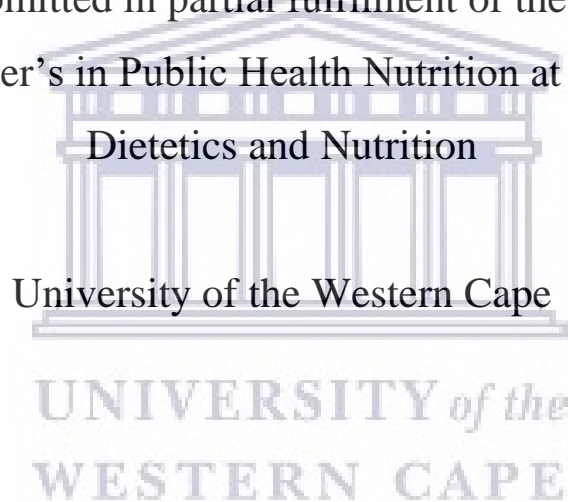


**The relationship between food environment, obesity and NCD
status among adults aged 30-70 years in Langa and Mount Frere,
South Africa.**

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3622300

A mini-thesis submitted in partial fulfilment of the requirements for
the degree of Master's in Public Health Nutrition at the Department of



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Abbreviations

BMI	Body Mass Index
CDC	Centres for Disease Control and Prevention
CI s	Confidence Intervals
CoE-FS	Centre of Excellence in Food Security
CVDs	Cardiovascular Diseases
F&Vs	Fruits and Vegetables
HICs	High-Income Countries
HPs	Health Professionals
IDF	International Diabetes Federation
KFC	Kentucky Fried Chicken
LMIC	Low- and Middle-Income Countries
MPHN	Master's in Public Health Nutrition
NCDs	Non-Communicable Diseases
NK	Nutrition Knowledge
OR	Odds Ratios
PA	Physical activity
PIs	Principal Investigators
PLAAS	Institute of Poverty, Land and Agrarian Studies
PURE	Prospective Urban and Rural Epidemiology
SA	South Africa
SAGE	Study of Global Ageing
SES	Socio-Economic Status
SOPH	School of Public Health
SPSS	Statistical Package for the Social Sciences
UWC	University of the Western Cape
WHO	World Health Organisation
WHtR	Waist to Height Ratio



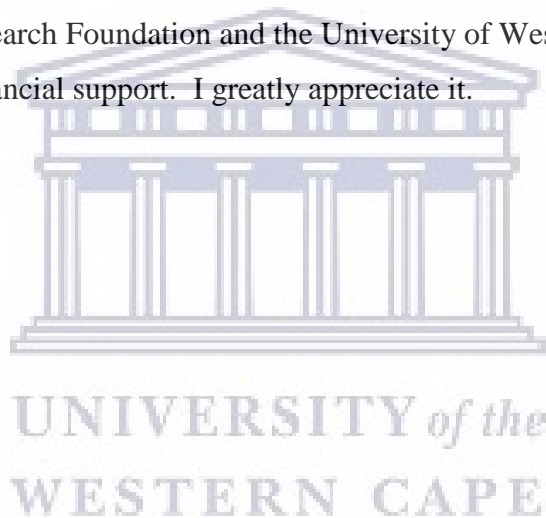
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Abstract

Background: Non-Communicable Diseases (NCDs) are some of the leading causes of death worldwide. Obesity results from the interactions between biology, behaviour, and environment. The current obesity epidemic is largely driven by environmental rather than biological factors, through its influence on social norms regarding food choices and lifestyle behaviours. The number of people dying from diabetes and hypertension keeps increasing because of the current obesity trend.

Aim: To examine the relationship between food environment, obesity and NCDs status of adults aged 30-70 years.

Study Design: Secondary data analyses of a quantitative cross-sectional study was done.

Population Sample: The study population was a sub-sample of 339 participants (222 from Langa and 117 from Mount Frere) of the 2000 baseline Prospective Urban and Rural Epidemiology (PURE) study participants for whom data on all of the aspects under investigation was available.

Data collection: The PURE study utilised standardised interviewer administered questionnaires previously tested and anthropometric measurements as well as blood sample collection for biochemical measurements. For the purpose of this study, demographic variables, eating habits, Physical Activity (PA) and the relevant biomedical measurements such as Blood Pressure (BP) Blood Glucose and Anthropometry were used.

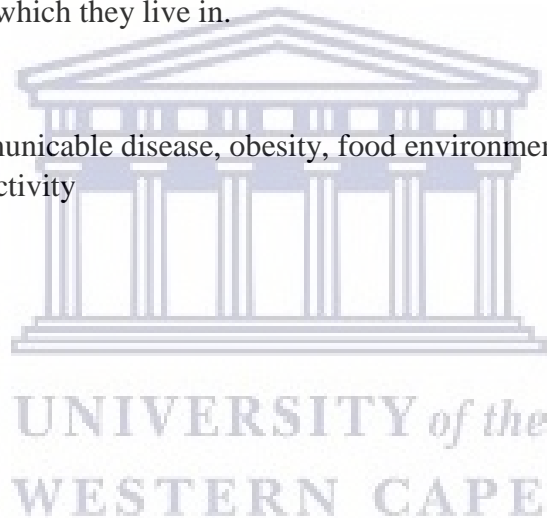
Analysis of Results: Data was analysed using Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics, including frequencies (n) and proportion (%) was analysed for categorical variables. Chi-square (χ^2) tests of significance was performed to show association between categorical variables and NCD risk factors

Results: Unemployment was high among the study participants with almost half (46.6%) of all participants being unemployed. Majority of female participants (51.7%) were found to be obese compared to their male (45.9%) counterparts. Diabetes was more prevalent in the urban sites (46.4%) compared to 14.5% of participants from the rural site. The prevalence of hypertension was mostly reported by rural (50.4%) participants compared to only 18.5% of participants in the urban site, p-value <0.001. The urban participants reported eating more fast foods compared to the rural site and the differences were statistically significant (p<0.001). There was significant association between nutrition knowledge and having an NCD status among adults in both the urban and rural site.

Conclusion: This study affirms socioeconomic status (SES) of black adults differ based on where they are located. The study also established that majority of females from both the urban and the rural areas have a higher Body Mass Index (BMI) and Waist to Height Ratio (WHtR) compared to males and the prevalence of obesity was slightly higher in the urban areas. People from the rural were found to be more hypertensive than those from the urban area. Diabetes is still mostly prevalent in the urban area. The food environment plays an important role in the way food is perceived and the nutrition knowledge.

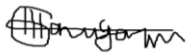
Recommendations: More outreach programmes and facilities of health that will address and educate people about obesity and the risk factors of NCDs are needed in the rural areas. Programme that are aimed at reducing obesity should focus more on females, taking into considerations the area in which they live in.

KEYWORDS: non-communicable disease, obesity, food environment, adults, diabetes, hypertension, physical inactivity



Declaration

I, Tshilidzi Manuga, declare that “The relationship between food environment, obesity and NCD status among adults aged 30-70 years in Langa and Mount Frere, South Africa” is my own work, and it has not been submitted for any degree or examination in any other university. All the sources I have used or quoted have been indicated and acknowledged by complete references.



Tshilidzi Millicent Manuga

15/03/2020



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1. CHAPTER ONE: INTRODUCTION

1.1 Introduction

Non-Communicable Diseases (NCDs) are major contributors to the global burden of disease.

NCDs are a medical condition or a disease that is non-infectious and non-transmittable to other people (Kim & Oh, 2013). They are among the leading causes of death worldwide. In 2015, NCDs alone accounted for 70% of all deaths globally (WHO, 2015). This trend is expected to increase and account for 73% of deaths worldwide in 2020 (WHO, 2018). A total of 269 500 South Africans was reported to have died from NCDs in 2016 while 26% of South Africans were found to be at a risk of premature deaths due to NCDs (WHO, 2018).

Diabetes and hypertension are noted to be among the most prevalent NCDs in South Africa (SA), affecting people living in both rural and urban areas (WHO, 2018). The number of people dying from diabetes and hypertension continues to increase, with approximately 18.2% of deaths in SA being the result of diabetes and/or hypertension. According to Stats SA (2016), these two diseases are found to be more prevalent among females (13%) than males (7.2%). Stats SA also reported that diabetes was the leading cause of death (8.6%) among black adults aged 45 years and older. Furthermore, diabetes accounted for 6.8% of deaths among adults in the Western Cape province (primarily urban) and 4.5% of deaths in the Eastern Cape province which is mostly rural. The percentage of people with hypertension was found to be similar among Eastern Cape (3.5%) and Western Cape (3.8%) National Department of Health (NDoH), Statistics South Africa (Stats SA), South African Medical Research Council (SAMRC), and ICF, 2019).

Obesity has been found to be one of the leading causes of most NCDs (Cois & Day, 2015). The Centres for Disease Control and Prevention (CDC) (2017) defines obesity as the range of body mass index (BMI) of 30 – 39.9 kg/m², while overweight is between the range 25 – 29.9 kg/m². Obesity has been recognized as a chronic disease by the World Health Organization (WHO, 2015). It is characterized by alterations in metabolic functions that result from an increase in total body fat mass as well as an accumulation of visceral adipose tissue (Van der Merwe & Pepper, 2006). Obesity results from the interactions between biology, behaviour, and environment (Campbell, 2015). Unfortunately, South Africa has not been spared of the current obesity epidemic that is still on the rise nationally and globally (Van der Merwe & Pepper, 2006). In 2016, 1.9 billion adults and 650 million adults were estimated to be overweight and obese respectively globally (Abarca-Gómez *et al.*, 2017). With South African women being found to be more obese and

overweight, having the combined prevalence of 69.3% for both overweight and obesity among adults. On the other hand, men had a 39% prevalence of combined overweight and obesity, with obesity alone showing a 14% prevalence rate (Ng *et al.*, 2014). Furthermore, about a quarter of boys and girls between 12 and 14 years are either overweight or obese (Abarca-Gómez *et al.*, 2017). The current obesity epidemic is largely driven by environmental rather than biological factors, through its influence on social norms regarding food choices and lifestyle behaviours (Cois & Day, 2015).

In South Africa, it has been found that persons of low socioeconomic status, residing largely in low-income locations which are largely obesogenic environments (Steyn & Mchiza, 2014), tend to be obese and are much more likely to engage in health risk behaviours (Mattes & Foster, 2014). However, Steyn and Mchiza (2014) found that overweight and obesity is no longer a problem of high-income countries (HICs) only but the prevalence rate is also increasing in low- and middle-income countries (LMICs) as well especially in urban settings. Peri-urban settings in SA are usually obesogenic environments, characterised by fatty foods and crime, which impedes people from engaging in physical activity (PA) (Micklesfield *et al.*, 2013). More so, environmental factors such as urbanisation are huge influencers of obesity in SA and it often results in unhealthy lifestyle choices such as unhealthy eating habits and little to no PA (Cobb *et al.*, 2015). Culture also has a big influence in the perception of body image among South African black women. Many of them prefer to have bigger bodies because being overweight is more acceptable and considered attractive by the black culture, which is the opposite for the white community in SA (Okop *et al.*, 2016). The environment that people live in influences their food choice, food accessibility and their eating habits (Mattes & Foster, 2014). Given the foregoing, the aim of this study is to examine the relationship between food environment, obesity and NCDs status of urban and rural residents. This study makes use of data from a DST/NRF Center of Excellence in Food Security (CoE-FS) study which was conducted on a sub-sample of a longitudinal study, the Prospective Urban and Rural Epidemiology (PURE) study.

1.2 Original studies

1.2.1 Prospective Urban and Rural Epidemiology (PURE) study

The PURE study is a multi-country cohort study. Its main aim is to track changing lifestyles, risk factors and chronic diseases in different population groups (Teo *et al.*, 2009). The University of the Western Cape's School of Public Health co-ordinates data collection in the Eastern and Western Cape Provinces of South Africa since 2009 (Igumbor *et al.*, 2010) with the North West University coordinating a rural and urban site in North West Province. The primary objectives of PURE study in South Africa are:

- (i) *to examine the relationship between societal influences and prevalence of risk factors and chronic non-communicable diseases*
- (ii) *to examine the relationship between societal determinants and incidence of chronic non-communicable disease events and on changes in rates of selected risk factors*

Utilizing periodic standardised data collection methods, the environmental changes, the societal influences on lifestyle, the risk factors and cardiovascular diseases (CVDs) are being tracked (Igumbor *et al.*, 2010).

1.2.2 Centre of Excellence in Food Security (CoE-FS) study

The CoE-FS is a virtual centre that is co-hosted by the University of the Western Cape and the University of Pretoria. The centre's main functions comprise of research, capacity building and dissemination on how a sustainable food system can be achieved to realise food security for poor, vulnerable and marginal populations. The Centres' work is structured under several research programmes, two of which are health and nutrition, and consumer choice and the food environment. Related research programmes include the food value chain as well as food production and processing. The CoE-FS provided funding to the PURE project, with the objective of investigating in greater detail the dietary choices and immediate food environment of the PURE cohorts in urban Langa in Cape Town, and rural Mount Frere in the Eastern Cape. The definition of the monthly household 'food basket' and factors shaping it are core to gaining a better understanding of the determinants of food and nutrition security in typical urban and rural settings.

1.3 Problem statement

Non-Communicable Diseases (NCDs) are among the leading causes of death in South Africa. The number of deaths due to NCDs continues to increase at a rapid rate among the black population of SA living in both urban and rural settings (Nojilana, 2016). The Black African population group makes up about 80.5 % of the South African population (Stats SA, 2015). Consequently, any disease of high morbidity and mortality such as NCDs with proven social determinants affects people living in different settings differently and will in turn have a negative impact on the overall health status of the country (Jan Mohamed *et al.*, 2015). Conducting studies in both rural and urban populations provides an opportunity to assess the type of relationship that exists in different types of locations rather than that between different socioeconomic statuses.

1.4 Rationale of study

This study seeks to explore the relationship between food environment, obesity and NCD status, specifically hypertension and diabetes, among urban and rural residents. Through such research, gaps in understanding the influence of environment on food practices and prevailing attitudes can be identified in order to plan interventions to address the issues that may lead to obesity and NCDs in adults.

1.5 Outline of the thesis

Chapter one gives a brief introduction on the prevalence of NCDs, focusing on risk factors such as obesity and physical inactivity. It also looks at the different socioeconomic status of South Africans from the urban and rural sites. It further articulates the research problem and the rationale of the study.

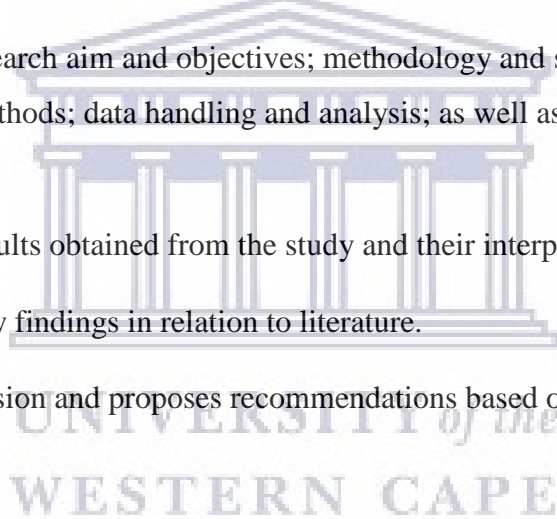
Chapter two scopes existing literature. It highlights the context of the research problem and provides a critical appraisal of the literature on NCDs, obesity and environmental factors.

Chapter three describes the research aim and objectives; methodology and study design, sampling of participants; data collection methods; data handling and analysis; as well as study limitations and ethical considerations.

Chapter four focuses on the results obtained from the study and their interpretation.

