	Out of pocket
OTC	Over the counter
PHC	Primary health care
PURE	Prospective Urban-Rural Epidemiology
SDGs	Sustainable development goals
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
THPs	Traditional health practitioner
T2DM	Type 2 diabetes mellitus
WHO	World Health Organization

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ABSTRACT

Investigating the determinants of use of healthcare services by South African adults with non-communicable diseases: an analysis of the Prospective Urban Rural Epidemiological (PURE) Study Cohort

Background: Non-communicable diseases (NCDs) are the leading cause of death globally, affecting a significant proportion of the economically active population, the majority of these occurring in low- and middle-income countries (LMICs). In South Africa, over 40% of deaths are attributable to NCDs. The use of healthcare services by individuals who have NCDs is putatively high but has yet, not been adequately quantified. Furthermore, there is a paucity of research data on factors that influence healthcare services use among those experiencing NCDs in South Africa.

Aim: To assess the use of healthcare services for NCDs by adults in South Africa and identify factors associated with their use of healthcare services.

Methods: Quantitative cross-sectional analytical study of data from a population-based cohort of 2000 black South African adult men and women, aged 35-70 years at baseline (in 2008/9) participating in the Prospective Urban Rural Epidemiology (PURE) Study. The PURE Study is an international prospective cohort study that follows-up a sample of adults undertaking repeat surveys including administering health questionnaires and performing several health examinations on the participants. This analysis is based on the PURE Study Cohort drawn from Mount Frere, Eastern Cape (rural site) and Langa, Cape Town (urban site). Data on socioeconomic and demographic factors (education level, income, occupation type, age, sex, marital status), NCD prevalence and risk, and healthcare use indicators were extracted from the PURE Study database. Weighted estimates of socioeconomic variables, NCD prevalence and risk factors and the healthcare use variables were calculated. The statistical association between the occurrence of NCDs and the use of healthcare services was also estimated for the overall cohort. Multivariate age and sex-adjusted analysis were conducted. In all analyses, *p-values* < 0.05 were considered significant.

Results

A total of 380 participants (190 in each study site) participated in this sub-study of which complete information on the use of health services was available for 218 participants with NCDs. Participants were predominantly female (91.8%) with a mean age (± standard deviation) of 62.7 (±8.5) years. Majority of participants in the urban site (74.5%) had completed secondary or higher education.

There was a high report of use of health services in the last 12 months among (100% among persons with NCDs compared to 92% among those without NCDs). In regression analysis, sex, age and socioeconomic status (education level, income) showed a weak independent association with the use of healthcare services ($p>0.05$). The setting, whether urban or rural however showed significant association (Odds ratio: 2.27, 95% CI: 1.54-3.34).

Overall, there was a low report of discussion of individual cardiovascular disease (CVD) risk assessment with health service providers during visits by participants in both urban and rural communities.

Conclusion

Independent of the NCD-related knowledge and attitude, adults with NCDs living in urban communities in South Africa use healthcare services more frequently than those who live in rural communities. More females and older participants use healthcare services but this is likely also explained by the level of knowledge about NCDs.

There is a need to prioritize adults living in rural communities in public health interventions to improve access and use of health services for NCDs. In both urban and rural communities, more attention should also be paid to CVD risk assessments by health practitioners when individuals present for medical attention.

CHAPTER 1: INTRODUCTION

1.1 Background and rationale

Non-communicable diseases (NCDs) have become the most significant global health threat being the leading overall cause of deaths. Of 56.9 million global deaths in 2016, 40.5 million, or 71%, were due to NCDs (WHO, 2018) with 52 million NCD deaths further predicted by 2030 (Ndinda, Ndhlovu, Juma, Asiki & Kyobutungi, 2018). Significantly, the majority of these deaths occur in low- and middle-income countries (LMICs) with cardiovascular diseases, cancers, chronic respiratory diseases and diabetes mellitus ranking as the four major NCDs that account for these deaths (WHO, 2020a).

Recent experience of the coronavirus pandemic (COVID-19 or SARS-CoV-2) has highlighted that individuals with underlying NCDs are more vulnerable to severe disease progression (Yang et al., 2020) and deaths (Zhang et al., 2020). The case fatality rate for those with an underlying NCD is much higher than for those without. For instance, the World Health Organisation (WHO) recently noted that in South Africa, "61% of the COVID-19 patients in hospitals had hypertension and 52% had diabetes and 45% of people aged 60–69 years who died from COVID-19 also had hypertension" (WHO, 2020b). In Kenya and the Democratic Republic of Congo, even higher rates of COVID-19 deaths occurred in people with NCDs, accounting for 50% and 85% of all COVID-19 deaths respectively (WHO, 2020b). Diabetes, chronic respiratory diseases, hypertension, and cancer have all been found to be significantly associated with poor patient outcome and death from COVID-19 infection (WHO, 2020c).

In LMICs, the mortality rate arising from high blood glucose was 60.5% in men and 45.6% in women aged 20-69 years (Rheeder, Morris-Paxton, Ewing & Woods, 2017). Physical inactivity, unhealthy dietary practices, smoking of tobacco and high alcohol consumption are the common leading underlying risk factors to the global NCD prevalence (Kapwata & Manda, 2018), of which adults in sub-Saharan Africa are exposed to at least one risk factor (Gouda *et al.*, 2019). The direct consequence to these behavioral risk factors is the intermediate metabolic risks of overweight, obesity, raised blood glucose, blood pressure, and cholesterol, resulting in disease (WHO, 2020a). In recognition of this, in 2015, the United Nations adopted the Sustainable Development Goals, (SDGs - also known as "Global Goals"), which *inter alia,* targets a reduction of NCD-related premature deaths by a third within 15 years, especially in

LMICs where individuals are 1.5 times more susceptible of dying from NCDs compared to their counterparts in high-income countries (Allen *et al.*, 2017).

The inordinate disparity in the prognosis and health outcomes between LMICs and high-income countries (HICs) is well reported as is the inequality in the accessibility of health services that exist between the rich and poor (Zyaambo, Siziya & Fylkesnes, 2012). Studies in HICs have shown that population groups with lower socioeconomic status have higher NCD rates than those with a higher socioeconomic status (Di Cesare *et al.*, 2013). Whilst a groundswell explanation of the reasons for poorer health outcomes relates to entrenched divides in social determinants of health (Ataguba, Day & McIntyre, 2015), the role of the healthcare services in early screening and diagnosis, linking to care and delivery of treatment and rehabilitation is paramount. Differences in the level of resourcing of the healthcare system evidently impart poorer health outcomes in LMICs.

Furthermore, when compared to HICs, healthcare systems in sub-Sahara African countries buckle under the pressure as they are inundated with further strain due to facing a "double burden" in the management of both communicable and NCDs (Temu, Leonhardt, Carter & Thiam, 2014). Indeed, South Africa's disease profile is aptly described as manifestly displaying a "quadruple burden" comprising of the HIV/AIDS epidemic alongside a high burden of tuberculosis, high maternal and child mortality, high levels of violence and injury, and a growing burden of NCDs (Pillay-van Wyk, 2016). The country's public health facilities face an overwhelming burden of patients, and particularly those with NCDs who require regular visits to healthcare centers as part of their ongoing management. Health services in South Africa also grapple with a shortage of health professionals and resources as well as inadequate supply of infrastructure and sub-optimal access (Brand *et al.*, 2013). Accessibility to health services particularly of primary health care facilities plays a significant role in the prognosis and survival of people with NCDs in communities. Access includes both geographical (i.e. the distance between the healthcare facility and user) and financial (out-of-pocket) expenses for both the purchase of services, transport and lost income. Other factors, such as acceptability standards to the community and the cultural environment influence access and use of health services (Kapwata & Manda, 2018).

South Africa's pre-democracy history of social inequality, the huge disparity in income and wealth distribution across its diverse population, persists and the implications of these

inequalities extend to health and healthcare even after two decades of democracy (Mayosi & Benatar, 2014). These inequalities are evidently and increasingly seen in the prevalence of NCDs with lower socioeconomic groups being more affected than wealthier populations. More than half of inequalities in risk factors that accounted for major NCDs such as cardiovascular diseases and lung cancer were attributed to social disparities (Di Cesare *et al.*, 2013). The urban-rural dichotomy in occurrence and outcome of NCDs has also been noticed as people's health is significantly affected by a lack of access to basic life requirements including access to basic health care. In summary, good quality healthcare services need to be available and appropriately utilized by individuals who need them. Yet, commonly held misconceptions that NCDs are diseases of the urban affluent negatively affect monitoring and more keen interventions in poor rural settings.