Chapter five discusses the study findings in relation to literature.

Chapter six outlines the conclusion and proposes recommendations based on the study results.



2. CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter will provide an overview of literature on the prevalence and the risk factors associated with NCDs, (behavioural factors, obesity, and socio-environmental and cultural factors). Lifestyle related chronic conditions as well as nutrition knowledge are also addressed in this chapter.

2.2 Prevalence and impact of NCDs

The prevalence of NCDs keeps rising in both LMICs and South Africa (SA) is no exception (Sanders *et al.*, 2016). NCDs are the leading causes of death globally and it results in approximately 16 million pre-mature deaths annually (WHO, 2015). Furthermore, the trend is expected to worsen and account for 73% of deaths worldwide in 2020 (WHO, 2015). Global projections indicate that the biggest increase in NCD deaths will occur in LMICs (WHO, 2010).

The International Diabetes Federation (IDF) reported that the number of adults living with diabetes in SA is approximately 4.5 million. this number is more than double the 2017 estimated figure (Yuen *et al.*, 2019) The IDF further explains that 12.7% of adults in SA have diabetes in 2019, which is a 137% increase on the 2017 figure of 5.4%. The figures are age-adjusted to allow comparisons between countries that take account of the differences in their populations' age structure (Yuen *et al.*, 2019). These numbers mean that SA has the highest proportion of adults with diabetes in Africa and the greatest number of deaths due to the disease.

The prevalence of hypertension in SA is also high, according to the Study of Global Ageing (SAGE), close to 70% (> 8 million people) of people 45 years and older in SA were hypertensive, with treatment coverage at only 27.5% amongst them (Hamid, Groot & Pavlova., 2019).

There is a 27% probability of dying between 30 and 70 years of age from CVDs, cancers, and NCDs in South Africa (WHO, 2015). The high mortality and morbidity rates of NCDs are predominantly caused by preventable risk factors such as obesity, physical inactivity and unhealthy diets (Abdelaal, le Roux and Docherty, 2017).

Apart from the impact they have on individuals, NCDs also have a large impact on the economy of the country and the livelihood of the people. These includes less productivity and increasing the need for healthcare services (Bloom *et al.*, 2012). The number of people who are expected to be affected by NCDs is increasing substantially and the global economy is expected to worsen in the coming decades (Ding *et al.*,

2016), the money spent treating cardiovascular disease, chronic respiratory disease, cancer, diabetes and mental health reveals that there will be a great loss of trillions over the next two decades (Bloom *et al.*, 2012).

The impact of NCDs resulted in 75% of global GDP loss in 2010 (Saleh *et al.*, 2018). The same money could have been spent towards eradicating poverty for other people (Saleh *et al.*, 2018). Although high-income countries currently bear the biggest economic burden of NCDs, the developing world, especially middle-income countries such as SA, is expected to assume an even larger share as the populations continues to grow (Ding *et al.*, 2016). The World Economic Forum's annual Executive Opinion Survey (EOS) shows that about half of all business leaders surveyed worry that at least one NCD will have a negative impact on the productivity of their business (Houghtaling *et al.*, 2019). If the trend continues to grow rapidly, the companies will suffer globally, especially in countries where the quality of healthcare or access to healthcare is perceived to be poor (Houghtaling *et al.*, 2019).

2.3 Behavioural factors associated with NCDs risk factors

Physical activity together with a healthy diet is important to maintain energy balance and therefore a healthy body weight and reducing the risk of NCDs (Reis *et al.*, 2016). Lack of PA plays a large role in health status of a person as inactivity often leads to weight gain and obesity, which puts the individual at a greater risk of developing NCDs such as diabetes and hypertension (Lavie *et al.*, 2017). Several studies on potential determinants of obesity of children and adolescents reported that children and adolescents with high media consumption time are more often obese than those with lower media consumption time (Steyn & Mchiza, 2014). Engagement with digital media is often associated with less physically active lifestyles (Steyn & Mchiza, 2014).

2.3.1 Unhealthy diets

Dietary practices and sedentary lifestyle are contributing majorly in the development of NCDs (Sami *et al.*, 2017). A study conducted in the United States of America that assessed the relationships between changes in lifestyle factors and weight change every 4-year interval from 1986-2006 found that within each 4-year period, participants gained weight due to their increased daily servings, the weight gain was strongly associated with the consumption of potato chips, potatoes, sugar-sweetened beverages, unprocessed red meats, processed meats and was inversely associated with the consumption of vegetables, whole grains, fruits, nuts and yogurt (Mozaffarian *et al.*, 2011).

The South African Food Based Dietary Guidelines (SAFBDGs) recommends that South Africans should “eat plenty of vegetables and fruit every day” (Vorster, Badham, & Venter, 2013). Even though there is evidence suggesting that Fruits and Vegetables (F&Vs) provide protection against NCDs, there is low consumption of F&Vs among South Africans (Tydeman-Edwards, Van Rooyen & Walsh, 2018). A mean frequency of less than once a day in relation to the consumption F&Vs was observed in all groups, contributing to a low intake of micronutrients (Tydeman-Edwards, Van Rooyen & Walsh, 2018).

A study conducted in Free State (FS) province showed a transition from the traditional diet to a western diet and the change was observed for participants from both rural and urban areas (Tydeman-Edwards, Van Rooyen & Walsh, 2018). In contrast to the expectation that urban participants are more overweight and follow a western diet compared to their rural counterparts, the study showed that rural participants were more overweight, and their diet was more westernized (Tydeman-Edwards, Van Rooyen & Walsh, 2018). Low consumption of fruits, vegetables, legumes, and milk have been observed for South African adults (Vorster, Badham, & Venter, 2013). Sugar was the most frequently consumed food item among all male and female participants while cooldrinks were the 11th most frequently consumed food. Frequent consumption of sugar is one of the most observed traits of nutrition transition (Smuts & Wolmarans, 2013).

In the urban township or in the urban areas in general, people have access to high energy dense foods, and this led to extra consumption of fatty which in turn leads to obesity (Haggblade, 2016). Different factors influence the consumption of energy dense foods and some of the factors that contribute to overweight include urbanisation, globalisation, socio-economic factors, cultural factors and dietary behaviours (Issaka *et al.*, 2018). Modification of diet by decreasing portions, eating more F&Vs as well as adapting healthy behaviours (such as cooking methods) when preparing food has been found to result to reduction of weights (Ley *et al.*, 2014).

2.3.2 Physical inactivity

Jerry Morris described PA as the “best buy” in public health. “Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure, the energy expenditure can be measured in kilocalories” (Dasso, 2019).

In 2012, it was reported by Lancet that an estimate of 5.3 million deaths per year are due to physical inactivity; the report went further to say that physical inactivity is one of the serious risk factors for chronic diseases that can be modified (Ding, 2016). Majority of people nowadays take taxis or use their own cars to get to places which, resulting in the reduction of being physically active. Another reason that has contributed

to inadequate exercise across all ages is the technological development (Colberg *et al.*, 2010). Children do not engage in outdoor activities as they before, instead they are on their cell phones, playing TV games and watching cartoons; adults on the other hand spend a lot of time watching TV, on social media platforms or in their computers (Dasso, 2019).

Inadequate PA leads to obesity which then contributes in the development of non-communicable. Literature shows that when people exercise and engage in different types of physical activities, they would have better health and escape from lifestyle disease (Reis, 2016).

Physical activity is one of the affordable and effective solution for the prevention and management of NCDs (Dasso, 2019). This was emphasized by the President of the WHO when he called for safe and accessible public spaces for physical activity; some of the strategies in place to promote being active include physical activity education and better infrastructure for sports (Colberg *et al.*, 2010). Although it is idealistic, efforts for a comprehensive way to promote being physical active at home is often unrealistic for most people, hence the importance of having facilities that promote physical activity within the environment the people stay in (Reis, 2016).

2.4 Obesity

Obesity has been described by the BMI of $\geq 30 \text{ kg/m}^2$ (Lavie *et al.*, 2017). Genetics plays a role in the body size of the individual which might lead to them being susceptible to obesity. However, it is said that our genes have not changed significantly over the past several decades, which means that changes in the environment might have been the cause of the recent obesity epidemic (Witten, 2016). Environmental factors associated with obesity are not only related to food but there are more plausible complex changes in the overall environment (Haggblade *et al.*, 2016). There are multiple related environmental changes apart from the food environment, such as lack of physical activity that plays a role in the epidemic of obesity. Unscrambling how each variable contributes to this epidemic is a difficult problem but food environment is likely the key contributor to the obesity epidemic (Swinburn *et al.*, 2019).

The prevalence of obesity has been increasing at an alarming rate and unfortunately, it is not limited to the adult population, but young children are also being affected (Lavie *et al.*, 2017). Overweight, obesity and high waist circumference have been associated with an increased risk for developing NCDs (Nnyepi *et al.*, 2015; Manning, Senekal and Harbron, 2016; Piernas *et al.*, 2016; Gouda *et al.*, 2019). Not only does obesity prevail in developed countries, literature shows that obesity has now become a public health issue that affects the world (Singh and Purohit, 2016; Biadgilign *et al.*, 2017; Chooi, Ding and Magkos, 2019). The

developed world, developing world as well as underdeveloped world has had increased prevalence of overweight and obesity over the years and research shows that this increase has implication in global health state. There are various risk factors that have been highlighted in literature that are known to have contributed to the increased obesity prevalence, specifically in developing countries such as South Africa (Cois and Day, 2015; Ford, Patel and Narayan, 2017).

Most of the studies that have been conducted in South Africa show that prevalence of obesity has increased rapidly in urban areas, especially poor urban areas (Malhotra *et al.*, 2008; Puoane, Tsolekile and Steyn, 2010; Cois and Day, 2015; Okop *et al.*, 2016). However, an emerging literature evidently shows concerns of rising obesity prevalence in rural areas of South Africa as well (Tydeman-Edwards, Van Rooyen and Walsh, 2018). Stats SA (2016) showed that there were 64.7% and 77.4% of overweight and obese adults in the Eastern Cape and Western Cape Province respectively and the trend is expected to increase (Statistics South Africa, 2016). Obesity is potentially a preventable condition, yet currently, it attributes to approximately 5% of deaths worldwide and if this trend continues, it is estimated that about half of the world's adult population would be overweight or obese by 2030 (Price *et al.*, 2018).

Apart from the risk factors associated with being obese, obesity also imposes a significant economic burden on an already strained health system and inflicts great costs to the country (Pisa *et al.*, 2015); Historically the poor living in LMICs, including South Africa, have over the years been shielded from obesity, leaving the rich more at an increased risk. This was contributed mainly by food unavailability and food insecurity among the poor (Swinburn *et al.*, 2019). Furthermore, the jobs held by the poor were mainly occupations that require high expenditure of energy compared to their rich counterparts (Swinburn *et al.*, 2019). Higher Income Countries (HICs) face different challenges in relation to food environment as a risk factor for obesity. For those countries, food security is usually not a problem, rather access to healthy food is more of a challenge (Swinburn *et al.*, 2019). Healthier foods are usually expensive for the poor which then leads to little or no consumption of healthy foods and a diet consisting of mainly high energy dense foods (Pisa & Pisa, 2017). A study conducted in rural SA reported that healthy food costs between 10% and 60% more compared to what is mostly consumed (Pisa & Pisa, 2017). Currently a multi-sectoral approach to address obesity in the country is not being implemented (Swinburn *et al.*, 2019).

2.5 Social and environmental factors

The environment is influenced by the surroundings, opportunities, or conditions of life that promote obesity in individuals or populations (Lake and Townshend, 2006). Obesogenic environments (obesity promoting) are perceived to be a driving force behind the escalating obesity epidemic (Lake and Townshend, 2006). Several factors have been identified as contributors to the problem of obesity; some of these factors are cultural, socio-economical, food availability, access and choice (Micklesfield *et al.*, 2013).

2.5.1 Cultural and social factors

In SA, there is large cultural diversity that influences perceptions of body image. In some cultures, overweight and obesity is perceived as being healthy and is associated with wealth, respect, beauty and dignity (Mattes & Foster, 2014). An overweight man gains status as they are seen/thought to have enough money to buy fast foods. Women think that being overweight is attractive and is considered healthy and makes a woman more dignified (Okop *et al.*, 2016). Research findings indicated that black girls desire to be overweight as it signifies wealth and happiness in black cultures (Okop *et al.*, 2016). People are also afraid of thinness because it is associated with illness and disease such as HIV/AIDS (Puoane, 2010). White girls on the other hand are seen to be heavily influenced by the western beauty idea, which shuns obesity (Mchiza, 2008).

2.5.2 Socio economic status in SA

South Africa is still battling issues of poverty, inequality, unemployment and hunger after celebrating more than two decades of democracy (Van der Westhuizen & Swart, 2015). The challenging issues identified include unemployment rate at (29%), the most vulnerable group that is burdened with unemployment is amongst the youth aged between 15–34 years as they account for 63,4% of the total number of unemployed persons (Stats SA, 2019). Poverty was reported to be at 59% while crime statistics were at 57% in SA, this poses a great concern for the South African citizens and the government need to address them urgently (Van der Westhuizen & Swart, 2015).

In South Africa, poor people are much more likely not to choose healthy food on cost grounds than people living in households with average incomes (Igumbor *et al.*, 2012). People of low-socio economic status (SES) consume foods that are affordable to them due to the limited budget, which leads to limited food choices (Steyn & Mchiza, 2014). Having limited budget may lead people to end up buying food that has high fat and sugar content. This may lead to weight gain and over a period of time, obesity (Popkin *et al.*, 2012).

2.5.3 Food availability, accessibility and choice

Besides food affordability, food availability has an influence on food choice (Krukowski *et al.*, 2010). Even though some people would like to get food of good quality, their geographic location might hinder them from accessing certain foods and their food choice might be compromised (Cobb *et al.*, 2015). Several studies indicate that food availability is an important factor that families of both high and low income consider when making food choices (Dachner *et al.*, 2010). In recent studies, supermarkets have been referred to in the literature as healthier food options than convenience stores and tend to offer food items at lower costs and higher quality (Reitzel *et al.*, 2016). Better access to supermarkets and food stores where healthy food is sold has been related to healthier food intakes, whilst greater access to convenience stores has been associated with a higher risk of obesity (Reitzel *et al.*, 2016). Also, meals at restaurants, especially from fast-food restaurants, tend to be of higher caloric density and of poorer quality than foods and beverages consumed at home, and therefore related to weight gain and obesity (Cobb *et al.*, 2015). However, this assumption may not be true in all settings due to the variability in quality and types of foods offered in food outlets (Cobb *et al.*, 2015). In addition to food availability being an important factor when it comes to purchasing, accessibility of certain foods may be influenced by other factors, including price and quality of the food (Krukowski *et al.*, 2010). Some research has indicated that healthier foods may cost more than unhealthy food items (Reitzel *et al.*, 2016).

Overall, availability and accessibility of healthy food in different geographic locations supermarkets is an important factor to consider when addressing food environments that supports the prevention of obesity, cardiovascular disease and NCDs (Krukowski *et al.*, 2010).

Other factors that contribute to food choices are food deserts and food swamps. Food deserts are defined as “residential areas with limited access to affordable and nutritious food” (Fitzpatrick, Greenhalgh-Stanley & Ver-Ploeg, 2019).), they have been described as one driver of the obesity epidemic and poor diet. people who reside near a grocery store are more likely to consume healthy foods and less likely to be obese (Jeffroy-Meynard, 2019). Food deserts and food swamps can co-exist in the same neighbourhood and are typically associated with the most economically vulnerable and primarily non-white communities (Hager *et al.*, 2017). People’s individual dietary decisions within food deserts and food swamps are influenced by access, availability, and cost (Hager *et al.*, 2017).

For instance, rural areas are primarily served by small grocery stores; any supermarkets that do exist are concentrated in regional hubs (Fitzpatrick, K., Greenhalgh-Stanley, N., & Ver Ploeg, M. (2019). These smaller stores often have a limited, less appealing, and more expensive selection of healthy foods than do

the supermarkets found in urban areas. this lack of acceptable and affordable healthy options may be influencing rural residents, including those with diabetes, to purchase more unhealthy items (Jeffroy-Meynard, 2019). Several studies, including some longitudinal studies, have found a positive association between small grocery stores and increased BMI in contrast to either a negative association or no association between supermarket availability and BMI (Hager *et al.*, 2017). In addition, the concentration of supermarkets in regional hubs means that rural residents must travel farther distances than their urban counterparts to access healthy foods, which is also made more difficult by the fact that rural areas often lack any public transportation (Fitzpatrick, K., Greenhalgh-Stanley, N., & Ver Ploeg, M. (2019).

2.6 Rural and urban differences in South Africa in relation to food environment

Maintaining good nutritional health is very important for both high and low-income populations (Mozaffarian *et al.*, 2011). These populations are filled with the poor who have little to no access to food and other resources due to inequality of living in rural or impoverished areas (Sharkey & Horel, 2008). The people in these communities' face obesity, increased morbidity, and a greater burden of diseases. Healthy food availability in homes largely depends on the geographic location and access to food such as the distance to food stores (Dean & Sharkey, 2011).

Previous researchers have identified that disadvantaged communities in the urban areas may influence inequality that residents are facing regarding access of healthy foods and the development of obesity (Igumbor *et al.*, 2012). Other research also recognizes that inequality between families among rural communities and families in urban areas also exists (Sharkey & Horel, 2008). Having difficult geographic access to grocery stores, families resort to spending a lot of money on travel costs to and from the grocery stores. (Dean and Sharkey, 2011) states that most research studies focusing on food access often examines unequal distribution of goods among different spatially embedded populations and they often focus on urban rather than rural environments.

2.7 Lifestyle chronic conditions

Several studies that have been conducted in most parts of the world, included those that were done in Africa and South Africa show that adverse socio-cultural and environmental factors are associated with increased risk of NCDs such as elevated blood pressure (hypertension) and elevated blood glucose (diabetes) (Micklesfield *et al.*, 2013; Ford, Patel and Narayan, 2017; Dendup *et al.*, 2018).

2.7.1 Diabetes

Diabetes has been seriously underrated as a global public health issue and the world can no longer ignore “the rise and rise” of type 2 diabetes (Franks & McCarthy, 2016). Diabetes is a metabolic disorder that results due to the lack of exercise and poor dietary intake and it is mainly caused by insulin resistance or by the lack of insulin (WHO, 1999; Smushkin & Vella, 2010). Some of the diagnostic criteria of diabetes mellitus include having a fasting plasma glucose level of more than 120 mg/dL (6.65 mmol/ L) and a glucose haemoglobin measurement greater than 7.0 percent (Hwang *et al.*, 2018).

Previously, diabetes used to affect middle-aged or older people and was referred to as “adult-onset diabetes” (Franks & McCarthy, 2016). Currently, type 2 diabetes is affecting both young children and teenagers, mainly due to childhood obesity (Franks & McCarthy, 2016). Obesity can lead to insulin resistance, especially visceral obesity (Unnikrishnan *et al.*, 2017).

In the past, chronic conditions such as diabetes were known to be more prevalent in high-income countries. However, in LMICs the prevalence of diabetes is currently catching up with higher income countries (Unnikrishnan *et al.*, 2017).

The International Diabetes Federation (IDF) estimated that by 2030, there would be 324 million people in the world with diabetes and by 2015, there were already 415 million people with diabetes, far above what the IDF predicted in 2000 (Zimmet, 2017). WHO also estimated the global prevalence of diabetes to 366 million by 2030 of which they were also wrong because the prevalence was above their estimate in 2015 (Zimmet, 2017). In 2014 WHO also estimated that there were 422 million people that had diabetes and approximately 25 million (7.1%) of those people were from African Region (WHO, 2016). A report that was published by the International Diabetes Federation showed that in 2017, the number of people that were diabetic globally had increased to 425 million and that the prevalence of diabetes in South Africa was estimated to be around 5.4% (Zimmet, 2017). This means that the latest estimated prevalence of diabetic cases among adults aged 20 to 79 globally (8.8%) in 2017 was higher when compared to the latest diabetes prevalence of South Africa (5.4%) by approximately 3.4% (Pheiffer *et al.*, 2018). Globally and in SA, diabetes is known to have resulted to high cases of morbidity and mortality (WHO, 2016). The rapid emergence of the chronic conditions such as type 2 diabetes in low and middle-income countries is sought to have been exacerbated by several factors such as socio- economic factors as well as urbanisation that has greatly contributed to obesity (Pheiffer *et al.*, 2018). The projected estimates of diabetes prevalence show that in 2045 there will be 629 million diabetic people in the world and that approximately 41 million of those people will be from Africa (Zimmet, 2017). In SA, The Lancet study predicted that by 2040 diabetes

will be the leading cause of death, contrary to 2016 where HIV/Aids was most prevalent (Coetzee *et al.*, 2019)

2.7.2 Hypertension

Hypertension is a chronic medical condition that occurs due to elevated blood pressure (more than 120mm/Hg systolic and 80mm/Hg diastolic pressure), a diagnosis of hypertension requires several readings that show sustained high blood pressure over time (Tackling and Borhade, 2019). Although the exact causes of hypertension are unknown, there are several factors that play a role, some of those factors include smoking, being overweight or obese, lack of physical activity, too much salt in the diet, high consumption of alcohol, stress, old age, genetics and family history of high blood pressure (Yousefi *et al.*, 2018).

Hypertension may result in complications such as heart failure, stroke or death if not managed properly (Tackling and Borhade, 2019). Hypertension is one of the leading burden of diseases, globally (Bromfield and Muntner, 2013). Most people that have elevated blood pressure frequently live with this condition for a long time without being diagnosed (Bromfield and Muntner, 2013). This is mostly caused by the fact that most of hypertension symptoms are like symptoms of other conditions. In 2008, nearly one billion of people in the world had elevated blood pressure (WHO, 2015). World Health Organisation reports show that the number of people who suffered from hypertension had increased to about 1.1 billion and approximately 66% of these were from LMICs (WHO, 2017).

South Africa Demographic Health Survey (SADHS) conducted a study in 2016 among South Africans who were 15 years and older to ascertain prevalence of hypertension. This study looked at both residents in urban and non-urban (SADHS, 2016). The results showed that 44% men and 46% women were diagnosed with hypertension. These statistics were almost doubled when compared to estimated prevalence of hypertension in 1998 for both men and women. This study further found that the Western Cape Province had highest prevalence of hypertension among men and that respondents that had no education had the highest prevalence of hypertension (Stats SA, 2016).

2.8 Nutrition knowledge

Nutrition knowledge is one of the important components that capacitate people to be able to make better food choice (Labban, 2015). Worsley (2002) in his study of nutrition knowledge and food consumption, highlights that nutrition knowledge alone might not be sufficient but it is necessary (Worsley, 2002). Most studies that have been conducted internationally and in South Africa have shown sufficient evidence that nutrition has an effect on one's health, and that poor diet is a major risk factor for the development of NCDs

(Musaiger and Al-Hazzaa, 2012; Dominguez, 2015; Holyńska *et al.*, 2015; Maayeshi *et al.*, 2019). Studies that have been conducted internationally and in South Africa have previously focused in finding relationships between nutrition knowledge and eating habits (Venter and Winterbach, 2010; Kunene and Taukobong, 2017; Mamba, Napoles and Mwaka, 2019). A study conducted among the low and middle income Hispanic and African American women on nutrition knowledge, attitude and beliefs associated with obesity showed that majority of African Americans had good nutrition knowledge while Hispanics had fair knowledge (Acheampong & Haldeman, 2013). Furthermore, attitudes and beliefs about healthy foods correlated with participants' weight or diet consumption. Both groups reported that the cost of healthy foods was the most common barrier to consuming healthy food (Acheampong & Haldeman, 2013).

In conclusion, the food environment that people are exposed to has an impact on their obesity and NCD status. The report published in the Lancet medical journal in 2018 which predicted a large global shift in deaths from infectious diseases to deaths from noncommunicable diseases such as diabetes, chronic obstructive pulmonary disease, kidney disease and lung cancer proves that the food environment we are now exposed to has caused a shift in the high prevalence of obesity and NCD diagnoses in the SA (Swinburn *et al.*, 2019).

The South African Department of Health has recognised that efforts to control obesity do not solely lie with an individual but will require engagement of different stakeholders to generate effective responses for the prevention and control of obesity (NDoH, 2016).

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3. CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

This chapter discusses the methods used to collect and analyse data for this study.

3.1 Aim of the study

The aim of this study is to examine the relationship between food environment, obesity and NCDs status of adults aged 30-70 years living in urban and rural settings in South Africa.

3.2 Objectives of the study

- i. To determine the socio demographic characteristics of adults aged 30-70 years in Langa (urban) and Mt Frere (rural).
- ii. To assess the relationship between obesity and NCD status of adults in Langa and Mount Frere.
- iii. To assess the relationship between food environment and NCD status of adults in Langa and Mount Frere.
- iv. To assess the relationship between physical activity and NCD status of adults in Langa and Mount Frere.
- v. To assess the association between nutrition knowledge and NCD status of adults in Langa and Mount Frere.

3.3 Study design

This study used secondary data from an established population-based cohort of the PURE and CoE-FS study. This study was conducted in two parts. The first part of the study was a quantitative cross-sectional analysis of the data from the 3-year follow up (data collected in 2015) of the PURE population-based cohort. The second part of the study was the exploration of food environment, nutrition knowledge and food perceptions using the CoE-FS data collected in 2015 on the same PURE participants. The data was collected concurrently for both studies in both study settings. Permission to use these databases was granted by the study Principal Investigators (PIs).

3.4 Study setting

This study used a subsample of PURE and CoE-FS data collected in Langa and Mount Frere. Langa is an urban township and a sub-district in Cape Town whereas Mount Frere is a rural village in the Eastern Cape. Langa Township is situated in the Western Cape Province with an estimated population of 52,401 of which 99% are black, 0.4% are coloured and 0.6 % are white (Stats SA, 2014). The majority of households live in

the informal settlement, predominately shacks (Stats SA, 2011). Most residents have zero to little land available for agricultural purposes. Stats SA (2014) estimated that about 42% of adults are employed and the sector of employment includes formal sector (82%) domestic work (10%) and informal sector (8%). Like most black townships of Cape Town, a significant proportion of residents in Langa (78%) live below the poverty line (Stats SA, 2018).

The rural counterpart Mount Frere is located in Alfred Nzo district in the Eastern Cape with a total area of 1,5000km² and an estimated population of 5,252 with 99% of them being black. The district is entirely rural. Most of the residents (84%) live below the poverty line and only 28% earn an average monthly income between R1001- 2500 with an unemployment rate of 76% (Stats SA, 2018). More than 90% of the population in both Langa and Mount Frère are Xhosa.

3.5 Sampling

The PURE study is an on-going investigation of the relative contribution of societal influences on individual lifestyle choices and on the risk factor of diabetes, obesity and CVD (Igumbor *et al.*, 2010). Participants were selected from two communities of Black South Africans - Mount Frere, a rural community located in the Eastern Cape Province and Langa, an urban settlement close to Cape Town in the Western Cape Province. The communities were purposively selected on the basis of having a relatively stable (non-migratory) black population for the feasibility of follow-up in a prospective cohort study (Igumbor *et al.*, 2010). In the PURE study, a street map obtained from the City of Cape Town was used to randomly select streets in each of the two areas. Once a street was selected, a systematic sample of every second house was approached for possible inclusion in the study. To be included, households needed to have at least one member who was aged 35-70 years. Trained field workers approach all eligible households for recruitment. For the PURE Study a sample of 2000 Xhosa-speaking adults between the ages 30-70 years of age, both male and female were recruited from an urban (Langa, Cape Town) and rural (Mount Frere, Eastern Cape) communities. In 2009 and 2010, the participants underwent detailed baseline assessments. Data collection incorporated the societal determinants of the built environment, nutrition environment, tobacco use and socioeconomic/ psychosocial determinants. Specific measurements include physical examination of blood pressures, anthropometry (weight, height, skin fold, waist and hip circumferences), electrocardiography, muscle strength using handgrip dynamometer, lung function test using a spirometer, blood and urine analysis including of glucose and lipids. Participants also completed questionnaires including a food frequency questionnaire.

All individuals who were “usual residents” were considered “household members” and eligible to be selected into the study. A “usual resident” was defined as one “who eats and sleeps in the household on most days of the week and in most weeks of the year and considered the household his/her primary place of habitation”.

During a 3-year follow up in 2015 (see [questionnaire](#)), a study by the CoE-FS purposely selected participants from the PURE study and conducted a survey focusing on knowledge, beliefs, and perceptions towards food and environment (see [questionnaire](#)). This study was a secondary analysis of data from PURE participants who also took part in the CoE-FS study and had their anthropometric measurements taken during a 3-year follow up.

3.6 Sample size

Two thousand (2000) participants were recruited in the urban (Cape Town) and rural (Mount Frere) arms of the PURE Cape Town study between 2009 and 2010. However, based on the inclusion criteria and for the purpose of this study, only 339 participants were purposely selected during the 3-year follow up data collection. Two hundred and twenty-two (65.5%) participants were peri-urban participants while 117 (34.5%) were from the rural site.

3.7 Data collection methods

This study used, study numbers to link participants who had participated in CoE-FS and those who had completed a 3-year PURE follow up study. The data of the eligible participants was extracted, and a new database was created using Microsoft Excel. The new database consisted of anonymised information on socio-demographic characteristics, physical measurements, food environment and nutrition knowledge. This database was used for the study analysis.

3.8 Validity and Reliability

The primary studies applied several strategies to strengthen the study rigor and trustworthiness. Validated tools and approaches were applied in its data collection. This included following a standardized protocol, training of data collectors, repeat measurements, calibration of measuring devices, conducting interviews in the local language (Xhosa), pre-testing of all tools and several strategies of error checking of the data (Igumbor *et al.*, 2010).

3.9 Generalizability

The PURE study cohort was established in two communities that are predominately Xhosa speaking people and may therefore not fully represent all urban and rural communities in South Africa. Findings from this

study may, however, suggest possible hypothesis which could serve as the basis for further investigation in other communities and population groups.

3.10 Data analysis

Data were analyzed using SPSS (Statistical Package for the Social Sciences) version 25 (SPSS Inc., Chicago, IL). Data from the study database was exported to the SPSS statistical software version 25. Frequencies and percentages were calculated to identify the distribution of socio-demographic information by site. Univariate analysis was conducted on the SES variables and the NCD status, which is presented as means and standard deviation for continuous data and as percentages for categorical data. This was performed separately for rural and urban study participants. Chi-square (χ^2) tests of significance was conducted for comparing proportions of categorical variables. Regression analyses were performed to identify the associations between BMI and NCD status, with 95% confidence intervals (CIs) was also calculated. Wherever Chi-square was used to test an association between the variables, Phi and Cramer values were used to determine the strength of the association. All statistical tests were two-tailed, and associations were considered to be statistically significant for a $p < 0.05$.