The use of healthcare services by individuals living with chronic NCDs is putatively high. However, existing health information systems do not optimally provide data to quantify NCD incidences and use of health services in South Africa. Whilst routine health facility records such as the District Health Information System (DHIS) capture the use of services in the Public Health system, it does not include information from users of private health services (Wandai, Aagaard-Hansen, Day, Sartorius & Hofman, 2017) and evidently misses those who do not present to a health facility or use alternative sources of care. Also, without unique patient identifiers, it is difficult to ascertain duplicity of counts on the use of health services derived from the DHIS. Population-based survey and surveillance activities have the potential to shed light on healthcare services use that are not captured through routine health information systems.

Furthermore, there is a paucity of research data on factors that influence healthcare services use among individuals with NCDs in South Africa. Such information would ideally support the development of evidence-based interventions to improve health care use by persons with NCDs to enhance the prognosis of their disease. Pursuant to filling this information gap, the analysis reported in this thesis examined the use of healthcare services in a cohort of adults with NCDs living in an urban and rural community in South Africa. Using data from the Prospective Urban and Rural Epidemiology (PURE) Cohort Study, the level of use of healthcare services among adults aged 35 years and older who were screened to have NCDs was investigated and the factors associated with their use, or not, of health services determined. Since the cohort included persons without NCDs, the relationship of NCD occurrence and use of health services

was compared with those who did not have NCDs. The presence of NCD risk factors – "precursors", and the use of healthcare services was also investigated.

1.2 Problem statement

With no immediate end in sight, NCDs continue as the leading cause of death globally and the prevalence has soared exponentially in the African region with a 25% projected increase in mortality by 2030. The growing influence of industrialization, urbanization and food market globalization are attributed as underlying causes of the rampant NCD burden in LMICs giving rise to sedentary lifestyles and westernized diets known to be high in salt, sugar and saturated fat (Idriss, Diaconu, Zou, Senesi, Wurie & Witter, 2020). Sub-Saharan Africa is reported to have one of the highest increases in disability-adjusted life-years (DALYs) of NCDs burden in a measured period. Between 1990 and 2017, the region had a 67% increase from 90.6 million DALYs to 151.3 million DALYs (Gouda *et al.* (2019) cited by Bigna & Noubiap, 2019). The severe threat NCDs place on population health requires even more urgent attention by governments than is currently being given (Bigna & Noubiap, 2019).

There is, however, scanty research on the factors influencing the outcome of NCDs in South Africa withal data on the determinants of use of healthcare services by individuals with NCDs. Limited studies have investigated the link between demographic (age, sex, education level, locality type) factors or socioeconomic status and their influence on healthcare service utilization by NCD patients. It is unclear if there are any differences in health care use behaviours among persons with NCDs who live in urban and rural settings in South Africa.

1.3 Original Study Context – the Prospective Urban and Rural Epidemiology (PURE) Study

The PURE Cohort Study involves 17 high-, middle- and low-income countries with the overall aim of investigating the association of societal influences on lifestyle behaviors, cardiovascular risk factors and incidence of NCDs (Teo, Chow, Vaz, Rangarajan & Yusuf, 2009). In South Africa, the Cape Town arm of the PURE Study started in 2009 with an aim of contributing Black African population data to the global investigation of the relationship of societal influences on lifestyle choices and risk factors for NCDs. The locations for the study populations are Mount Frere, Eastern Cape which was designated as the "rural study site" and Langa, Cape Town, Western Cape as the "urban study site". The combined study population

includes male and female adult residents aged between 30 and 70 years at the study baseline (Egbujie, Igumbor & Puoane, 2016).

Among the elements forming part of the collection of data were the societal determinants of the built environment, nutrition environment, tobacco use and socioeconomic/psychosocial determinants. Specific measurements including physical examination of blood pressures, anthropometry (weight, height, skin fold, waist and hip circumferences), electrocardiography, muscle strength using hand grip dynamometer, lung function test using a spirometer, blood and urine analysis including of glucose and lipids were undertaken at baseline and have been repeated over the years of the study follow-up. Participants also completed questionnaires including a food frequency questionnaire, physical activity questionnaire, medical and social history (including data on tobacco and alcohol use), and a household questionnaire (including data on income and household possession).

Mount Frere and Langa were purposively selected as both were inhabited predominantly by Xhosa-speaking black Africans. Socioeconomic status of residents residing in Mount Frere was classified as low while those in Langa regarded as high relative to their proximity to Cape Town. Having two distinct settings gave the study an opportunity to assess the type of relationship that exists in different types of locations (Igumbor *et al*., 2010).

1.4 Aim and Objectives

1.4.1 Aim

To assess the use of healthcare services for NCDs by adults in South Africa and identify factors associated with their use.

1.4.2 Objectives

1. To investigate the use of healthcare services among adults positively screened to have NCDs in the PURE Cohort Study
2. To determine whether sex, age, education level, locality type and socioeconomic status affect the use of health services among adults in the PURE Cohort Study
3. To determine whether NCD related knowledge and attitudes influence the use of healthcare services in the PURE Cohort Study

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This review focuses on the prevalence and burden of NCDs. It summarizes investigations on whether sex, age, education, locality type and socioeconomic status influence the use of healthcare services for NCDs. The review looks at available research with a particular focus at LMICs in order to present the South African context more objectively. The posterior end of the review delivers early research findings of the association between the coronavirus (COVID-19) and NCDs.

2.2 Prevalence and burden of NCDs

The encroachment of globalization across LMICs including sub-Saharan Africa could be likened to a double-edged sword which gave rise to not only structural changes in social and economic developments, but also ushered an epidemiological transition in the burden of diseases largely moving away from infectious to chronic diseases. The rapid increase in NCD burden across sub-Saharan Africa was associated with the increase in population size, life expectancy and significant changes to dietary habits to that of Westernized culture (Gouda *et al.,* 2019). Accompanying these developments were behavioral (lifestyle) modifications and improved life expectancy which exposed individuals to increasing NCD risk factors. In LMICs such as Botswana, the rise in physical inactivity and overweight/obesity was positively attributed to industrialization which displaced a traditionally active lifestyle for a sedentary way of life and the increase in disposable income enabled more people to purchase foods high in salt, sugar and saturated fats (Keetile, Navaneetham, Letamo & Rakgoasi, 2019). While there was a significant global rise in overweight and obesity (one of the risk factors for NCDs) in both men (28.8% to 36.9%) and women (29.8% to 38.0%) between 1980 and 2013, sub-Saharan Africa reported the highest increases. South Africa surpassed all African countries as it reported the highest prevalence of obesity in women (42%) and a staggering 69.3% prevalence rate when combined with overweight status (Rheeder, Morris-Paxton, Ewing & Woods, 2017).

According to the first South African National Burden of Disease study, NCD deaths accounted for 41% of deaths in the year 2000 (Nojilana *et al.,* 2016).The succeeding National Burden of Disease study in 2012 showed an increase to 43.4% of overall deaths attributable to NCDs. When disaggregated by race, the black Africans comprised the least proportion to have died

from NCDs (37%) when compared to Indians (or Asians) and whites (80%) and coloured (61%) respectively (Pillay-van Wyk *et al.,* 2016). The latest body of research reported in the NCD progress monitor declared a steady increase in deaths attributed to NCDs at 51% of which 26% were probable premature deaths (WHO, 2020a).

As the urban settings population increased with mass migration of rural populations, pressure on available health services in urban settings is apparent. A case in point is the Gauteng province, classified as high economy generating, has more health facilities than low economy generating provinces (Kapwata & Manda, 2018).

South Africa, a LMIC, now faces a growing NCD burden in its rural poor population (Mayosi, Flisher, Lalloo, Sitas, Tollman & Bradshaw, 2009). As most NCDs largely share common risk factors, the causes can be different and therefore necessitates for each country to address its population's NCD needs in alignment to their social determinants of health and using an integrated approach to chronic disease management (Maimela *et al.,* 2018). South Africa has made great strides in moving towards an integrated delivery of healthcare services by launching the PHC re-engineering initiative. The initiative was part of a comprehensive strategy by the government to strengthen NCDs' detection and management through health promotive and preventive community-based interventions and health system strengthening (Rheeder, Morris-Paxton, Ewing & Woods, 2017).

As a result of the late stimulation of chronic diseases healthcare management systems in LMICs, their established acute care (predominantly infectious diseases) health systems were incapable of confronting the influx of rising NCD cases effectively. The healthcare requirements for NCD patients were more demanding when compared to acute care patients as the former necessitated more frequent healthcare treatment and support skills from a primary health care (PHC) level. Swift adaptations were necessary in LMIC primary health care systems to better accommodate and manage the high prevalence of NCDs as PHC facilities were the nearest and most widely utilized mode of health service delivery for most of these populations (Lall *et al.,* 2018). To better provide comprehensive healthcare services which address both infectious diseases and NCDs, the Andersen healthcare utilization model could be use to explain contributory factors to the use of healthcare services. The model is describes three determinants of healthcare use namely; predisposing factors, enabling resources and need. Demographic (age, gender, etc), social structure (education status, occupation, ethnicity)

and health beliefs (attitudes, values and knowledge) were classified as predisposing factors. Enabling resources for the use of healthcare services are reliant on both community and personal participation. People are more likely to visit a healthcare facility if it is present within appropriate distance and is resourced with health professionals, furthermore, surety of an income, possessing medical insurance and a decent level of availability of healthcare with acceptable waiting times were enabling resources. The final determinant of need consists of perceived and evaluated need. An individual applies their discretion on the need of seeking medical care by their perception of current state of health against the illness, their functional capacity and their overall judgment whether medical intervention is necessary. Health professionals issue an intervention for a patient based on their evaluated need of medical assistance. Through this, the model provides insights on the type and amount of treatment given to patients based on evaluated need while perceived need illustrates health-seeking behaviour and compliance to treatment. Altogether, the model uncovers conditions that either constrain or advance healthcare utilization (Andersen, 1995).

Among the greatest concern of the NCD epidemic in LMICs is its decapitating effect on the economically-active population. As reports illustrated NCDs occurred at a much earlier stage in LMICs than HICs. In HICs, the NCD mortality rate in persons younger than 60 years was 12% while in low-income countries there was a 44% mortality burden within the same age classification (Kostova, 2017). In South Africa, between 2006 and 2015 an estimated US$1.88 billion was lost to the South African economy at the expense of NCDs (diabetes, stroke and coronary heart disease) among the economically active population (Hofman, 2014).

Albeit limited, research has evidently shown that the prevalence of NCDs in LMICs continues to grow exponentially. If major challenges such as nominal funding for NCD prevention, poor reform to health systems and failure to implement globally reviewed cost-effective NCD prevention measures (tobacco taxation, regulation of marketing of unhealthy food and drinks) and remain disregarded by governments, particularly in Sub-Saharan Africa, NCD prevalence shall remain irrepressible (Juma *et al.,* 2019). The WHO & World Economic Forum have packaged cost-effective "best-buy" clinical services to assist low-income countries in reform to integrate NCD preventive and treatment management into their health systems. These recommendations should be considered by LMICs governments to make available economical primary and secondary prevention interventions at the primary level of health care (Bollyky,

Templin, Cohen & Dieleman, 2017). Furthermore, it is crucial for health authorities also to understand the determinants of healthcare use by individuals affected with NCDs.

2.3 Determinants of healthcare utilization by NCD population

The South African General Household Survey (GHS) in 2011 investigated various determinants in the use of health facilities. Within its findings black Africans (81.3%) and coloured (63.1%) were the highest users of public health services (particularly clinics) than whites (10.5%) and Indians (35.6%) who were predominantly serviced by private medical aid coverage. The majority of the study population utilized public health facilities that were closest to them and of these users most were satisfied (74.5%) with the services offered by the health facilities (Statistics South Africa, 2013).

Proximity (distance) of health care institutions indicated significant influence on the utilization of health services by NCD patients, where closer located facilities witnessed more frequent follow-on consultations for assessment and treatment when compared to further located health care providers (Deshmukh *et al.*, 2017). Transport costs similarly to proximity were significant determinants to health-seeking behaviour of patients. A cross-sectional survey conducted in a rural setting of South Africa assessed the household costs of seeking health care in South Africa's free public PHC and hospitals, reported that the further away from a health care institution was from clients homes the higher the health cost burdens regarding transport fees. The provision of free health care services at public PHC institutions and exempted hospital fees in South Africa contributed to the overall reduced cost burden of health expenditure when compared to other LMICs which attached out-of-pocket (OOP) fees in the provision of public health services (Goudge *et al.*, 2009). Where individuals lamented of OOP fees towards healthcare access in South Africa this was associated with unintended costs such as transport fees and leave of absence from work which may have discouraged regular clinic visits, although this was not commonly found as a contributory factor to healthcare utilization (Ibanez-Gonzalez & Norris, 2013).

In LMICs such as Vietnam whose health system was highly dependent on health insurance, utilization of health services by NCD individuals was dependent on their affordability of health insurance (Van Minh *et al.*, 2018). Although NCD treatment and management required more frequent health facility visits than other diseases, OOP fees attached to healthcare use in LMICs were a significant deterrent for most NCD individuals in poor countries. Where healthcare was

obligated, NCD individuals would fund their healthcare fees through accessing loans from family or friends due to healthcare constraints that made services unaffordable to the majority of the population. Such behaviour furthermore impaired adherence to treatment as individuals were compounded by burdensome conditions (Murphy *et al.,* 2020).

When disaggregated by age and sex, the GHS survey showed the 10-14; 15-24 and 25-34 years age groups were the least likely to consult a health worker in the event of an acute injury or illness citing confidence in themselves to administer their own aid, possibly through the purchase of over-the-counter (OTC) medication. The 55 years and older age group along with the 0-4 years age group displayed different health care utilization as they were the most frequent consulters of health workers during illness. Females were reported to have been the most frequent users of health services compared to their male counterparts. The aforementioned age groups that least consulted health workers were also the least affected by NCDs such as diabetes, hypertension, arthritis, and cancer as the risk of developing these conditions increased among the 65 years and older age categories (Statistics South Africa, 2013).

Link and Phelan (1995) cited by Phelan, Link & Tehranifar (2010) are well recognized for their theory of fundamental causes which sought to infer the association of socioeconomic status to health and mortality. In their supposition of social causes on health inequalities they identified four (4) contributing factors; firstly, the manifold disease outcomes; secondly, the various underlying risk factors that induce multiple diseases; the inaccessibility of preventive resources to risk factors or disease; lastly, the relationship between a fundamental cause and health is propagated in the future through the substitution of intervening mechanisms. The socioeconomic status is seen as a fundamental cause to health inequality due to its significant influence in overall health outcomes (Phelan, Link & Tehranifar, 2010).

Malta *et al.* (2017) in their investigation in Brazil, found that patients with confirmed NCDs were more frequent users of healthcare services (predominantly females), were hospitalized more and received more medical consultations in a year compared to those without an NCD. NCD patients with low or no education status were reported to have higher hospital utilization rate and received more medical consultations than those with a higher education status (Malta *et al.,* 2017). Adults with low education were at risk of not receiving the full benefits of health care services due to lack of awareness of the benefits of seeking early health care services at the onset of illness and symptoms; poor knowledge regarding where and how to access health care. In communities where most of the individuals are illiterate, community members cannot

contribute to finding solutions to social barriers related to the health care delivery (Rosengren *et al.,* 2019). In Tanzania, the utilization rate of healthcare services depended on the level of education and socioeconomic status due to OOP fees' influential role. Higher income and educated people were found to have used more health services or made more visits to health care providers than their poor and less educated counterparts (Zyaambo, Siziya & Fylkesnes, 2012). A study conducted in an urban setting in Bangladesh assessed the level of diabetes (T2DM) knowledge and healthcare utilization rate, it found literacy rate, knowledge and perception regarding T2DM as determining factors in health care services use along with socio-demographic (location, gender, age) and socioeconomic (occupation and income) factors (Siddique, Islam, Banik & Rawal, 2017). Patients' perception of the unimportance of frequent follow up assessment and management were other barriers found to have influenced health-seeking behaviour of patients possibly due to asymptomatic features of some NCDs such as hypertension (Ameh *et al.,* 2014*;* Deshmukh *et al.,* 2017).

The detailed narrative of community health workers (CHWs) in the successful delivery of basic healthcare services in LMICs, particularly in infectious diseases, child and maternal health is further explored in NCD preventive management. Along with traditional health practitioners (THPs), CHWs play a crucial role in community-based health services wherefore poor integration of services and formal health structures and community-led structures could prove definitive. Nurses, CHWs, THPs and patients were collectively found to be lacking in knowledge and inadequate training of chronic disease and management. Through comprehensive training and support their inclusion in the reform of LMICs health systems could accelerate the distribution of services to communities in the form of health education, adherence support and counselling (Maimela *et al.,* 2018; Tsolekile, Schneider & Puoane, 2018). LMICs are commonly faced with shortages in healthcare personnel. Therefore, recruitment and extension of duties of CHWs in the prevention and management of NCD patients would have favourable cost effective implications and delivery of primary care services thus improving utilization of services (Jeet, Thakur, Prinja & Singh, 2017). Community customs and standards inclusive of cultural values significantly influence shaping health-seeking behaviour in which ill individuals would select either traditional, complementary or complementary medical services. Selection of medical care could be guided by patient preference; status and reputation of the service provider in communities, and level of trust. The collaborative role between community networks and health professionals strengthened the delivery of information as they cooperatively ensured a clear translation of

scientific derived medical knowledge to the appropriate level community members would be receptive to (Idriss, Diaconu, Zou, Senesi, Wurie & Witter, 2020).