3.11 Limitations / Assumptions

This study used a sub-sample of the PURE participants, which is just a snapshot of the population. In spite of efforts to minimize bias, there is a potential for recall and measurement bias in the primary study arising from eliciting information. The current study was reliant on the data integrity of the primary study. Due to variation in geographical factors and socioeconomic status of different communities, the generalizability of the results obtained from this study might not be possible in different urban and rural settings within South Africa. In addition, an unequal number of participants from a rural and urban setting and an unequal number of males and females may affect representativeness.

3.12 Ethical statement

Ethical approval for the secondary analysis was obtained from the University of Western Cape Biomedical Research Ethics Committee prior to the commencement of the study ([Reference number BM 18/9/12](#)). Permission to conduct the nested study from which this study was sourced was requested from the International Steering Committee of the PURE study and the local Principal Investigators (Professors Rina Swart and Thandi Puoane). The request for permission made it clear that the proposed study was primarily being conducted as research for a mini-thesis towards the Masters in Public Health Nutrition (MPHN) degree at the University of the Western Cape.

Ethical clearance for the primary PURE study was obtained from the UWC Research and Ethics committee ([Reference number 08/4/4](#)). Participation in the study was voluntary and it was explained to the participants that they are free to leave the study at any time. All participants signed an informed consent form when they agreed to participate in the study.

During data handling, validation and analysis in the PURE study, only codes were used instead of names, and the outcome was reported devoid of identities. All data is being kept in lockable cabinets and computers which was accessible only by the researchers. The current study also complies with this data handling principle. Results of the current analysis are disseminated in line with the primary study protocol of publishing study results.



4. CHAPTER FOUR: RESULTS

4.1 Introduction

In this chapter, the results of the study are reported based on the objectives of this study. The findings included the demographic characteristics of the sample, the obesity and NCD status, as well as the food environment's influence on the prevalence of NCDs among the participants.

4.2 Demographic profile

The results of the socio-demographic profile of the participants are presented in Table 1 below. They include the difference in Age, Gender, Education level, Marital status, Employment status and their Monthly income.

4.2.1 Age and marital status of study participants

Between the two sites, only 74 (21.8%) of the study participants were males while 265 (78.2%) were females (Table 1). The overall mean age of participants was 57 years ($SD\pm 10.5$); with a mean age of urban participants being 56 years and mean rural age of 58 years. More of the rural participants were found to be in the older age categories than urban participants, and the results were significantly different ($P < 0.001$). The marital status characteristic of participants was significantly different in the two sites. Majority of the participants in the rural site (39.3%) were married compared to the participants in the urban site (20.3%). More than half (53.6%) of the urban participants reported that they were single compared to 20.1% of their rural counterparts. Only a few were divorced/separated in both urban (9.0%) and rural (7.7%) sites. A further 14.9% in urban and 28.2% in a rural site were found to be widowed.

4.2.2 Education and socio-economic characteristics of study participants

At least half of the participants in both the urban (58.1%) and the rural (50.4%) location had completed secondary education whilst 35.1% and 43.6% had completed only primary education, respectively (see Table 1 below). Only a few residents in the urban (0.9%) and rural (2.6%) had no education at all while about 5.0% in urban and 1.7% completed tertiary education. There was no statistically significant difference in education level between the urban and rural participants.

The socio-economic characteristics of the study population were established using descriptive statistics that considered mostly categorical data. Unemployment was high among the study participants with almost half (46.6%) of all participants being unemployed. Unemployment rate was slightly higher in participants from the rural site (50.4%) than the urban (44.6%) site, although this was not statistically significant. Majority of the participants (64%) in both sites receive an income between R0 – R2000 with more rural participants (72.6%) belonging in this low-income bracket.

Table 1 : Socio-demographic characteristics of the study participants by site (n=339)

	Characteristics	Urban n=222 (%)	Rural n=117 (%)	Total n =339 (%)	p-value
	Age (years) M±SD	56.1±10.3	58.8±10.7	57.0±10.5	0.021
Age Category (years)	30-40	5 (2.3)	8 (6.8)	13 (3.8)	<0.001
	41-50	74 (33.3)	14 (12.0)	88 (26.0)	
	51-60	72 (32.4)	41 (35.0)	113 (33.3)	
	61-70	71 (32.0)	54 (46.2)	125 (36.9)	
Gender	Male	53 (23.9)	21 (17.9)	74 (21.8)	0.209
	Female	169 (76.1)	96 (82.1)	265 (78.2)	
	Marital Status				<0.001
	Never Married	119 (53.6)	27 (23.1)	146 (43.1)	
	Married	45 (20.3)	46 (39.3)	91 (26.8)	
	Widowed	33 (14.9)	33 (28.2)	66 (19.5)	
	Divorced /Separate	20 (9.0)	9 (7.7)	29 (8.6)	
	Co-habiting	5 (2.3)	2 (1.7)	7 (2.1)	
	Education level				0.183
	None	2 (0.9)	3 (2.6)	5 (1.5)	
	Primary	78 (35.1)	51 (43.6)	129 (38.1)	
	Secondary	129 (58.1)	59 (50.4)	188 (55.5)	
	Vocational/ Trade	2 (0.9)	2 (1.7)	4 (1.2)	
	Tertiary	11 (5.0)	2 (1.7)	13 (3.8)	
	Employment Status				0.061
	Full-time	33 (14.9)	5 (4.3)	38 (11.2)	
	Part-time	17 (7.7)	8 (6.8)	25 (7.4)	
	Self-employed	15 (6.8)	9 (7.7)	24 (7.1)	
	Unemployed	99 (44.6)	59 (50.4)	158 (46.6)	
	Retired	58 (26.1)	36 (30.8)	94 (27.7)	
	Monthly income				0.054
	R0 - R2000	132 (59.5)	85 (72.6)	217 (64.0)	
	R2001-R5000	73 (32.9)	29 (24.8)	102 (30.1)	
	R5001-R10000	15 (6.8)	2 (1.7)	17 (5.0)	
	≥R10000	2 (0.9)	1 (0.9)	3 (0.9)	

4.3 Anthropometric and NCDs condition characteristics of the participants by location

Anthropometric assessments and NCDs characteristics of participants were assessed in each of the sites. The results are presented below.

4.3.1 BMI by gender variation

The study consisted of both male and female participants. Majority of the participants were female. Obesity was found to be more prevalent in females (51.7%) than in males (45.9%). Overweight was also found to be more prevalent among females (23.4%) compared to their male (21.6%) counterparts who are overweight. Only 22.6% of females and 31.1% of males were found to be normal weight and minority of the study participants were underweight with only 2.3% females and 1.4% males falling in that category. The anthropometric differences between women and men were, however, not statistically significant ($p=0.049$) (see Table 2 and Figure 1 below).

Table 2: BMI by gender variation

Gender	Female n= 265 (%)	Male n=74 (%)	Total n=339 (%)	p-value
BMI by Gender				0.49
Underweight (≤ 18.5)	6 (2.3)	1 (1.4)	7 (2.1)	
Normal (18.5-24.9)	60 (22.6)	23 (31.1)	83 (24.5)	
Overweight (25-29.9)	62 (23.4)	16 (21.6)	78 (23.0)	
Obese (>30)	137 (51.7)	34 (45.9)	171 (50.4)	

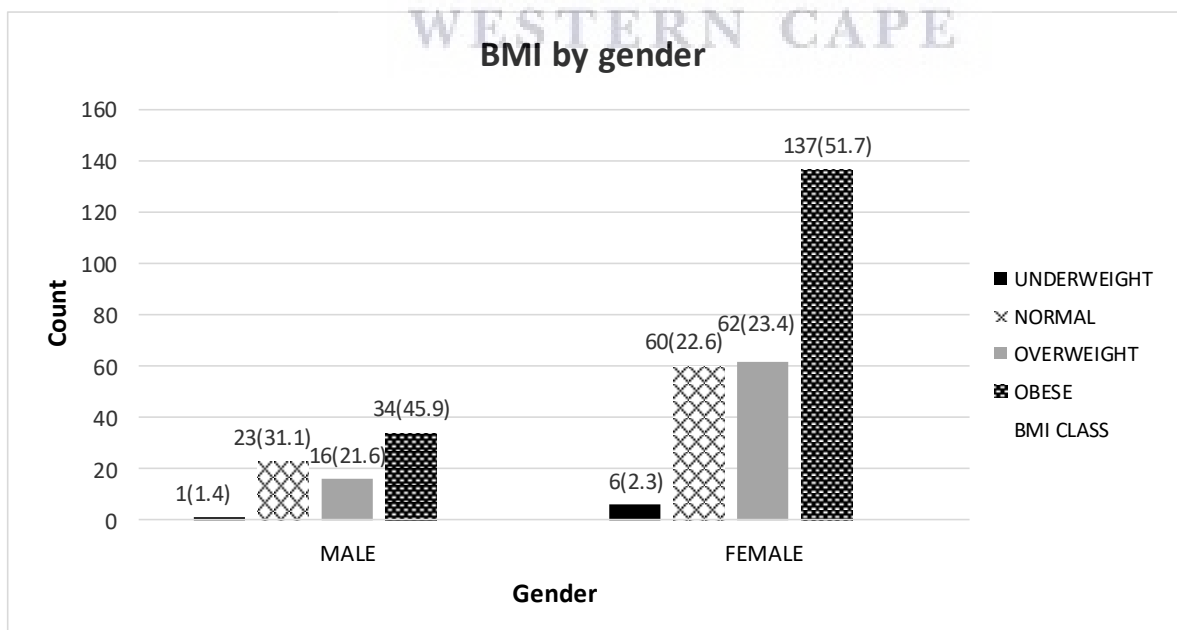


Figure 1: BMI by gender for all adult participants (p=0.49)

4.3.2 BMI classifications among adults by site

Table 3 below shows the results of the weight and NCD status of participants by site.

Analysis of the BMI showed that the prevalence of obesity is high among study participants in both the urban (52.3%) and rural (47.0%) site. Rural participants have a slightly lower prevalence of obesity compared to their urban counterparts, whilst they showed a slightly higher prevalence of participants who are overweight (27.4%) compared to those from the urban site (20.7%).

There is not much difference in the prevalence of participants falling under a normal classification of a BMI in urban (24.8%) and rural (23.9%) residents and both urban (2.3%) and rural (1.7%) sites had few participants with a BMI of less than 18.5kg/m², which classifies them as being underweight.

4.3.3 Waist to Hip Ratio classification by site

In addition to the BMI analyses of the weight status, WHtR was measured on all participants. Similarly, to BMI, the results of the analysis showed that majority (83.5%) of the participants have high values of WHtR, which classifies them at high risk of abdominal obesity (Table 3). This applies to both urban (82.9%) and rural (84.6%) participants (p=0.68).

4.3.4 Diabetes Mellitus diagnosed by site

A known diagnosis of Diabetes mellitus of participants was significantly different in the two sites. Among all the participants who were diabetic (35.4%) from both sites, the majority of diabetic participants were from urban sites (46.4%) whilst only 14.5% of participants from the rural site reported having diabetes. The difference in association between diagnoses of diabetes by sites was statistically significant in the study population, p-value <0.001.

4.3.5 Hypertension diagnosed by site

As was seen with diabetes, the distribution of hypertension was statistically significantly different between participants in urban and rural sites. A smaller proportion of all participants (29.5%) reported having been diagnosed with hypertension. Unlike with diabetes, the prevalence of hypertension was 50.4% in rural participants compared to only 18.5% of participants in the urban site, p-value <0.001.

Table 3: Weight and NCDs (Diabetes and Hypertension) characteristics of participants in Urban and Rural sites

Characteristics	Urban n=222 (%)	Rural n=117 (%)	Total n =339 (%)	P-value
BMI Category				0.57
Underweight	5 (2.3)	2 (1.7)	7 (2.1)	
Normal	55 (24.8)	28 (23.9)	83 (24.5)	
Overweight	46 (20.7)	32 (27.4)	78 (23.0)	
Obese	116 (52.3)	55 (47.0)	171 (50.4)	
WHtR				0.68
Low risk (≤ 0.5)	38 (17.1)	18 (15.4)	56 (16.5)	
High risk (>0.5)	184 (82.9)	99 (84.6)	283 (83.5)	
Diabetes				<0.001
Yes	103 (46.4)	17 (14.5)	120 (35.4)	
No	119 (53.6)	100 (85.5)	219 (64.6)	
Hypertension				<0.001
Yes	41 (18.5)	59 (50.4)	100 (29.5)	
No	181 (81.5)	58 (49.6)	239 (70.5)	

4.4 Association between food environment and NCD status of adults in Urban and Rural sites

Table 4 below shows the overall prevalence of participants with NCDs as well as their prevalence in each of the two study locations. It also shows behavioural factors that might increase or reduce their risk of developing or worsening their NCD status. This focuses on whether having a garden, physical activity and eating in restaurants' (formal and informal) have an influence on NCDs status for urban and rural participants.

Table 4: Food environment and NCDs (Diabetes and Hypertension) characteristics of adults in Urban and Rural sites.

Variable	Urban n=222 (%)	Rural n=117 (%)	χ^2	Df	P-value
Do you have an NCD?			1.680	1	0.195
Yes	144 (64.9)	76 (65.0)			
No	78 (35.1)	64 (35.0)			
Do you have a vegetable garden?			229.309	1	<0.001
Yes	11 (5.0)	101 (86.3)			
No	211 (95.0)	16 (13.7)			
Do you engage in PA?			4.230	1	0.040
Yes	185 (83.3)	10 (8.5)			
No	37 (16.7)	107 (91.5)			
Do you eat in a formal fast food restaurant?			15.907	1	<0.001
Yes	134 (60.4)	44 (37.6)			
No	88 (39.6)	73 (62.4)			
Do you eat in an informal food restaurant?			91.978	1	<0.001
Yes	144 (64.9)	12 (10.3)			
No	78 (35.1)	105 (89.7)			

The results of this analysis showed an equal number of participants from the urban and the rural area (65%) reported being diagnosed with an NCD (Diabetes or/and Hypertension). Less than half the participants in the urban and rural (35%) reported to not have NCDs. Chi-square (χ^2) analysis showed that the number of participants who reported to have NCDs was not significant, $p < 0.19$.

Majority of participants in the urban setting reported that they participate in some form of PA (83.3%) whilst the majority of the rural participants (91.5%) reported not to engage in PA. Chi-square (χ^2) analysis showed that the number of participants who reported to engage in PA in the two areas was significantly

different with ($\chi^2= 4.230$; $p<0.040$). Having a garden was more prevalent in the rural (86.3%) setting compared to the urban (5.0%) setting. Chi-square (χ^2) analysis showed that the number of participants who reported to have a garden was significantly different between these two areas ($\chi^2=229.309$; $p<0.001$).

The urban setting has a high prevalence of people eating in formal fast food restaurants (for example KFC, MacDonald’s and others) compared to their rural counterparts. Furthermore, a greater proportion of the urban setting (64.9%) reported that that they eat in informal fast food restaurants (such as food stalls) compared to those in the rural (10.3%) settings. The differences between urban and rural participants were found to be statistically significant ($\chi^2=91.978$; $p<0.001$)

4.4.1 Logistic regression analysis on the association between NCDs and food environment

Tables 5 to 8 reports on the association between NCD status and food environment characteristics that were analysed using logistics regression. The aim of the analyses was to assess whether there is any relationship between lifestyle behaviours (eating habits and exercising) and an NCD diagnosis. The assumption is that people from the rural site have a garden and eat less of restaurant food and thus have a lower prevalence of people with NCDs. When it comes to physical activity, people assume that urban participants have access to facilities (such as gyms and sports halls) that makes it easy for them to exercise and make them more physically active than people in rural sites. This section of the results will look at whether there is an association between the four variables (PA, having a garden, eating in formal and informal restaurants) and NCD status.