Furthermore, other barriers in primary care management of NCDs in LMICs were the lack of both diagnostic and screening equipment; limited accessibility to NCD medication; inaccessible service hours and capacity (failure to attend to all patients within an acceptable time); financial constraints; poor reporting and referral systems. The poor disproportionate distribution of healthcare services deprived local communities off preventive support (awareness and knowledge) and disease control measures. Divested off comprehensive care gave root to a negative perception about health systems' proficiency consequently undermining the utilization of health services (van der Hoeven, Kruger & Greeff, 2012; Ojo, Hawley, Desai, Akiteng, Guwatudde & Schwartz, 2017).

In South Africa, Statistics South Africa (2017) indicated a per capita healthcare spending of R3 332 for the 82% of individuals who opted for public healthcare services over private medical cover services (Statistics South Africa, 2017). Hospital services consumed the majority of the healthcare budget (62% of the R150 billion). Yet, less than 0.1% of the budget was dedicated to NCDs despite the ambitious target of a 28% reduction of NCDs by 2030 according to the National Development Plan (Puoane *et al.,* 2017). Similar concerns of suboptimal NCD funding have been raised in India where funding towards communicable disease programmes was prioritized over NCDs with the ramification of significant OOP fees being extended to NCDs patients above other disease conditions (Bhattacharyya, Pattanshetty & Duttagupta, 2016). Inappropriate allocation of budgets to the management of NCDs significantly restricted availability and accessibility of services at health care providers, therefore, may influence delay in patients seeking health care (van der Hoeven, Kruger & Greeff, 2012). Increased research and reporting of NCDs in LMICs would optimistically stimulate NCD prioritization by governments and associate sectors, and further raise political will for national and regional strategy implementation (Juma *et al.,* 2019).

2.4 The impact of COVID-19 on NCD management

According to the WHO, research as early as 2010 showed a declining trajectory in the fight against NCDs and had conceded the SDG goal of reducing NCD related premature deaths by a third before 2030 would not be met, this downward spiral was thought would be exacerbated coupled with the impact of COVID-19 on NCD individuals (Dyer, 2020).

Early studies from Italy, Spain, China and the USA, which were among the earliest to be heavily affected by COVID-19 infections and deaths, strongly showed the associated increased risk of infection and mortality across populations with chronic disease. In Italy, 96.2% of COVID-19 mortality cases were found to have had underlying comorbidities, predominantly NCDs. Hypertension (69.2%) was the most commonly identified chronic disease and cancer (16.3%) was the least identified, whilst type 2 diabetes (31.8%), ischemic heart disease (28.2%) and chronic obstructive pulmonary disease (16.9%) were also among the prevalent chronic diseases found. The probability of people with diabetes contracting COVID-19 and succumbing to it was twice as high as those without diabetes, according to a statement by the WHO (Kluge *et al.,* 2020; WHO, 2020b).

While researchers learn more insight about the implications of SARS-CoV-2 on NCD individuals, survivors thereof are thought to be at heightened risk of the progression of their pre-existing clinical conditions. Furthermore, the infection containment strategies (quarantine, social distancing and travel restrictions) of the virus have significantly affected NCDs' prevention and control measures across all affected countries which were likely to witness both short and long consequences (Palmer *et al.,* 2020). Implementation of these repressive measures indirectly affected individuals with chronic diseases by limited access to preventive or health promotive services, fostered poor management of behavioral risk factors such physical inactivity, non-availability to nutritious foods, increased use of tobacco and alcohol. The reprioritization of services in efforts to minimize the burden and infection risk at healthcare facilities further contributed to the impairment of continuum of care as specific routine NCD management were either postponed or scaled-down, outpatient visits and deferrable surgery procedures were restricted. The swift metastasis of SARS-CoV-2 germinated fear across populations, thus discouraged diseased people from seeking care in efforts to evade infection (Kluge *et al.,* 2020; Palmer *et al.,* 2020). A survey conducted by the WHO across 155 countries with a 94% response rate showed partial or complete disruption to 53% of hypertension services, 49% of diabetes and diabetic-related complications services, 42% for cancer treatment and 31% for cardiovascular emergencies. The reassignment of health staff from NCD management to COVID-19 response management also deferred services from individuals with chronic diseases. According the survey, the impact was most noticeable in low-income countries (WHO, 2020a). Therefore, the multifaceted responses to the virus's curtailment influenced healthcare use of individuals with NCDs. Thus, there is an envisaged escalation of

risk in NCD morbidity, disability, and premature mortality as a consequence of the unsettling of routine health services and medical supplies (Kluge *et al.*, 2020).

In summary, while the extent of impact COVID-19 shall have on NCD prevention and control management remained a mystery, studies prior to its discovery showed LMICs including South Africa had restrictively investigated the prevalence of NCDs, and have further provided evidence on factors that may influence the utilization of health services by adults affected with NCDs. Multiple sources of data have proven the overwhelming burden the surge of NCDs has had on health systems and highlighted the unpreparedness of health services to effectively manage these conditions with poorly equipped personnel and unreformed healthcare delivery models. While health surveys evidently demonstrated that black Africans are predominant users of public health services, there still remains a significant aperture of collective evidence on the utilization of healthcare services (including private) by adults with NCDs in South Africa. Furthermore, there is a paucity of research data on factors that influence healthcare services utilization among those experiencing NCDs in South Africa. The explorative use of the Andersen's healthcare utilization model alongside government commitment onto research investment could provide compelling evidence on healthcare utilization factors. This would enable the county's healthcare system to effectively manage the quadruple burden of diseases it faces.

CHAPTER 3: METHODOLODY

3.1 Study design

Quantitative cross-sectional analytical study of data from a population-based cohort of 2000 black South African adult men and women, aged 35-70 years at the time of recruitment (in 2008/9), participating in the PURE Study. The study conducted a secondary analysis of data on all participants from recruitment to the study cohort to date.

3.2 Study Setting, Population and Sample

The PURE Study is an international prospective cohort study that aimed to follow a representative sample of adults from high- middle- and low- income countries for 10-12 years period with an intended 3-yearly data collection interval. The global investigation uses a uniform protocol to undertake repeat surveys wherein health questionnaires are administered to the study cohort and perform a number of health examinations on all the participants. The South African arm of PURE is conducted in four sites including two at which the present study was conducted. One site was an urban community in the Western Cape (Langa, Cape Town) and the other a rural community in the Eastern Cape (Mount Frere) (Igumbor *et al.,* 2010).

For sampling in the PURE Study, Langa was stratified into 3 clusters – "old Langa", "the Zones", and "the hostels" from which every second household was systematically sampled for the inclusion of individuals into the study. Households with at least 1 member aged 30-70 years were deemed eligible for inclusion and were further approached by trained field workers for recruitment. The household sampling in Mount Frere differed from Langa due to lack of defined streets therefore through the demarcation of areas by clan heads, the selection of households was cluster sampled. The sampling yielded 437 households in the urban community (with 1081 individuals) and 329 households in the rural community (with 1003 individuals).

A sub-study of this cohort called "PURE-Systems" employed an additional questionnaire that was administered to all PURE participants at follow-up interviews during mid-2014 to mid-2015. The PURE-Systems questionnaire sought to understand health-related behaviors among all participants who self-reported history of hypertension, stable angina, acute myocardial infarction, heart failure or stroke. A total of 225 participants reported at least one of these conditions. Information on sociodemographic characteristics, risk and prevalence of NCDs and

the use of healthcare services was extracted and formed the basis of this Masters Research project.

As such, all participants of the PURE Cohort for whom follow-up data was available were included in this secondary data analysis.

3.3 Data Collection

The collection of data for the PURE Study entailed structured interviewer-administered questionnaires, anthropometric measurements and blood sample collection for biochemical measurements. Trained data collectors conducted the interviews gathering information on socioeconomic factors (education level, employment status, income), health status and history (diabetes, cancer, heart failure, etc.), household assets, demographic and NCD related lifestyle factor (food intake, physical activity, etc.).

Anthropometric and biological measurements were conducted through standard protocol by trained research assistants and a research nurse/doctor, including measurement of height, weight, waist-to-hip ratio, blood pressure and blood samples. Two blood pressure measurements were taken on each participant's left arm, 3-4 minutes apart in a sitting position and the average of the two readings was used to define hypertension. Participants that had reported to be on anti-hypertensive medication or those whose blood pressure reading was >140 mmHg systolic or >90 mmHg diastolic were classified as hypertensive (Chalmers *et al.*, 1999). Fasting blood glucose and lipid levels (total and differential cholesterol- high- and low-density lipoprotein, triglycerides) were also measured. The Framingham's risk score was calculated of the study participants.

From the PURE-Systems questionnaire, data on general use of health services, management of NCD risks, and then using hypertension as a tracer condition, knowledge about NCDs and beliefs about NCD treatment was extracted for all individuals with a self-reported history of hypertension, stable angina, acute myocardial infarction, heart failure, or stroke (n = 218).

3.4 Variables

The current study analysed the following indicators:

3.4.1 Socioeconomic Status (SES) and Demographic indicators:

Including education level, occupation, income, marital status, sex, age and locality type. Education variables were recorded as one of four categories from "no schooling" (category 1, 0 years), primary school (category 2, 1-8 years), secondary school (category 3, 9-12 years) and post-secondary school (category 4, >12 years). Employment type was classified as employed or unemployed while marital status was recorded as single, married/co-habiting, divorced/separated, widow/widower. Gender was categorized as male or female while age was grouped into one of four categories from Group 1 (35-44 years), Group 2 (45-54 years), Group 3 (55-64 years) and Group 4 (65 years and older).

3.4.2 Healthcare use:

Participant self-report of a visit to a healthcare facility for any medical attention. For purposes of this analysis, the number of health visits was annualized and extracted from responses to the questions exemplified as: "In the last 12 months, have you visited a health care facility?"

3.5 Data analysis

Statistical data analysis was performed using the STATA software, version 14 (StataCorp. 2015. Stata Statistical Release 14. College Station, Tx: StataCorp LP). Univariate analysis was conducted on the socioeconomic variables; NCD prevalence and risk factors; and healthcare use variables. These were presented as means and standard deviation for continuous data and percentages for categorical data to describe each variable's frequency and distribution. Descriptive statistics included frequency, percentage, mean and standard deviations (if normal distribution) and median and interquartile range (if non-normal) were used primarily to summarise data on SES, NCD risk factors and healthcare use. This was performed separately for males and females and rural and urban study participants. The statistical association between the occurrence of NCDs and the use of healthcare services was estimated for the overall cohort and conducted using a Chi-square test. Examination of the associations between SES indicators, NCD risk factors and healthcare were undertaken by dichotomizing variables as "high vs low SES"; "high vs low risk" and "adequate vs inadequate use of health services". Kendall's τ rank correlation coefficients were obtained to assess the relationship between these

explanatory variables and the use of health services. Prevalence rates and proportions were reported with 95% confidence intervals.

Multivariate age and sex-adjusted analysis were conducted on the data to establish the individual and collective relationship between the independent variables (socioeconomic characteristics and NCD risk factors) and the dependent variables (healthcare use indicators) for each of the rural and urban populations. Chi-square test was applied to test for difference in data obtained between the rural and urban populations (for nominal data). Paired t-Test was used to establish whether any difference found between variables for the rural and urban population groups was due to chance alone or were real (continuous and ordinal data). Multiple logistic regression analyses to estimate the independent effects of NCD prevalence and risk indicators on healthcare use were performed. Interaction tests were used to examine differences in associations between SES factors, NCD risk factors, and health facilities use according to the urban-rural residence. In all analyses, p-values < 0.05 were regarded as significant.

3.6 Validity and Reliability of study

The validity and reliability of the primary study was ensured through validating tools and applying strategies for data collection. Among these was the use of a standardized protocol in both urban and rural sites, training of data collectors, repeat measurements, calibration of measuring devices, conducting interviews in the local language (isiXhosa), pre-testing of all tools and several strategies of error checks of the data (Igumbor *et al*., 2010).

For the current analysis, a study protocol was developed and used. Two analysts independently extracted the data from the PURE Study database, and the Study Principal Investigator furthermore cleared this data before its release for analysis.

3.7 Ethical Considerations

Approval for the conduct of this study was obtained from the UWC Faculty of Community and Health Sciences Higher Degrees Committee and the Biomedical Research Ethics Committee. Permission to conduct the study was also received from the International Steering Committee of the PURE Study and the local Principal Investigator of the Study. The request for permission made it clear that the study was primarily conducted as research for the award of the Masters in Public Health (MPH) degree at the UWC.

Ethical clearance for the primary PURE Study was obtained from the UWC Research and Ethics committee BM19/1/2. To be included in the cohort, permission was received from all participants in the study following an explanation of the study objectives. This analytical study was in line with the objective presented to study participants when they were recruited at baseline. Their participation in the study was voluntary, and it was explained to them that they were free to leave the study at any time. It was further explained that participation in the study would not negatively affect them and that their rights before the beginning of study would be maintained. All participants signed an informed consent form when they agreed to participate in the study.

During data handling, cleaning and analysis, an anonymised dataset was used. Results of the analysis are being disseminated in line with the primary study protocol of publishing study results.

CHAPTER 4: RESULTS

4.1 Study Population and Socio-demographic Characteristics

The inclusion criteria onto the PURE Cohort Study (Cape Town/Mount Frere) yielded 2,084 individuals from both the rural site (Mount Frere, 1003 participants) and urban site (Cape Town, 1081 participants) recruited in 2008/9. Of these, follow-up data on 1,329 participants was available in 2015. A sample of 380 participants (190 in each study site) was randomly selected for participation in the PURE-Health Systems study. Complete information on the use of health services was available for 218 participants with NCDs representing approximately 10% of the initially recruited cohort, and are used in the current analysis.

Participants were predominantly female (91.8%) in the urban site and almost evenly split by gender in the rural site (Table 1). The mean age (± standard deviation) of the participants in the rural site was 62.7 (±8.5) years and the majority of participants in the urban site (74.5%) had completed secondary or higher education. A relatively higher proportion of participants in the rural site (25.8%) compared to their urban counterparts (11.2%) reported that they were employed (p=0.0001).

Table 1. Socio-demographic characteristics of Cohort Participants used in the current analysis

Characteristic	Study Site		
	Urban (n = 98)	Rural (n = 120)	p-value
Female, n (%)	90 (91.8%)	62 (51.7%)	0.003
Age (in 2015), mean (SD)	60.4 (9.2)	62.7 (8.5)	0.214
Secondary or higher education, n (%)	73 (74.5%)	56 (46.7%)	0.002
Employed, n (%)	12 (12.2%)	33 (27.5%)	0.004

4.2 Use of Healthcare Services in the PURE Cohort Study

Compared to participants who did not have NCD, those reporting at least one NCD reported more frequent visit to a healthcare facility ($p<0.001$).

When questioned, all participants in the urban settings, confirmed to have visited a health facility within the past 12 months, while majority 92.7% (95% CI 86.8-96.1%) of the rural participants had visited a healthcare facility. The number of health facilities visited was higher for individuals in the urban site (OR= 1.77; 95% CI: 1.57-1.96) compared to those from rural (1.44 (95% CI 1.28-1.60) site. Visitation to a private physician was comparable to that of a public physician. Both urban (15.8% (95% CI 10.0-24.2%) vs 10.9% (95% CI 6.2-18.5%)) and rural (8.9% (95% CI 5.0-15.2%) vs 6.5% (95% CI 3.3-12.2%)) population utilized the services of a private physician more than of a public physician, where the urban population utilized more of the services of a private and public physician than those from rural. Participants from urban locations visited a traditional healer more often (6.9% (95% CI 3.4-13.6%) vs (2.4% (95% CI 0.8-6.9%)) and were more than twice likely (32.7% (95% CI 24.3-42.3%) vs 16.1 (95% CI 10.7-23.6%)) to visit a community health centre (CHC) than those from rural locality. Visitation to a private pharmacy was comparable to that of a public pharmacy. Both urban (6.9% (95% CI 3.4-13.6%) vs 2.0% (95% CI 0.5-6.9%)) and rural (11.3% (95% CI 6.8-18.1%) vs 4.0% (95% CI 1.7-9.1%)) populations utilized the services of a private pharmacy more than that of a public pharmacy, where the rural participants utilized more of the services of a private and public pharmacy than those from the urban population.