Table 5: Summary of Logistic Regression analysis for variables predicting the association between NCDs and PA for urban and rural (n=339) participants

		95% CI. for EXP(B)							
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1 ^a	NCD diagnose (1)	.255	.316	.650	1	.420	1.290	.695	2.396
	Constant	-1.959	.233	70.666	1	.000	.141		

Variable(s) entered on step 1: NCD diagnose.

Table 5 above shows the results for analysis using logistic regression adjusting for the association between NCDs and PA. Following the analysis, those who reported engagement in PA were slightly more likely to have an NCD diagnosis (Diabetes and/or Hypertension) compared to those who reported that they do not engage in PA. However, this difference was not statistically significant (95% CI 0.695 – 2.396; $p < 0.420$).

Table 6: Summary of Logistic Regression Analysis for Variables Predicting the association between NCDs and the availability of a garden for urban and rural (n=339) participants

		95% CI. for EXP(B)							
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1 ^a	NCD diagnose (1)	-.169	.231	.534	1	.465	.845	.537	1.329
	Constant	.792	.166	22.874	1	.000	2.208		

Variable(s) entered on step 1: NCD diagnose.

Table 6 above shows the results for analysis using logistic regression adjusting for the association between NCDs and the availability of a vegetable garden in a household. Following the analysis, the participants who have a vegetable garden in their households were less likely to have an NCD diagnosis (Diabetes and/or Hypertension) compared to those who reported that they do not have a garden. The results of the analysis were not statistically significant (95% CI 0.537 – 1.329; $p < 0.465$).

Table 7: Summary of Logistic Regression Analysis for Variables Predicting the association between NCDs and eating in formal restaurants for urban and rural (n=339) participants

		95% C. I. for EXP(B)							
		B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Step 1 ^a	NCD diagnose (1)	.037	.218	.028	1	.867	1.037	.677	1.590
	Constant	.141	.154	.846	1	.358	1.152		

Variable(s) entered on step 1: NCD diagnose.

The results for the analysis presented in the table above using logistic regression adjusting for the association between NCDs and eating in a formal fast food restaurant. The results show that participants

who eat in fast food restaurants were more likely to have an NCD diagnosis (Diabetes and/or Hypertension) compared to those who reported that they do not eat in fast food restaurants. The results of the analysis were not statistically significant (95% CI 0.677 – 1.590; $p < 0.867$).

Table 8: Summary of Logistic Regression Analysis for Variables Predicting the association between NCDs and eating in informal restaurants for urban and rural (n=339) participants

								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1	NCD diagnose (1)	.272	.218	1.555	1	.212	1.312	.856	2.012
	Constant	-.236	.154	2.342	1	.126	.789		

a. Variable(s) entered on step 1: NCD diagnose.

The results for the analysis presented in table 8 above using logistic regression adjusting for the association between NCDs and eating in an informal fast food restaurant. The results show that participants who eat in informal fast food restaurants (e.g. food stalls, street vendors) were more likely to have an NCD diagnosis (Diabetes and/or Hypertension) compared to those who reported that they do not eat in informal fast food restaurants. The results of the analysis were not statistically significant (95% CI 0.856– 2.012; $p < 0.212$).

4.5 Food perception, nutrition knowledge (NK) scores, and NCD status of participants

This section of the results will look at whether the environment has an influence on the nutrition knowledge, perception and consumption of foods. The questions in this section include what the participants perceive to be healthy/unhealthy food, physical activity and what are their source of information on food.

4.5.1 Perception on the recommended daily servings of fruit and vegetables

Participants were asked on what they believe is the recommended daily serving of F&Vs. The answers were grouped in either correct answer (between 4-6 serving) or incorrect (>4 , ≤ 7 and don't know) answer. Analysis of the results shows that majority of the participants (72.3%) from both sites had incorrect answers. Only (34.2%) of the participants from the urban site and (15.4%) from the rural site were correct and said the recommended serving size of (F&Vs is 4-5 servings. However, majority (84.6%) of the rural participants reported to either not know/ give incorrect answers on how many F&Vs health professionals recommend

daily. Analysis was found to be statistically significant, $p < 0.001$. The scores are presented in the table 9 and figure 2 below.

Table 9: Answers on perceived recommended serving of F&Vs

	Urban n=222 (%)	Rural n=117(%)	Total n=339 (%)	p-value
Servings of F&Vs answers				<0.001
Correct answer	76 (34.2)	18 (15.4)	94 (27.7)	
Did not know/Incorrect answer	146 (65.8)	99 (84.6)	245 (72.3)	

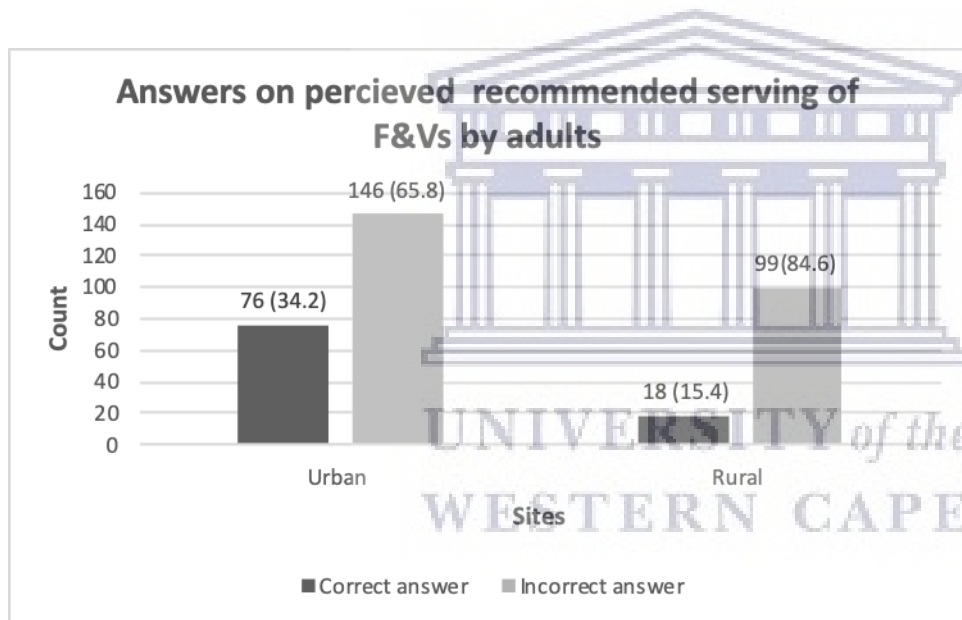


Figure 2: Perceptions on the recommended daily servings of F&Vs ($P < 0.001$)

4.5.2 NK scores of participants

The nutrition knowledge (NK) scores of the participants were estimated using information collected from a section of the knowledge, beliefs and perceptions towards food and environment questionnaire (see the [CoE-FS questionnaire](#)). A single point was awarded to each correct answer regarding foods' composition of sugar, salt, starch, protein and fibre. The scores were grouped into three categories and participants' knowledge was classified in 3 categories (low, average and acceptable)

- Low – A score between 0-5, Average – a score between 6-10 and Acceptable – a score between 11-15. Acceptable).

Using cross tabulation, the nutrition scores of the participants were calculated. The maximum sum of the questions were 15 points for each participant if his/her responses are correct to all food groups mentioned. The scores showed that majority of participants from both urban and rural sites had average nutrition score of 49,5% and 61,5% respectively. Almost half of the urban participants (43.7%) received a high acceptable NK compared to just over a quarter of rural participants (25.6%). Both sites had low percentage of people who have low NK. The results were significant, $p=0.003$ and are presented in a table and graph below.

Table 10: NK score by site

		SITE		
		Urban=222 (%)	Rural n=117(%)	Total n=339(%)
<i>NK scores</i>	Low	15 (6.8)	15 (12.8)	30 (8.8)
	Average	110 (49.5)	72 (61.5)	182(53.7)
	Acceptable	97 (43.7)	30 (25.6)	127 (37.5)

$p=0.003$

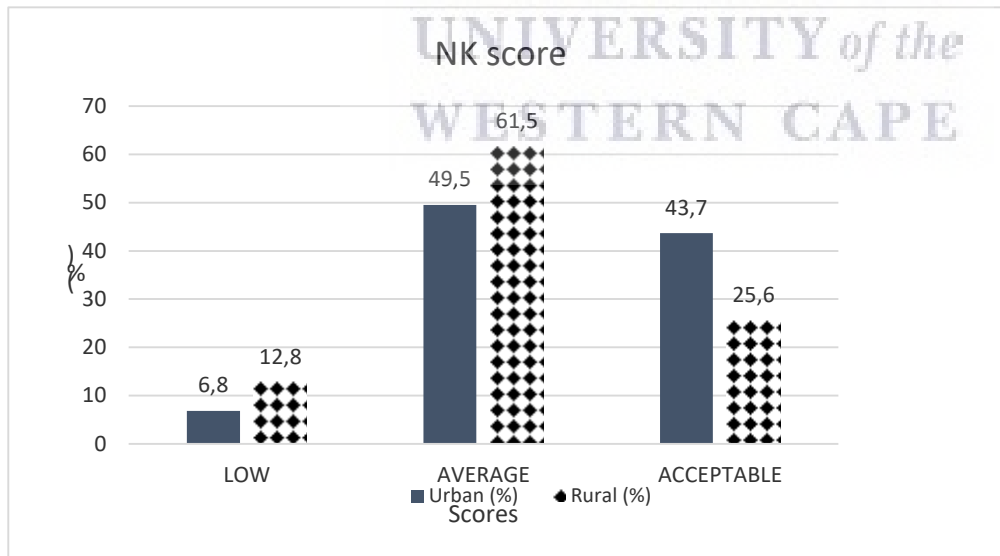


Figure 3: NK scores of adults from urban and rural settings ($p=0.003$)

4.5.3 Source of information on food

Having shown that participants who reported to not know what health professionals recommend for daily serving of F&Vs and with a slightly lower NK were more prevalent in the rural locations compared to the urban, further analysis was done to ascertain the source of food information from both sites. This was done using cross-tabulation and by computing the Chi square as well as the P-values. Generally, participants from both sites mentioned parents as their source of information. Majority of participants from the rural site also mentioned print material and TV as their source of information. On the other hand, friends and dieticians were some of the main sources of information mentioned by participants from the urban site. Most of the analysis was significant; the results of the analysis are presented in Table 11 below.

Table 11: Participants' main sources of information on food

Source of information on food	SITE		p-value
	Urban n=222 (%)	Rural n=117 (%)	
Parents	171 (77)	77 (65.8)	0.02
Friends	104 (46.8)	6 (5.1)	<0.001
Television	29 (13.1)	110 (94)	<0.001
Radio	17 (7.7)	7 (6)	0.57
Print material	7(3.2)	115 (98.3)	<0.001
Health workers	10(4.5)	24 (20.5)	<0.001
Dieticians	87 (39.2)	2 (1.7)	<0.001
Other	2 (0.9)	12 (10.3)	<0.001

4.5.4 Relationship between Nutrition Knowledge and BMI Status of Urban and Rural participants

Table 12 below shows the relationship between NK and BMI status of participants from both urban and rural sites. The results show that majority of the participants had average NK scores. More than 60% of participants who were obese had average NK scores. With participants who were overweight, almost half of them had either average (44.9%) or acceptable (44.9%) NK. Similar results were reported for participants with normal weight, majority of them either had average (45.8%) or acceptable (42.2%) NK. Participants who were underweight either had low or average NK scores only; the results of the analysis were significant.

Table 12: NK vs. BMI status (overall)

		BMI status				
		Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	Total (%)
<i>NK scores</i>	Low	2 (28.6)	10 (12)	8 (10.3)	10 (5.8)	30 (8.8)
	Average	5 (71.4)	38 (45.8)	35(44.9)	104 (60.8)	182 (53.7)
	Acceptable	0 (0.00)	35 (42.2)	35(44.9)	57 (33.3)	127 (37.5)

p=0.019

4.5.5 Relationship between NK and overall NCD status of urban and rural participants.

Table 13 and 14 below shows results of the analysis regarding the relationship between NK and NCD status of participants from both urban and rural sites.

4.5.5.1 Relationship between NK and diabetes status of urban and rural participants (overall)

Analysis for NK and diabetes status was done to see whether those with diabetes have a low, average or acceptable knowledge scores compared to participants who do not have diabetes. The results of showed that majority of the participants who had diabetes (46.7%) had a higher acceptable NK score compared to those with no diabetes (32.4%). Almost 60% of participants with no diabetes had an average NK score compared to only 43.4% of their diabetic counterparts. Both participants who are diabetic (10%) and non-diabetics (8.8%) had a few participants who had low NK. The results were found to be significant.

Table 13: NK vs Diabetes status (overall)

		Diabetes Diagnosed		
		Yes n=120 (%)	No n=219 (%)	Total n =339 (%)
<i>NK scores</i>	Low	12 (10.0)	18 (8.2)	30 (8.8)
	Average	52 (43.3)	130 (59.4)	182 (53.7)
	Acceptable	56 (46.7)	71 (32.4)	127 (37.5)

p=0.017

4.5.5.2 Relationship between NK and hypertension status of urban and rural participants

Analysis for NK and hypertension status was done to see whether those with hypertension have a low, average or acceptable knowledge scores compared to participants who do not have hypertension. Unlike the results of diabetes vs NK, these results showed that majority of the participants who had diabetes (55.4%) had a higher average NK score compared to those with no diabetes (52.9%) whereas those without hypertension had a slightly higher acceptable score (39.5%) in comparison to those with hypertension. Both hypertensive (11.9%) and non-hypertensive (7.6%) had a few participants who had low NK.

Table 14: NK vs Hypertension status (overall)

		Hypertension Diagnosed		Total n=339 (%)
		Yes n=100 (%)	No n=229 (%)	
<i>NK scores</i>	Low	12 (11.9)	18 (7.6)	30 (8.8)
	Average	56 (55.4)	126 (52.9)	182(53.7)
	Acceptable	32 (32.7)	95 (39.5)	127 (37.5)

p=0.293

4.5.5.3 Relationship between NK and overall NCD status of urban and rural participants

Although the results were not significant, they showed that majority (53.7%) of participants had an average NK score. Among those with diabetes and/or hypertension, majority of them (48.8%) have an average NK score. Around 41.1% of participants with NCD had an acceptable NK score. Similar results were reported for participants who did not have NCDs, majority (58.5%) of them had average NK and 33.9% had an acceptable NK.

Table 15: Nutrition Knowledge vs. NCD status (overall)

		NCD Diagnosed		Total (%)
		Yes (%)	No (%)	
<i>NK scores</i>	Low	17 (10.1)	13 (7.6)	30 (8.8)
	Average	82 (48.8)	100 (58.5)	182(53.7)
	Acceptable	69 (41.1)	58 (33.9)	127 (37.5)

p=0.198

5. CHAPTER FIVE: DISCUSSION

5.1 Introduction

In this study, the relationship between obesity, food environment and the NCD (hypertension and diabetes) status of black South Africans in both an urban and rural population was studied and compared. The results also assessed the SES of adults living in the urban location and showed that it was significantly different from those in the rural location. The positive NCD status (being diabetic or/and hypertensive) were generally more prevalent among urban adult Black Africans compared to the rural Black Africans. This chapter will discuss the association between food environment and NCD status by comparing the different anthropometric measurements, nutrition knowledge and food perceptions of adults from the two sites in relation to what is already known.

5.2 Socio-demographic profile: urban and rural comparison

The socio demographic factors of the two sites are expected to be different. Eastern Cape province that has the highest number of adults living in poverty in SA; the opposite results were reported for Western Cape, as it is one of the two provinces with the lowest proportions of adults living in poverty (Stats SA, 2017). The results of this study also suggest that even though there is high level of unemployment from both sites, the rural site had a slightly higher rate compared to the urban site. Although majority of participants from both sites have an average monthly income of less than R2000, the rural site has an even higher number of participants living with an average income ranging between 0-R2000 per month. Considering the inflation in SA, majority of participants are living below the upper bound poverty line of R1227 per person per month as of 2019 (Stats SA, 2019).