When questioned where participants measured their blood pressure, the CHC or other facility was most commonly used by rural (91.9% (95% CI 87.9-96.4%)) and urban (91.1% (95% CI 87.1-96.9%)) population than a doctor's office (urban: 7.9% (95% CI 4.0-13.7%) & rural: 7.3% (95% CI 3.2-11.7%)) or at a pharmacy (urban: 1.0% (95% CI 0.0-6.8%) & rural: 0.8% (95% CI 0.0-5.3%)). The majority of rural (77.4% (95% CI 71.0-84.5%)) and urban (75.2% (95% CI 68.3-84.0%)) residents when enquired on the last time they had tested their blood pressure responded to have done so in less than six (6) months from the date of interview, while 15.8% (95% CI 8.9-24.6%) urban participants last tested 1-2 years ago and 12.1% (95% CI 5.6-19.2%) rural participants did not recall when last they had tested their blood pressure.

Participants from urban settings outperformed those residing in rural settings on all levels when questioned about the likelihood of having tested blood cholesterol. Nearly a third (27.7% (95%

CI 18.8-38.4%)) of urban residents reported to have tested their blood cholesterol less than six months of the interview while 14.5% (95% CI 6.5-22.7%)) of rural participants had measured theirs within the same period. More than two-thirds (66.1% (95% CI 58.1-74.3%)) of the rural population reported having never measured their blood cholesterol compared to 34.7% (95% CI 25.7-45.3%) of urban participants with the same response.

About 64.5% (95% CI 55.4-73.6%) of participants in urban sites had last tested their blood glucose less than one year from the interview time. A significant proportion of rural participants had either never measured their blood glucose or recalled if they ever had measured it (Table 2).

There was a very low report of having a discussion about CVD risks with a health professional. Among persons in the urban site, 83.2% (95% CI 77.2-90.6%) and 78.2% (95% CI 71.8-85.4%) in the rural site indicated that they had no discussion with a healthcare professional about CVD risks.

Table 2. Use of Healthcare Services by Study Participants over a 12-months period

Question	Response	Research site	
		Urban	Rural
Visited any health facility in the past 12 months	Yes (%)	100% (96.3-100%)	92.7% (86.8-96.1%)
Number of health facilities visited	---	1.77 (1.57-1.96)	1.44 (1.28-1.60)
Public physician visited	Yes (%)	10.9% (6.2-18.5%)	6.5% (3.3-12.2%)
Private physician visited	Yes (%)	15.8% (10.0-24.2%)	8.9% (5.0-15.2%)
Traditional healer visited	Yes (%)	6.9% (3.4-13.6%)	2.4% (0.8-6.9%)
Community health centre visited	Yes (%)	32.7% (24.3-42.3%)	16.1% (10.7-23.6%)
Public walk-in clinic visited	Yes (%)	76.2% (67.1-83.5%)	62.9% (54.1-70.9%)

Public emergency department visited	Yes (%)	3.0% (1.0-8.4%)	2.4% (0.8-6.9%)
Public hospital outpatient department visited	Yes (%)	19.8% (13.2-28.6%)	20.2% (14.0-28.1%)
Public pharmacy visited	Yes (%)	2.0% (0.5-6.9%)	4.0% (1.7-9.1%)
Private pharmacy visited	Yes (%)	6.9% (3.4-13.6%)	11.3% (6.8-18.1%)
Where do you usually get your blood pressure measured?	Doctor's office	7.9% (4.0-13.7%)	7.3% (3.2%-11.7%)
	CHC or other facility	91.1% (87.1-96.9%)	91.9% (87.9%-96.4%)
	Pharmacy	1.0% (0.0-6.8%)	0.8% (0.0-5.3%)
Last time blood pressure was measured	Less than 6 months ago	75.2% (68.3-84.0%)	77.4% (71.0-84.5%)
	6 months to < 1 year ago	5.9% (0.0-14.7%)	3.2% (0.0-10.3%)
	1 year to < 2 years ago	15.8% (8.9-24.6%)	3.2% (0.0-10.3%)
	2 or more years ago	3.0% (0.0-11.8%)	2.4% (0.0-9.53%)
	Never had it measured	0.0% (0.0-8.8%)	1.6% (0.0-8.7%)
	Don't know	0.0% (0.0-8.8%)	12.1% (5.6-19.2%)
Last time blood cholesterol was measured	Less than 6 months ago	27.7% (18.8-38.4%)	14.5% (6.5-22.7%)
	6 months to < 1 year ago	9.9% (1.0-20.6%)	0.0% (0.0-8.1%)
	1 year to < 2 years ago	6.9% (0.0-17.6%)	0.8% (0.0-9.0%)
	2 or more years ago	5.9% (0.0-16.6%)	0.0% (0.0-8.1%)
	Never had it measured	34.7% (25.7-45.3%)	66.1% (58.1-74.3%)

	Don't know	14.9% (5.9-25.5%)	18.5% (10.5-26.7%)
Last time blood glucose was measured	Less than 1 year ago	64.5% (55.4-73.6%)	53.2 (45.2-62.7%)
	1-3 years ago	23.8% (14.9-33.0%)	4.8% (0.0-14.3%)
	More than 3 years ago	5.9% (0.0-15.2%)	3.2% (0.0-12.7%)
	Never had it measured	4.0% (0.0-13.2%)	19.4% (11.3-28.9%)
	Don't know	2.0% (0.0-11.2%)	19.4% (11.3-28.9%)
In the past 5 years, has a health professional discussed your risk of CVD with you?	Yes	11.9% (5.9-19.3%)	9.7% (3.2-16.8%)
	No	83.2% (77.2-90.6%)	78.2% (71.8-85.4%)
	Don't know	5.0% (0.0-12.4%)	12.1% (5.6-19.2%)

Note: CHC = Community Health Centre

4.3 Self-assessment of the level of knowledge of NCDs

When asked their level of knowledge regarding NCD and related risk factors, most respondent indicated that they "know a little about it", with 68.3% (95% CI 60.4-77.6%) emanating from urban participants and 42.7% (95% CI 33.9-52.1%) from rural individuals. Nearly a third (29.8% (95% CI 21.0-39.2)) of rural individuals responded to have no knowledge about blood pressure while 16.8% (95% CI 8.9-26.2%) of urban residentials were knowledgeable about blood pressure compared to 12.9% (95% CI 4.0-22.3%) of rural residents. Figure 1 shows the distribution of participants level of NCD knowledge.