When it comes to education, Black South Africans have been denied access to education in the past due to the apartheid regime that existed before democracy, this study found that many of the study participants (55.5%) had completed secondary education but only 3.8% had completed post-secondary education. This suggests that there is high level of secondary education attainment while there is low level of higher education attainment. Stats SA (2011) suggested that about 8.3% of black South Africans had some post-secondary education as of 2011, which is in line with the findings of this study. Participants from the rural site even have a less percentage of those with post-secondary education.

The study consisted of more females than males from both sites. There were more single participants in the urban compared to rural site but more married and widowed participants in the rural location. This disparity in marital status could be attributed to the fact that rural participants get married at younger age compared to

the urban participants. Stats SA (2016) on their divorce report mentioned that the mean age for women getting married is 27 years in the rural areas compared to 33 years in the urban areas. Socio-economic factors have an influence on the overall health of people (Micklesfield *et al.*, 2013) and for this study, they have an impact on the weight and NCD status of participants.

5.3 Obesity prevalence: Urban and Rural comparison

Overweight and obesity have been linked to developed countries in the previous years, but with urbanisation and changes in lifestyle behaviours, the prevalence of obesity is on the rise in South Africa. Dietary transition is one of the transitions experienced by the population of South Africans. One of the hypotheses for the transition is reported to be the adoption of western diet in most communities. The rise in the prevalence of obesity, especially within the black female population has been observed. Using BMI and WHtR as a measure of weight status, this study revealed that most of the study participants are either overweight or obese. Majority of those who are overweight (23.4%) or obese (51.7%) were females compared to their male counterparts. The SADHS (2016) reported similar results in their study where they found an average of 29.2% of women in South Africa to be obese compared to only 23.6% of men. Recent studies have been reporting on the nutrition transition happening in both the rural and urban areas, which is possibly the reason behind the high prevalence of obesity from both sites (Crush, Frayne and McLachlan, 2011; Nnyepi *et al.*, 2015; NDoH *et al.*, 2019). Even though this study reported a slightly higher prevalence of obesity, the results also show that the prevalence of overweight was higher in the rural site. In addition to BMI as a measure of weight status, the waist-to-height ratio (WHtR) has gained attention as an anthropometric index for measuring central adiposity (Ashwell & Gibson, 2016). A prospective study of body size and risks of NCDs conducted on 45,000 women in Germany showed that using WHtR as a measure of abdominal obesity was a strong predictor of stroke in the 11 years of follow-up, compared to BMI (Yoo, 2016). Even though the WHtR results of this study are similar with that of the BMI, this measure revealed that more than 80% of participants from both the rural and urban site are at high risk of abdominal obesity which might lead to NCDs and CVDs.

5.4 NCDs (diabetes and hypertension) prevalence: Urban and Rural comparison

Hypertension and diabetes are two of the leading cause of the burden of non-communicable diseases in developing countries. In the Eastern Cape, hypertensive heart disease has become the second most common cause of death, and diabetes followed third as the most common cause of death (Morris-Paxton *et al.*, 2018). The Western Cape has also shown an increase in the prevalence of hypertension and diabetes. Data reported in the 2013 Western Cape Mortality Profile 4 indicates that NCDs have accounted for an increasing proportion of deaths between 2009 and 2013 (57% and 61% respectively) and the trend is expected to

increase (Sheik *et al.*, 2016). This study looked at the prevalence of hypertension and diabetes from the rural and the urban location. The high prevalence of diabetes reported by participants from the urban site compared to their rural counterparts corresponded to higher prevalence of overweight and obesity in the urban than in rural sites, suggesting that weight status might be an influencing factor. A study by Price *et al* (2018) that compared obesity and diabetes among rural and urban participants in Malawi reported similar results with majority of participants who were obese (62%) and diabetetic (20%) being from the urban site compared to 36% obese and 6% diabetics of their rural counterparts. Hypertension on the other hand showed different results to that of diabetes. Rural participant had a significantly higher prevalence of hypertension (50.4%) in comparison to urban participants with only (18.5%) reporting to have hypertension.

5.5 Influence of food environment on lifestyle behaviours.

The environment in which people live has an influence on food consumption, and physical activity/inactivity. Recent studies have been reporting on nutrition transition and how the rural areas are abandoning their traditional food to Western diets (Bosu, 2015). This study compared the rural and urban site focusing on whether having a garden, exercising and eating in fast food restaurant has an association with NCDs status. Similar to other studies comparing urban and rural sites, majority of participants in the rural site had a vegetable garden compared to those in the urban site (Walsh & Van Rooyen, 2015). This could be attributed to the access to land in backyards whereas in the urban settings land is limited (Walsh & Van Rooyen, 2015). There was a significant difference between the two sites regarding whether they engage in PA, eat in formal fast food restaurant and informal fast food restaurant with urban participants being a majority in those respective questions.

The results of the PA analysis showed that majority of participants from the urban site (83.3%) reported to engage in some physical activity compared to 8.5% participants from the rural site. Engaging in PA was positively correlated to the likelihood of having NCDs. The observed association suggests that urban participants who reported to engage in some PA are more likely to have hypertension and/or diabetes. The possible correlation could be the result of PA being recommended to participants who already have NCDs. Those who are reporting to be physically active could have started being active after being diagnosed.

Results of the analysis on the availability of a home garden was negatively correlated to the likelihood of having NCDs. The observed association suggests that rural households with vegetable gardens are less likely to have hypertension and/or diabetes. The possible explanation could be based on that home gardens normally provide vegetables high in micronutrients and low in fat, sugar and starch (Mozaffarian, 2016).

Majority of participants who reported to eat in fast food restaurants (formal or informal) were from the urban site. These results of the study showed a positive correlation between eating in fast food restaurants (formal and/or informal) and having NCDs. The correlation could be due to the food sold in fast food restaurants that are high in sugar, fat, starch and salt which lead to increased chances of obesity. A study by Maddock (2004) also found similar results when they were comparing the association between eating in fast food restaurants and obesity. The results revealed that majority of participants who reported to eat out more were more likely to be obese than those who eat home cooked meals most of the times (Burgoine *et al.*, 2016). Even though some participants in the rural site indicated they eat in fast food restaurants, majority of those who frequently eat fast food are from the urban site. Nutrition transition could be a contributing factor to those results as it is characterized by increased intakes of saturated fat, animal protein, salt and sugar, and the decreased intake of fibre, fruits and vegetables rich traditional diet. One of the studies that was done to examine dietary intake of black adults residing in Cape Town observed trends of having moved from rural areas. The study found that carbohydrate intake decreased from 61.4% to 52.8% of energy intake, while fat intake increased from 23.8% to 31.8% since they are staying in the urban site (Mchiza & Steyn, 2014).

Another study that examined dietary intake in urban and rural settings in the northern part of South Africa showed that the urban group had the highest fat (30.6%), cholesterol (420 mg), and protein (13.3% of energy intake) intake, while rural residents and rural farm workers were found to follow a very prudent diet significantly lower in fat (22.8%), protein (12.1%), and cholesterol (283 mg) and higher in carbohydrate (Morris-Paxton *et al.*, 2018). Urban participants in different areas tend to eat fast food more than those in rural areas and this study found a positive association between eating in fast food restaurants and having an NCD.

5.6 Food perceptions and NK (Urban and Rural comparison)

5.6.1 Perception on consumption of F&Vs

The consumption of F&Vs is an important indicator of a healthy diet that is associated with positive health outcomes and the reduction on the incidence of CVDs and NCDs (Borgi *et al.*, 2016). One of the objectives for this was to find out the participants knowledge on the recommended servings of F&Vs. The results of the analysis showed that majority of participants in the urban site had no knowledge of how many servings of F&Vs health practitioners recommend. Majority of participants from the rural area gave an incorrect answer of how many F&Vs the health professionals recommend. Similarly, majority of rural participants also do not know the recommended servings of F&Vs compared to only 15.4% who know the recommended servings, $p < 0.001$. The urban participants have access to health facilities where they can visit and receive information

regarding food, rural participants do not have that privilege which could be the reason most of them stated that they do not know the recommended servings of F&Vs. A study conducted in Iran observed similar results when it compared nutrition knowledge, assumption and attitudes in rural and urban areas. Heshmat *et al* (2016) reported that more than 60% of households had F&Vs knowledge compared to 49% of rural households with the knowledge.

5.6.2 NK score and NCD status of Urban and Rural participants

According to the results of this study, majority of participants from the urban and rural site had average NK in relation to what is considered to be healthy or unhealthy food, $p=0.003$. The urban site had a slightly higher percentage of participants with acceptable knowledge compared to those from the rural site. The relationship between NK and dietary intake among diabetic patients was conducted by Fitzgerald *et al* (2015) who examined the association among 200 Latinas in the United States, of which 100 of whom had type 2 diabetes, using an adapted general NK questionnaire. Their results found a positive association between NK and having type 2 diabetes. The results of this study showed that participants with diabetes and/or hypertension have an average NK. These results could suggest that participants with an NCD and living in low SES still put dietary modification in a cornerstone or do not see it as an effective diabetes self-management. Participants without an NCD were not different in relation to the nutrition score. Almost 60% of them scored an average nutrition score, comparing participants with an average NK to their BMI shows that of those who are obese, 60.8% of them have an average nutrition score while 33.3% have an acceptable score, which raises concern on whether the information on healthy eating is not getting to the people or they are mainly focusing on the medication as a form of treating their NCD and less on learning about food. This study also compared the source of information on food by sites to determine how their nutrition score came about. Although both sites reported that their parents are their source of food, there was a significant difference between the two sites as majority of rural participants still rely on print material for information while urban participants get their information from dieticians or friends $p<0.001$.

Even though there are some differences between the sites based on all the results of this study, the rural populations are moving towards the western lifestyle which tends to bridge the gap in BMI, NCDs and socioeconomic conditions between the urban and rural participants.

6. CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study affirms socioeconomic status of black adults differ based on where they are located. Even though those in urban areas have better socioeconomic status, they are also still living below the poverty line. The study also established that majority of females from both the urban and the rural areas have a higher BMI and WHtR compared to males and the prevalence of obesity was slightly higher in the urban areas. Although the results were as expected in relation to weight status, people in rural areas are catching up to those in urban areas with regards to weight gain. Furthermore, the prevalence of NCDs were determined and contrary to majority of other studies, people from the rural site were found to be more hypertensive than those from the urban site. Diabetes is still mostly prevalent in the urban area. The food environment plays an important role in the way food is perceived and in NK. Urban participants had a slightly higher NK score compared to their rural counterparts which could be attributed to their access to a variety source of information such as dieticians. Overall, obesity and NCDs are on the rise and are not only associated with the urban area but the rural area as well. The food environment that people live in plays a role in the source of NK they have as well as their perceptions on food.

6.2 Recommendations

Based on the results of this study, the following recommendations can be made.

- Programme that are aimed at reducing obesity should focus more on females, taking into considerations the area in which they live in. People in the rural areas have different challenges from those in the peri-urban areas and therefore different interventions to combat obesity should be implemented. For an example, the rural community can be equipped with agricultural skills of which they will be exercising and producing food at the same time.
- More outreach programmes and facilities of health care that will educate people about obesity and the risk factors of NCDs are needed in the rural areas. Only few participants from the rural has seen a dietician to advise them on food. In order to improve their nutrition knowledge score, more nutritionists and dieticians should be placed in those areas.
- Restricting the marketing of unhealthy foods, especially those aimed at children and regulating the nutritional quality of foods in schools will reduce the onset of obesity in children and teenagers. This could help reduce the prevalence of obesity and NCDs in the country for the next coming years.

- The Government should look at having regulations regarding the proportion of healthy to unhealthy food that supermarket/spaza or any business that sells food should be allowed to have. Consumers should be able to access healthy options in their local supermarkets.



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7. REFERENCES

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8. APPENDICES

8.1 Mini-thesis UWC Ethics approval



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05 December 2018

Ms TM Manuga
School of Public Health
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Ethics Reference Number: BM18/9/12

Project Title: The relationship between food environment, obesity and NCD status among adults aged 30-70 years in Langa and Mount Frere, South Africa.

Approval Period: 05 December 2018 – 05 December 2019

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.

A handwritten signature in black ink, appearing to read 'Josias'.

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

BMREC REGISTRATION NUMBER -130416-050

8.2 PURE UWC Ethical approval

**OFFICE OF THE DEAN
DEPARTMENT OF RESEARCH
DEVELOPMENT**

Private Bag X17, Bellville 7535
South Africa
Telegraph: UNIBELL
Telephone: +27 21 959-2948/2949
Fax: +27 21 959-3170
Website: www.uwc.ac.za

4 July 2008

To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape has approved the methodology and the ethics of the following research project by Prof T. Puoane (School of Public Health Programme)

Research Project: Prospective Urban and Rural Epidemiology Study to track changing lifestyles and risk factors for chronic disease

Registration no. 08/4/4



Peter Byster
Research Development
University of the Western Cape

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WESTERN CAPE



**UNIVERSITY of the
WESTERN CAPE**

A place of quality, a place to grow, from hope to action through knowledge



8.3 PURE Consent form

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959, Fax: 27 21-959

E-mail:

Prospective Urban and Rural study

Consent form

I have been informed about the purpose and the nature of the study. I understand that all information will be confidential. I understand that taking part in this study is voluntary.

I can withdraw from participating in this study at anytime without giving any reasons and my doing so will have no negative repercussions. I also have the right to refuse answering questions when I feel uncomfortable.



Name of the participant:.....

Signature:.....

Interviewer :

Date:.....



8.4 PURE Information sheet

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959209, Fax: 27 21-959 2872

E-mail:

Prospective Urban and Rural study

Participant Information sheet

Dear Participant

We are from the University of the Western Cape (UWC), and would like you to invite you to participate in this study. This study will help researchers understand the way in which environmental/ societal factors influence the development of cardiovascular disease.

What is this study about?

This is a 15 year research study to understand the way in which environmental/ societal factors influence the development of cardiovascular disease. The South African study is part on an international project being carried out in 15 countries. The research will be carried out in 2 urban sites, and 2 rural sites in South Africa, involving 2,000 participants. The research will look at a number of factors to understand whether, and how, they influence the development of cardiovascular disease.

Who can participate in this research?

Man and women between 35-60 years, who are not planning to move in the next 4 years

What will be expected from the participants?

All participants will be expected to answer a number of questionnaires (food intake, physical activity, socio-economics). Weight, height, waist, hip and other body measurements will be taken. All participants in the study will

remain anonymous and all information will remain strictly confidential. This means that your names will not be written on the questionnaire, only numbers will be used.

What are the risks of this research?

There are no known risks associated with participating in this research project.

What are the benefits of this research?

This research is not designed to help you personally, however you will receive a free medical examination and receive your own results informing you whether you have diabetes, high blood pressure, high cholesterol or high blood fats as well as your body size measurements every three years for the next 15 years.

The findings of this research can be used to help prevent, treat and manage diseases associated with heart disease and stroke in South African people.



Can I withdraw from the study?

Your participation in this research is voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

Any further questions?

More information may be obtained from Prof Thandi Puoane or Lungiswa Tsolekile at (021) 959 2809 or Moise Muzigaba. If you would like to take part in the study, please read and sign the consent form.

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Head of Department:

Dean of the Faculty of Community and Health Sciences:

University of the Western Cape

Private Bag X17

Bellville 7535

This research has been approved by the University of the Western Cape's Senate Research Committee and Ethics Committee.