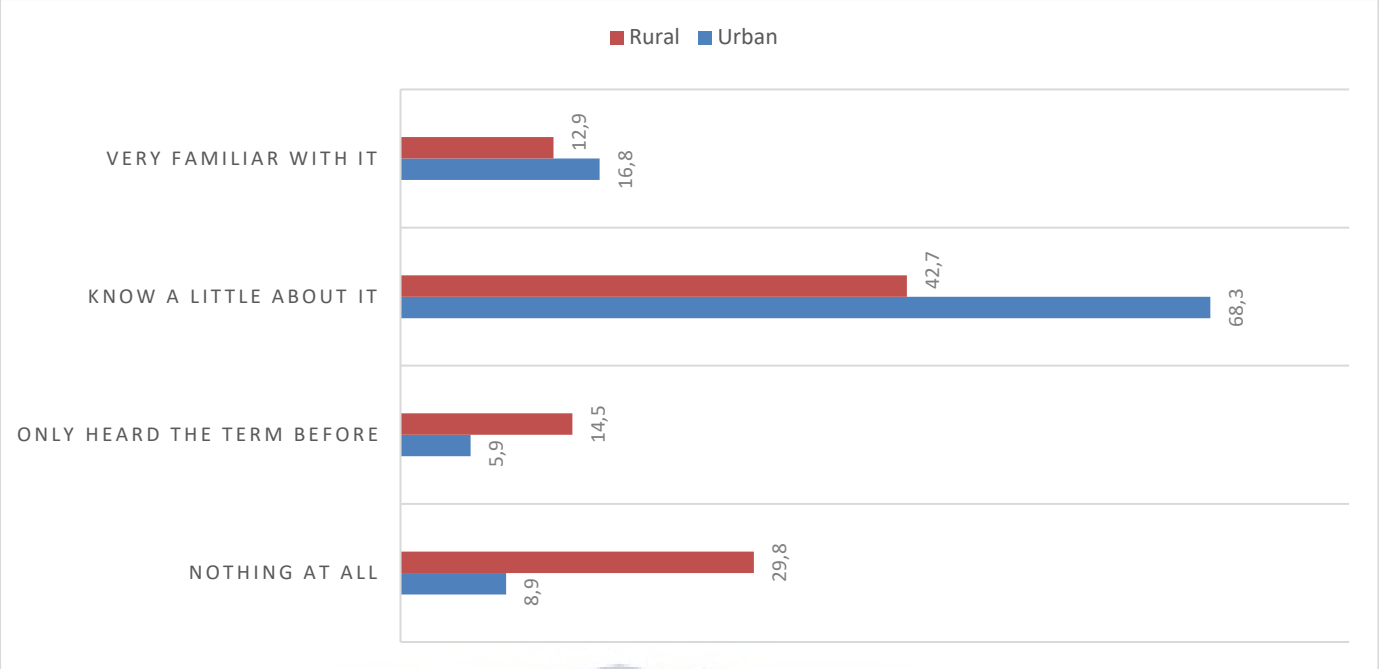

Figure 1: Self-assessment on their level of knowledge about NCD

Participants were more assertive in their response to knowledge about raised blood pressure being causative to stroke than to cancer. The majority of urban (85.1% (95% CI 79.2-91.7%)) and rural (66.1% (95% CI 58.1-74.6)) participants confirmed stroke was a resultant of a raised blood pressure yet when asked if the same indicator was a cause to cancer, both majorities from urban (45.5% (95% CI 35.6-56.2%)) and rural (45.2% (95% CI 36.3-55.0%)) settings were firmly unaware.

Participants were questioned on the state of well-being of a diagnosed hypertensive; more than half (51.5% (95% CI 41.6-61.5%)) of the urban population and 47.6% (95% CI 38.7-57.3%) of rural participants stated a hypertensive person generally felt unwell. A resounding majority (83.2% (95% CI 77.2-90.5%)) of participants from urban settings and 50% (95% CI 41.1-59.5%) from rural settings declared hypertension individuals weren't to terminate use of medication once their raised blood pressure had normalised. When asked whether hypertensive patients were to use medication only if unwell, 85.1% (95% CI 79.2-91.7%) of urban participants and 55.6% (95% CI 47.6-65.3%) rural individuals responded "No", while 27.4% (95% CI 19.4-37.1%) of the latter population were ignorant.

4.4 Beliefs on the efficacy of potential treatments for NCDs

Participants were asked about the effectiveness of allopathic medicine in NCD management. The majority of participants positively responded with either 'effective' or 'very effective'. However, when assessed on the effectiveness of traditional medicine in the same application, 64.4% (95% CI 55.4-74.0%) of participants from urban locations and 51.6% (95% CI 42.7-60.8%) from rural residents were dismissive of its efficacy with over a third from both urban (31.7% (95% CI 22.8-41.3%)) and rural (37.9% (95% CI 29.0-47.1%)) attesting to its effectiveness. Individuals were further assessed on the effectiveness of non-medical interventions in reducing blood pressure, where majority of urban (84.2% (95% CI 78.2-91.2%)) and rural (66.1% (95% CI 58.1-74.4%)) participants were in agreement weight loss and reduction of salt [(75.2% (95% CI 67.3-83.2%)) urban; (58.9% (95% CI 50.8-68.2%)) rural] were effective in lowering raised blood pressure. Additionally, exercise was positively associated among participants from both urban (68.3 (95% CI 60.4-78.0%)) and rural (63.7% (95% CI 55.6-72.4%)) settings as it was seen effective in reducing raised blood pressure. Majority of participants identified stress reduction as an effective approach in the lowering of raised blood pressure, with 70.3% (95% CI 62.4-79.5%) urban and 58.9% (95% CI 50.8-68.2%) rural in agreement.

Table 3. Beliefs about the efficacy of potential treatments for NCDs

Question	Response	Research site	
		Urban	Rural
How effective is allopathic medicine at reducing blood pressure?	Ineffective	2.0% (0.0-10.9%)	4.8% (0.0-14.0%)
	Effective	76.2% (69.3-85.1%)	45.2% (36.3-54.3%)
	Very effective	21.8% (14.9-30.7%)	50.0% (41.1-59.2%)
How effective is traditional medicine at reducing blood pressure?	Ineffective	64.4% (55.4-74.0%)	51.6% (42.7-60.8%)
	Effective	31.7% (22.8-41.3%)	37.9% (29.0-47.1%)
	Very effective	4.0% (0.0-13.6%)	10.5% (1.6-0.19.7%)
How effective is weight loss at reducing blood pressure?	Ineffective	5.0% (0.0-12.0%)	25.0% (16.9-33.3%)
	Effective	84.2% (78.2-91.2%)	66.1% (58.1-74.4%)

	Very effective	10.9% (5.0-17.9%)	8.9% (0.1-17.2%)
How effective is reducing salt intake at reducing blood pressure?	Ineffective	5.9% (0.0-13.9%)	16.9% (8.9-26.3%)
	Effective	75.2% (67.3-83.2%)	58.9% (50.8-68.2%)
	Very effective	18.8% (10.9-26.8%)	24.2% (16.1-33.5%)
How effective is exercise at reducing blood pressure?	Ineffective	7.9% (0.0-17.6%)	22.6% (14.5-31.3%)
	Effective	68.3% (60.4-78.0%)	63.7% (55.6-72.4%)
	Very effective	23.8% (15.8-33.5%)	13.7% (5.6-22.4%)
How effective is stress reduction at reducing blood pressure?	Ineffective	9.9% (2.0-19.1%)	25.8% (17.7-35.2%)
	Effective	70.3% (62.4-79.5%)	58.9% (50.8-68.2%)
	Very effective	19.8% (11.9-29.0%)	15.3% (7.3-24.7%)

4.5 Factors influencing the Use of Healthcare Services in the PURE Cohort Study

To explore the influence of factors such as sex, age, education level, locality type, socioeconomic status and NCD diagnosis on use of healthcare services, a regression model was developed applying the observed NCD-related knowledge and beliefs. As shown in Table 4, the only factor that showed a significant odds ratio was the Urban/Rural setting.

Table 4. Regression analyses of factors determining the use of healthcare services and association with NCD-related knowledge and beliefs

Parameter	**Association with NCD-related knowledge**	**Association with NCD-related beliefs**
	Odds ratio (95% confidence interval)	
Age	1.00 (0.98-1.02)	1.00 (0.96-1.04)
Sex (male)	0.86 (0.59-1.26)	1.13 (0.52-2.43)
Level of education	1.04 (0.84-1.28)	0.83 (0.52-1.30)
Setting (urban)	2.27 (1.54-3.34)	5.11 (2.10-12.48)
NCD diagnosis	1.09 (0.78-1.52)	1.03 (0.51-2.06)
Intercept 0 | 1	0.42 (0.12-1.47)	2.76 (0.18-39.23)
Intercept 1 | 2	0.88 (0.66-1.18)	---

Intercept 2 | 3	1.46 (1.08-1.97)	---

Notes: "Knowledge" used an ordered probit model, whereas "Beliefs" used a logit model, so three intercepts are provided for the former model and only one for the latter. Age was coded as a continuous variable (in years); sex, research setting, and NCD diagnosis were coded as dichotomous variables; and level of education was coded as an ordered categorical variable (ranging 1 = "none" to 5 = "college/university").

CHAPTER 5: DISCUSSION

This study investigated the determinants of healthcare service utilization by a cohort of adults with NCDs in an urban and rural setting in South Africa. It specifically considered the role of sex, age, education, locality type and socioeconomic status in influencing the use of healthcare services for NCDs. Undertaken on the PURE Study Cohort, it was possible to undertake this investigation using data for individuals who have been followed up since 2008 and demonstrate longitudinal studies' utility in answering important individual and health systems questions.

5.1 Socio-demographic and economic profile: Urban-Rural comparison

The cohort of adults in this study was predominantly female, and between 50 and 70 years old in 2015. As such, the study observations may relate more closely to occurrences among this demographic group. In general, females have been reported to have higher use of healthcare services in South Africa (Aboyade et al., 2016) than their male counterparts. Therefore it is conceivable that the use of health services reported in this analysis would be higher than the average rates in the overall adult population.

A key finding of this analysis is that locality is an independent determinant of use of health services among individuals with NCDs. Participants living in the urban site were two times more likely to use a healthcare facility than those residing in the rural site. This is important as it continues to reflect the urban-rural disparities in access and use of health services in South Africa (Mayosi & Benatar, 2014). There is a need to continue expanding programmes of the health services to rural communities accompanied by health education and promotion services to improve the use of services.