Biomedical Research Ethics Committee

Private Bag X17 Bellville 7535

BMREC Research Development

Tel: 021 959 4111

Email: research-ethics@uwc.ac.za

Thank you very much



8.5 CoE-FS questionnaire



Centre of Excellence in Food Security

Knowledge, Beliefs and Perceptions towards Food and Environment

DEMOGRAPHICS

STUDY ID

Grid for Study ID input

TODAY'S DATE

Grid for Today's Date input

Initials

Grid for Initials input

Name

Line for Name input

D.O.B

Grid for D.O.B input

Or Age _____

1 Marital status

Form for Marital status with checkboxes for Never married, Married, Widowed, Divorced/separated, Co-habiting, and Other (Specify)

2 Education level

Form for Education level with checkboxes for None, Primary (Grade 1-7), Secondary (Grade 8-12), Vocational/Trade school, Tertiary, and Other (Specify)

3 Employment status

Form for Employment status with checkboxes

http://etd.uwc.ac.za/

Full time Part time Self-employed Unemployed
 Retired Other (Specify).....

4 Total household income

- a) Less than R2000 per month
- b) R2001-R5000 per month
- c) R5001-R10 000 per month
- d) R10 001-R15000 per month
- e) Above R15000 per month

5 Household Expenses

- 1.1 How much do you spend on your groceries monthly R_____
- 1.2 How much do you spend on your rent and utilities (water, and phone etc) monthly R_____
- 1.3 How much do you spend on clothing (monthly) R_____
- 1.4 How much do you spend on transportation costs (public transit and fuel for personal vehicle) R_____
- 1.5 How much do you spend on electricity monthly R_____
- 1.6 How much do you spend on cooking fuels (paraffin or gas) monthly R_____

6 Household Possessions

a) Does your household own any of the following? In working condition (Check all that apply)

- Car motorbike bicycle Refrigerator TV
 Electricity Gas Cultivable land (garden) Radio

b) What do you use as a primary source of fuel for cooking?

- Electricity Paraffin stove Gas stove Wood

7 Health

7.1 Have you ever been told by the doctor that you have any of the following? (Check all that apply)

- a) Diabetes
- b) Hypertension
- c) Stroke
- d) Heart disease

8 KNOWLEDGE, ATTITUDES, AND BELIEFS

8.1 Have you ever done a course that teaches you about nutrition?

Yes No

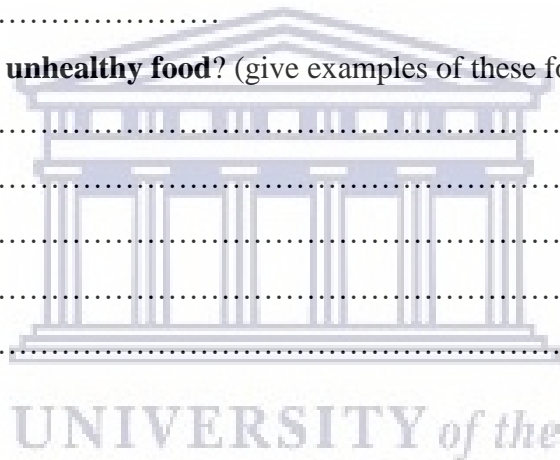
Please specify _____

8.2 What do you understand by **healthy food**? (give examples of these foods)

.....
.....
.....
.....

8.3 What do you understand by **unhealthy food**? (give examples of these foods)

.....
.....
.....
.....
.....



8.4 How do you prepare your food most of the time? (Probes fry, boil, steam and grill)

.....
.....
.....
.....

8.5 What foods should you eat less of to keep you healthy?

.....
.....
.....
.....

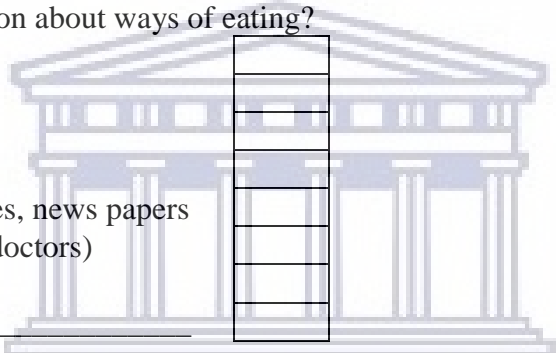
.....
.....

8.6 What foods should you eat more of to keep you health?

.....
.....
.....
.....
.....
.....

8.7 Where do you get information about ways of eating?

- a) Parents
- b) Friends
- c) TV
- d) Radio
- e) Print material (magazines, news papers)
- f) Health workers (nurse, doctors)
- g) Dieticians
- h) Other (Specify) _____



8.8 Do you believe that certain foods are good for your health?

Yes No

8.9 If yes which foods are good for you? (5 foods)

.....
.....
.....
.....

8.10 Do you believe that certain foods are bad for your health? (5 foods)

Yes No

8.11 If **YES** which foods are bad for you?

.....
.....
.....
.....
.....

9 PRACTICES:

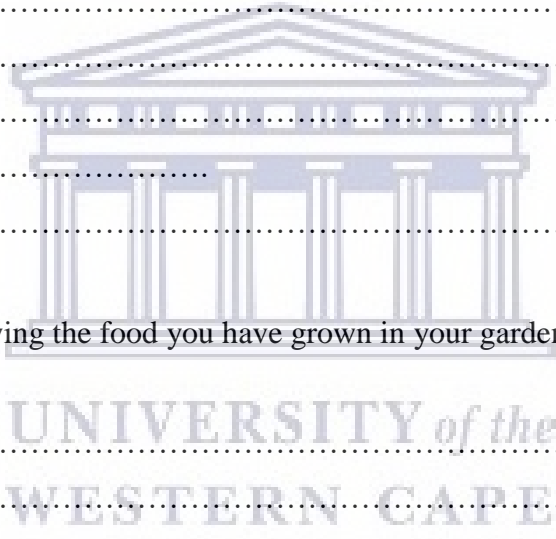
9.1 Do you have a food garden? Yes No

9.2 If **YES** do you grow any food in your garden? Yes No

9.3 What food do you grow in your garden?

.....
.....
.....
.....
.....

9.4 What is the purpose of growing the food you have grown in your garden? (*Probes: to sell or to use for self*)



.....
.....
.....
.....

9.5 Where do you buy most of your groceries?

.....
.....
.....
.....
.....

9.6 Why do you buy in that particular place?

.....
.....

.....

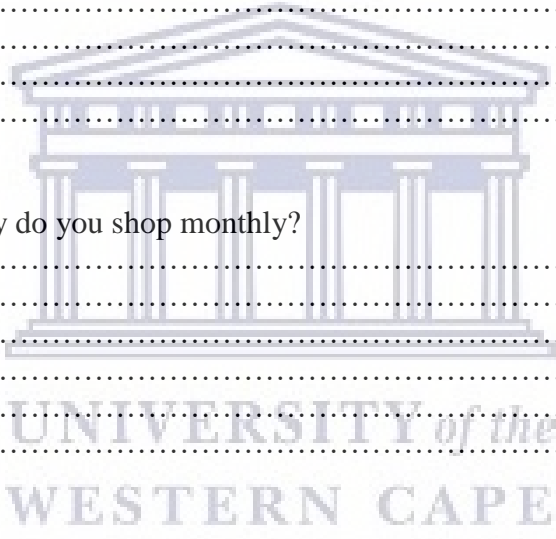
 9.7 Do you write a grocery list when you go shopping? Yes No

9.8 If YES do you always buy what is on your grocery list? Yes No

9.9 How often do you purchase most of your groceries?
 Daily Weekly Twice a month Monthly

9.10 For **daily and weekly** shoppers why do you shop daily or weekly?

9.11 For **monthly** shoppers why do you shop monthly?



9.12 How often do you purchase any of the following?

Food Item

- a) **Cereals:** oats, corn flakes, weetbix, all bran flakes etc.
- b) **Starch:** maize meal, samp, rice, flour

Daily	Weekly	Monthly	Seldom/ Never

.....

9.17 Who is responsible for preparing your food?

Mother Father House
 helper
 Spouse/partner Other (*Specify*) _____

9.18 Who decides on the food that must be prepared daily?

Mother Father House
 helper
 Spouse/partner Other (*Specify*) _____

9.19 How often do you buy vegetables and fruits?

Daily Weekly Twice a month Monthly

9.20 How often do you eat any of the following? (*tick all that apply*)

Food Item	Daily	Weekly	Monthly	Seldom/Never
a) Oranges				
b) Apples				
c) Pears				
d) Banana				
e) Peach				
f) Potatoes				
g) Spinach				
h) Cabbage				
i) Pumpkin				
j) Carrot				
k) Tomatoes				
l) Onion				

9.21 Do you ever eat in formal fast food outlets such as KFC, McDonalds, Chicken Licken, Steers, Captain Doritos etc?

Yes No

9.22 If **YES** how often do you eat in these fast food outlets?) *Do not probe!*

Every day Once a week Once a month More than twice a month

Rarely

9.23 Do you ever eat in informal fast food outlets such as street vendors?

Yes No

9.24 If **YES** how often do you eat in these outlets?

Every day Once a week Once a month More than twice a month

Rarely

9.25 Do you do any physical activities at home?

Yes No

9.26 What are these activities? Probes home chores, walking to a shop, taking a walk

.....

.....

.....

.....

.....

.....

.....

.....

.....

9.27 How much time do you usually spend when you do these activities?

- a) 1-30 minutes
- b) 31-60 minutes
- c) 1-1:30 hours
- d) 1:31-2 hours
- e) More than 2 hours

10 Assessing Neighbourhood

10.1 How long do you walk to the convenience store or spaza?

- a) 1-15 minutes
- b) 16-30 minutes
- c) 31-45 minutes
- d) More than 45

10.2 Have you seen any junk food/unhealthy food advertisements in your area?

- a) Billboards

Yes	No
-----	----
- b) Shops/small food stores

Yes	No
-----	----
- c) Permanently sponsored signage on shops and buildings

Yes	No
-----	----

10.3 Have seen any soft drinks/soda/sweetened drinks advertisements in your area?

- a) Billboards

Yes	No
-----	----
- b) Shops/small food stores

Yes	No
-----	----
- c) Permanently sponsored signage on shops and buildings

Yes	No
-----	----

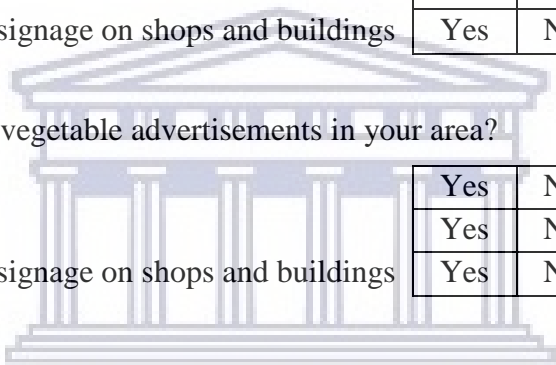
10.4 Have seen any fruit and vegetable advertisements in your area?

- a) Billboards

Yes	No
-----	----
- b) Shops/small food stores

Yes	No
-----	----
- c) Permanently sponsored signage on shops and buildings

Yes	No
-----	----



11. Nutrition Knowledge

11.1 How many serving of **fruit and vegetables a day** do health professionals advise people to eat?

.....

.....

.....

.....

.....

11.2 Which foods do you think are **high or low in added sugar**? (*Tick one box per food item*)

Food Item	High	Low	Not Sure
a) Jive/twiza			
b) Unflavoured yoghurt			
c) Coca cola			
d) Fruit juice			

11.3 Which foods do you think are **starchy foods** in the following? (*Tick one box per food item*).

Food Item	Yes	No	Not Sure
a) Cheese			
b) Pasta			
c) Rice			
d) Porridge			
e) Nuts			
f) Butter			

11.4 Which foods do you think are **high or low in salt**? (*Tick one box per food item*)

Food Item	High	Low	Not Sure
a) Aromat			
b) Soup (powder)			
c) Viennas			
d) Cheese			
e) Noodles			

11.5 Which foods do you think are **high or low in protein**? (*Tick one box per food item*)

Food Item	High	Low	Not Sure
a) Chicken			
b) Fruit			
c) Baked Beans			
d) Cheese			

11.6 Which foods do you think are **high or low in fibre/roughage**? (*Tick one box per food item*)

Food Item	High	Low	Not Sure
a) Bananas			

- b) Eggs
- c) Red Meat
- d) Baked potatoes with skin
- e) Broccoli

11.7 How do you prefer to receive nutrition information? (Probes: magazines, newspapers, TV, radio, billboards etc)

.....

.....

.....

.....

.....

11.8 Do you have any suggestions on how to improve sources of nutritional information?

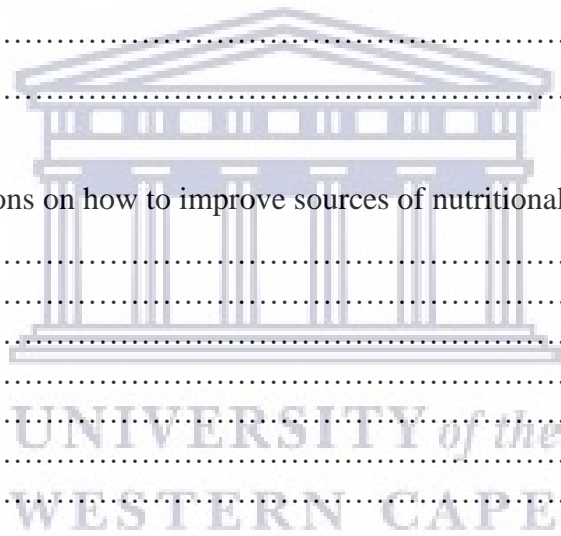
.....

.....

.....

.....

.....



12. Health Problems and Diseases

12.1 Are you aware of any major health problems or diseases that are related to a **low intake of fruit and vegetables?**

Yes No Not sure/don't know

12.2 If **YES** please name these health problems:

.....

.....

.....

12.3 Are you aware of any major health problem or diseases that are related to **how much salt** people eat?

Yes No Not sure/don't know

12.4 If **YES** please name these health problems:

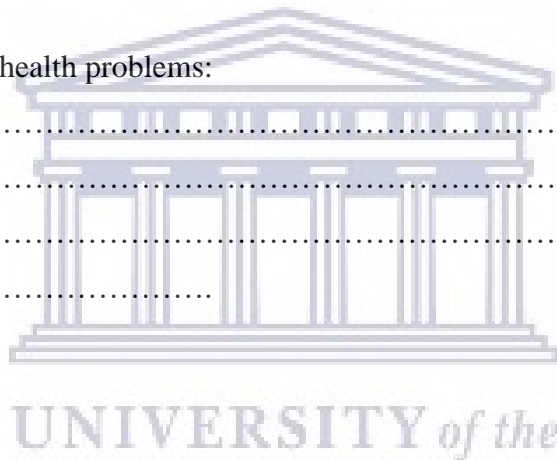
.....
.....
.....
.....

12.5 Are you aware of any major health problem or diseases that are related to **amount of sugar** people eat?

Yes No Not sure/don't know

12.6 If **YES** please name these health problems:

.....
.....
.....
.....



INVENTORY

ASK TO TAKE PICTURES OF ALL FOOD ITEMS IN THE HOUSEHOLD

Thank you for your time!!!!

8.6 PURE 3-year follow-up questionnaire

PURE

3 YEAR FOLLOW-UP VISIT PARTICIPANT QUESTIONNAIRE



INSTRUCTIONS

Please answer EACH question by marking an X in ONE BOX on each line: (unless otherwise instructed)



OR

By writing number(s) in the spaces provided:

1 8

OR

By specifying the answer on the line(s) provided



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LAST Follow-up Visit: Provide the details of the LAST **informative** follow-up visit for this particular individual. For example; the visit where contact was made and meaningful information (i.e. events, medications, physical activity etc.) about this particular individual was obtained. This also includes optional annual visits, where only event details are obtained. If the LAST follow-up visit was Baseline visit, check 'Baseline Visit' only. The date of baseline visit is not required. Otherwise, provide the last follow-up visit date and the corresponding visit number (i.e. 1-12 year visit). Proceed to Current Follow-up Visit Date (see below).

CURRENT Follow-up Visit: Provide the date that the current follow-up visit questionnaire is being administered.

Q4. Subject's Follow-up Status: Choose **one** option only.

If you've been informed that an original participating member no longer lives at the family household (e.g. they are now married and have moved to another household or have moved away due to divorce/separation etc.), obtain their current contact details from an existing household member and try to contact them directly, to perform either a clinic or telephone visit (for current follow-up visit and for all future follow-up visits).

- If you are successful in contacting this subject directly, their current follow-up status will be either **4(a)** or **4(c)**, depending on whether they wish to continue or not. If **4(c)**, see further details below

- if you are NOT successful in contacting the subject directly after multiple attempts, indicate option **4(b) Subject is alive but direct contact cannot be established**. Please make all attempts to establish contact with this subject at all future visits.

4c) Refused to continue participating in follow-up:

- If a subject refuses to participate in the current follow-up visit **only**, check 4c. No further details are required for this visit however, do try to establish contact with this subject at all future visits.

- If a subject refuses to participate in the current follow-up visit **and** all future visits, check 4c and complete the Stop Form (plate 500). Do not try to establish contact with this subject for any future visits.

4d) Lost to follow-up:

If, after multiple attempts, you are not able to establish contact with **anyone** (i.e. with the subject directly or with any others such as relatives, friends, neighbours, administrative database, etc.), indicate option **4d** and provide the number of attempts that were made.

This option should only be checked after ALL other possible methods of contact and/or communication have been tried and have not been successful.

This status indicates that the subject is temporarily 'lost to follow-up', their live status is 'Unknown' (refer to Q3) and no further details (for this current visit) will be provided. Please make all attempts to establish contact with this subject at all subsequent visits.

Please note that if you have been successful in contacting a relative, friend, neighbour or have learned of a subject's 'live' status by any other means (i.e. newspaper, administrative database etc.), they are not considered 'lost to follow-up'. Rather indicate whether they are dead or alive and proceed accordingly (i.e. if Dead, complete Death CRF; if Alive, choose option **4(b) Subject is alive but direct contact cannot be established**).



Clinic Visit Telephone / Mail Follow-up Visit

ii) Has subject moved away from family household?

No

Yes

Year/Month subject moved away
[][][][] [][]

Complete CRF90

s

year

month

iii) In what city/town and country were you born? iv) How many years have you lived in your current city/town?

[][] years

City/Town: _____

Country: _____

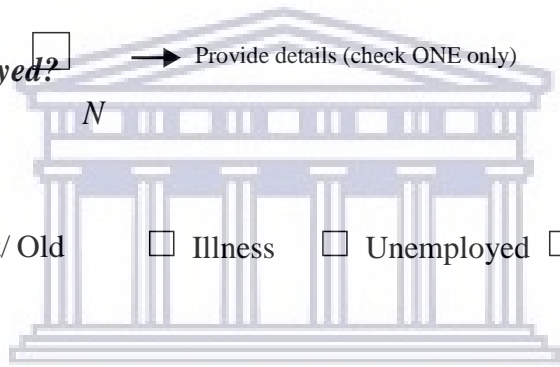
v) Are you currently employed?

→ Provide details (check ONE only)

Yes → Proceed to CRF 352

o

Retirement/ Old Illness Unemployed Housewife
age



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b) Subject is alive (via family member, relative, friend, neighbour or other), but direct contact cannot be established; no further details can be provided for this current follow-up visit

c) Refused to continue participating in Follow-up: *See facing page for further instructions*

d) Lost to follow-up → Provide # of attempts below (see facing page for details)

[][]

if less than three attempts, please attempt to contact again

i) Number of attempts made to contact subject

If Subject follow-up status is 4b, 4c or 4d, please sign and date form; If 4a, sign and date CRF 360 only

Name of Interviewer: _____
(please print) Last Name First Initial

Date [][][][] [][] [][]
year month day

<http://etd.uwc.ac.za/>

Event Abbreviations:

COPD: Chronic Obstructive Pulmonary Disease

TB: Tuberculosis

HIV: Human Immunodeficiency Virus

MI: Myocardial Infarction

Atrial fibrillation is an irregular and often rapid heart rate that commonly causes poor blood flow to the body. During atrial fibrillation, the heart's 2 upper chambers beat irregularly, out of coordination with the 2 lower chambers of the heart. Symptoms include heart palpitations, shortness of breath and weakness.

Q8. Valvular heart disease: Defined as any disease process involving one or more of the four valves of the heart. Valve problems may be congenital (inborn) or acquired (due to another cause later in life). Treatment may be with medication but often (depending on the severity) involves valve repair or replacement (insertion of an artificial heart valve).

Valvular heart disease resulting from recurrent episodes of rheumatic fever (caused by a combination of bacterial infection and immune system overreaction) is referred to as **Rheumatic Heart Disease**.

Please only indicate yes to this question if the specific diagnosis was made by a physician. Do not include joint pain and/or swelling, palpitations, chest pain and other symptoms without a specific diagnosis.

Q9a. Crohn's Disease: is a chronic inflammatory condition which can involve the whole gut from mouth to anus. Please only indicate yes to this question if the specific diagnosis was made by a physician. Do not include abdominal pain or other abdominal symptoms without a specific diagnosis.

Q9b. Ulcerative colitis: is a chronic inflammatory condition of the colon. Please only indicate yes to this question if the specific diagnosis was made by a physician. Do not include abdominal pain or other abdominal symptoms without a specific diagnosis.

PURE Individual #062
#003

Plate #352

Visit

Subject ID:

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Centre #	Community #	Household #	Member #

Subject

Initials F M L

5. Did any of the following events/ new diagnoses occur since the last follow-up?

No	Yes	
<input type="checkbox"/>	<input type="checkbox"/>	→

Report No.	Report No.	Report No.
<input type="text"/>	<input type="text"/>	<input type="text"/>

a) MI/ Heart Attack

Complete MI Report, CRF 51- 52

b) Stroke

Complete Stroke Report, CRF 110-112

c) Angina

Complete Angina Report, CRF 115-116

d) Heart Failure

Complete Heart Failure Report, CRF 57- 58

e) Atrial Fibrillation

Complete AFib Report, CRF 120-121

f) Cancer

Complete Cancer Report, CRF 69-70

g) TB

Complete TB Report, CRF 60-61

h) HIV/ AIDS

Complete HIV/ AIDS Report, CRF 63
for NEW diagnoses ONLY

OR → Not Answered

i) Malaria

Complete Malaria Report, CRF 66

j) COPD/Chronic Bronchitis/Emphysema

Complete COPD/Chronic Bronchitis/Emphysema Report, CRF 78 for
NEW diagnoses ONLY

Complete Asthma Report, CRF 75

k) Asthma
a

→

for NEW diagnoses ONLY

Report No. Report No. Report No.

l) Pneumonia
a

→
 →

Complete Pneumonia Report, CRF 72

m) Renal/Kidney
(Dialysis/transplant)

Complete Kidney Report, CRF 130

6. Since the last follow-up, have you had any injuries that were serious enough to limit your normal activities for at least one day?

No Yes

Complete Injury Report, CRF 93-94

Report No. Report No. Report No.

7. Have you been hospitalized for any other reason(s) aside from the events/diagnoses listed in Q5 and 6 above?

No Yes

Complete Hospitalization Report, CRF 81

Report No. Report No. Report No.

8. Have you ever been diagnosed with Valvular Heart Disease?

No Yes

a) Time of Diagnosis

Prior to baseline After baseline

Prior to baseline

After baseline

Prior to baseline

After baseline

b) Date of Diagnosis

year month

year month

year month

Unk

k

Un

k

Unk

9a. Have you ever been diagnosed with Crohn's Disease?

No Yes

9b. Have you ever been diagnosed with Ulcerative colitis?

No Yes

Ye

s

Ye

s

10. If YES to question 9a or 9b, were you ever treated with medications?

No Yes

Un If yes, provide details below; check ALL that apply

k

5-

aminosalicylates

Steroid

Immunosuppressant

Biologics/TNF inhibitors

s

Other, specify _____

Unkown type of medication



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Facing Page Instructions

CRF 353

For all medications:

Regularly = Most days of the week (5 out of 7 days) for greater than or equal to 1 month



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PURE Individual #062
#003

Plate #353

Visit

Subject ID:

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Centre #	Community #	Household #	Member #

Subject

Initials F M L

11. Do you have **hypertension/high blood pressure**?

No

→ Go to Q12.

Yes

→ Go to Q11a.

11a. Are you taking medications regularly to lower your blood pressure?

No

→ Go to Q11b

Yes → Go to Q11c

11b. In the last 12 months, were you taking medications for high blood pressure but then stopped?

No → Go to Q12

Yes

→ Provide details below

Main reason for stopping blood pressure medication (i.e. Doctor or Self): Next check ALL that apply; then proceed to Q12

i) Doctor advised me to stop

Blood pressure was under control

Felt unwell from blood pressure medications so was told to stop

Felt well; no need to take my medications

OR

ii) Self decision to stop

Blood pressure was under control; no need

Felt unwell from blood pressure medications so decided to stop

Felt well; no need to take my medications

Cannot afford blood pressure medications

The pharmacy is too far away from me

I have to take too many medications

My blood pressure medication is often not available in my pharmacy

11c. In the past month, how often did you take your blood pressure medications as the doctor prescribed? (Check **ONE** only)

All of the time
 Nearly all of the time
 Most of the time
 About half the time
 Less than half the time

12. Do you have **diabetes**?

No

Go to

Yes

Go to Q12a.

Q13.



Complete Diabetes Report

<http://etd.uwc.ac.za/>

For all medications:

Regularly = Most days of the week (5 out of 7 days) for greater than or equal to 1 month

Q14 Aspirin

If you are currently taking aspirin regularly, please indicate YES to question 14.

Q14a Aspirin Adherence: Provide a response (i.e. all, nearly, most etc.) to this question ONLY if you are taking aspirin regularly, as prescribed by a doctor. Otherwise, check 'N/A, Self-prescribed'.



PURE Individual #062
#003

Plate #354

Visit

Subject ID:

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Centre #	Community #	Household #	Member #

Subject

Initials F M L

13. Do you have high cholesterol? No Yes

→ Go to Q14

Go to Q13a.

13a. Are you taking medications regularly to lower your cholesterol? No Yes

→ Go to Q13b.

→ Go to Q13c.

13b. In the last 12 months, were you taking medications for lowering cholesterol but then stopped? No Yes

N

→ Go to Q14 Yes → Provide details below

Main reason for stopping cholesterol medication(i.e. Doctor or Self): Next check ALL that apply; then proceed to Q14

i) Doctor advised me to stop

Cholesterol was under control

Felt unwell from cholesterol medication(s) so was told to stop
 Felt well; no need to take my medications

OR

ii) Self decision to stop

Cholesterol was under control; no need
 Felt unwell from cholesterol medications so decided to stop
 Felt well; no need to take my medications
 Cannot afford cholesterol medications
 The pharmacy is too far away from me I have to take too many medications

My cholesterol medication is often not available in my

pharmacy 13c. In the past month, how often did you take your cholesterol medications as the doctor prescribed? (Check ONE only)

All of the time Nearly all of the time Most of the time About half the time Less than half the time

14. Are you taking aspirin regularly?

No

→ Go to Q15 Yes

<http://etd.uwc.ac.za/>

Go to Q14a

14a. In the past month, how often did you take your aspirin as the doctor prescribed? (Check **ONE** only)

→ **OR** N/A; self prescribed

- All of the time
- Nearly all of the time
- Most of the time
- About half the time
- Less than half the time

15. Are you taking **any other heart medications**?

- No → Go to Q16
- Yes → Go to Q15a

15a. In the past month, how often did you take your other heart medications as the doctor prescribed? (Check **ONE** only)

- All of the time
- Nearly all of the time
- Most of the time
- About half the time
- Less than half the time

16. List **ALL medications** the participant is taking regularly. Participant is **NOT** regularly taking any medications

R

(This should include ALL medications for conditions listed above plus any other medications participant is taking regularly, for any reason)

Please **PRINT** the name of the medication clearly and enter the corresponding code in the box provided, using the list

i) _____	Code <input type="text"/>	ii) _____	Code <input type="text"/>
iii) _____	Code <input type="text"/>	iv) _____	Code <input type="text"/>
v) _____	Code <input type="text"/>	vi) _____	Code <input type="text"/>
vii) _____	Code <input type="text"/>	viii) _____	Code <input type="text"/>
ix) _____	Code <input type="text"/>	x) _____	Code <input type="text"/>

Q17. Tobacco

Use: Q17a.

Never used tobacco products: Adults who have never smoked or who smoked fewer than 100 cigarettes in their entire life- time

Currently use tobacco products: Adults who have smoked at least 100 cigarettes in their lifetime and currently smoke ciga- rettes every day (daily) or some days (non-daily).

Formerly used tobacco products: Adults who have smoked at least 100 cigarettes in their lifetime but say they currently do not smoke.

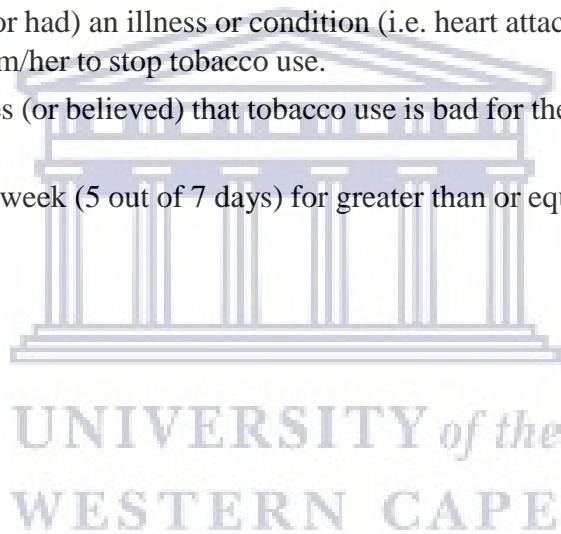
17d(i): Former smokers ONLY: How many years ago did you stop smoking? Response should be in YEARS only; unless subject has stopped smoking less than 1 year ago. If stopped less than 1 year ago, indicate the amount of time in months only

17d(ii): Main reason for stopping tobacco use:

Illness or condition: Subject has (or had) an illness or condition (i.e. heart attack, stroke, lung condition, cancer etc.) that en- couraged or caused him/her to stop tobacco use.

Bad for health: Participant believes (or believed) that tobacco use is bad for their health and he/she decided to stop using to- bacco products

17f: Regularly = Most days of the week (5 out of 7 days) for greater than or equal to 1 month



Q18. Alcohol

Use: Q18a.

Formerly used alcohol products: Adults who have consumed at least 12 drinks in their lifetime but say they currently do not consume alcoholic beverages.

Currently use alcohol products: Adults who have consumed at least 12 drinks in their lifetime and currently consume alco- holic beverages.

Never used alcohol products: Adults who have consumed < 12 drinks in one lifetime

18d(i): Former alcohol users ONLY: How many years ago did you stop drinking