Data from the study cohort show that there is a strong association between locality type and the education level status of individuals with higher literacy rates in urban populations (88.9%) than rural residents (74.5%). Statistics South Africa (2016) have previously highlighted superior access to education in urban communities compared to rural communities. Corresponding findings of this study showed a compelling majority (91.8%) of participants in urban locations possessed a secondary or higher education (74.5%) achievement compared to 46.7% of rural residents. Regression analyses showed a positive correlation between NCD related knowledge and level of education (OR=1.04). According to Statistics South Africa (2016), the post-secondary educational attainment between the Western and Eastern Cape (the

two study settings of the PURE Cohort) stood at 13.4% and 8.3% respectively (Statistics South Africa, 2016).

Mass migration of rural populations into urbanized surroundings in LMICs precipitated the acceleration of high population density in urban areas as many sought after employment opportunities. Unemployment rates in urban areas were however exorbitantly high with a significant fraction as much as 60% of the urban population were employed in the unsecured informal economy (Gűneralp, Lwasa, Masundire, Parnell & Seto, 2017). This analysis of the PURE Study Cohort gives support to this emerging trend as it reflected a higher proportion of rural residents were formally employed (25.8%) compared to 11.2% participants from urban settings.

5.2 Health system aspects of NCD care & assessment of NCD knowledge

It was observed that participants, more so those in the urban site, visited health facilities frequently within a 12-month period. The 2011 General Household Survey (GHS) reported an overwhelming majority of black Africans (81.3%) to be the highest users of public health services when compared to coloreds, whites, and Indians. Clinics were the most utilized source of healthcare provider as it was commonly nearest to their users' residents as first-line provider of healthcare (Statistics South Africa, 2013). More visitations by urban residents could have been due to better access to health facilities than at rural locations (Kapwata & Manda, 2018) and as Deshmukh *et al.,* 2017 reported, proximity was a significant influencer that would determine whether clients would choose to visit a health facility or not. The scarcity in accessibility of essential services in rural surroundings was not solely limited to conventional western health services (including community health centers). However, our findings showed that traditional healers' alternative health services were also more accessible to urban participants than those residing in rural locations. Accessibility to services faired better in urban surroundings than rural due to the centralization of services within close proximity of one other, allowing residents to visit more than one service provider contrary to rural settings.

The poor disproportionate distribution of healthcare services deprived local communities off preventive support (awareness and knowledge) and disease control measures. Divested off comprehensive care gave root to a negative perception about the proficiency of healthcare systems consequently undermining the utilization of health services (van der Hoeven, Kruger & Greeff, 2012; Ojo, Hawley, Desai, Akiteng, Guwatudde & Schwartz, 2017)

Although both urban and rural populations were frequent private physician and pharmacy users, measurement of basic vital signs such as blood pressure was reported to have been commonly done at CHCs or similar facilities than the two private facilities. The higher usage recall of public health facility to private could have been postulated to individuals utilizing their nearest health facility either in emergency scenarios or profiting from the free health screening and assessment at public health institutions. This was further supported by the findings of the 2011 GHS in the high usage of state healthcare facilities by African blacks than any other ethnicity (Statistics South Africa, 2013). Blood pressure was the most common vital sign measured and arguably regarded as most important by both urban and rural populations compared to the measurement of cholesterol and/or blood glucose. Our data showed both majorities of urban and rural participants had tested blood pressure more regularly (i.e. less than six months) than the other two vital signs in mention. Cholesterol was the least likely ever to have been tested among rural individuals whilst blood glucose was known and tested but not as often as blood pressure. Possibilities arise as to reasons cholesterol and blood glucose were either less assessed or acknowledged as important by participants above blood pressure. The non-invasiveness of measuring blood pressure and immediate display of results could be a possible reason whilst the former two vital signs required invasive procedures such as needle pricking or withdrawing of blood or as reported by Brand *et al.* (2013) the regular unavailability of equipment (e.g. glucometers and test strips) at under-resourced facilities. Participants might have held an unbalanced level of chronic diseases knowledge and seemed better informed about raised blood pressure (i.e. hypertension) than other chronic diseases. The imbalance might have been caused by participants' past communication experiences with health personnel who shared limited information to patients about chronic diseases. This was further fortified by data showing that most urban (83.2%) and rural (78.2%) individuals were ignorant of their CVD risk despite regular visits to health facilities. The low level of comprehensive knowledge about NCDs held by participants reflected the shameful findings by Maimela *et al.* (2018) and Tsolekile, Schneider & Puoane (2018) of the poor state of knowledge and inadequate training of chronic disease management held by nurses, CHWs and THPs, prominent figures in delivering community-based health services.

5.3 Beliefs on the efficacy of potential treatments for NCDs

Health system approaches in LMICs are significantly influenced by community integration for maximum service coverage. Therefore this substantiated the inclusion in an enquiry of traditional medicine when participants were interviewed regarding the efficacy of potential treatments for NCDs. Whilst both urban (76.2%) and rural (45.2%) participants notably expressed their supportive view of the efficacy of allopathic medicine, contrastingly the majority of both groups (64.4% and 51.6% respectively) affirmatively disputed the efficacy of traditional medicine in reducing raised blood pressure. A noteworthy finding showed the proportion of rural participants that were confident in the efficacy of allopathic medicine in reducing raised blood pressure (45.2%) to those who supported the efficacy of traditional medicine (37.9%) was at close quarters to views on former medicine efficacy. Conceivably there were more participants from rural settings than urban (31.7%) that supported the efficacy of traditional medicines in reducing raised blood pressure in view that traditional and/or cultural leaders remained respected and influential upholders of certain practices which weren't as firmly held in urban locations. Idriss, Diaconu, Zou, Senesi, Wurie & Witter (2020) identified patient preference, status and reputation of the service provider in communities, and level of trust as leading determinants in selection of medical care provider. This is a further reason for the need of a collaborative role between community networks and clinical health professionals to coincidingly deliver necessary health services to LMIC populations with equal efficacy.

Although limited, most of the knowledge from participants of both urban and rural settings displayed a similar level of responses when questioned about the efficacy of nonpharmaceutical interventions in reducing raised blood pressure. Both groups concurred that weight loss, regular exercise, salt reduction in foods and good stress management were all effective approaches to better-controlled blood pressure.

Nominal government funding for NCD prevention and management significantly restricted availability and accessibility of services at health care providers, therefore, contributing to delay in patients seeking health care (van der Hoeven, Kruger & Greeff, 2012). Significant proportions of the population in LMICs still resided in rural surroundings where education levels were generally low as compared to urban settings. Illiterate adults were at risk of not receiving the full benefits of health care services due to lack of awareness of the benefits of seeking early health care services at the onset of illness and symptoms; poor knowledge

regarding where and how to access health care (Rosengren *et al.,* 2019). Whereas LMICs governments consistently refrained from reforming health systems and implement globally reviewed cost-effective NCD preventive measures NCD prevalence shall remain uncontainable (Juma *et al.,* 2019).

5.4 Study Limitations

Several study limitations are worthy of note. First, the study utilized self-reported information on health services use which were not cross-checked with any medical records. Thus the study is thus limited in relying on respondents to be truthful in their responses regarding health facility visits. Therefore, the chance is that the study could have suffered from misclassification bias. Since it was not the study objective to report a true prevalence of these conditions, these limitations will probably have little effect on result interpretation.

Secondly, the use of a small sample of people in a disadvantaged urban community from Cape Town, South Africa and rural Eastern Cape, primarily composed of one ethnic group. This is because the participants were a sub-set from a larger study. Therefore, the results cannot be generalizable to other contexts within South Africa, let alone other countries.

Thirdly, unequal numbers of participants in relation to key socio-demographic characteristics were recruited affecting representativeness. However, weighting and sex-adjustment with the study populations were undertaken to limit the impact of this. Nevertheless, small numbers meant that the sample was biased to older females.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

Independent of the NCD-related knowledge and attitude, adults with NCDs living in urban communities in South Africa use healthcare services more frequently than those who live in rural communities. More females and older participants use healthcare services but this is likely also explained by their level of knowledge about NCDs.

There is a need to prioritize adults living in rural communities in public health interventions to improve access and use of health services for NCDs. In both urban and rural communities, more attention should also be paid to CVD risk assessments by health practitioners when individuals present for medical attention.

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Appendix I:

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06 March 2019

Mr N Shange
School of Public Health
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Ethics Reference Number: BM19/1/2

Project Title: Investigating the determinants of use of healthcare services by South African adults with non-communicable diseases: An analysis of the Prospective Urban Rural Epidemiology (PURE) study.

Approval Period: 15 February 2019 – 15 February 2020

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report in good time for annual renewal.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

BMREC REGISTRATION NUMBER -130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE.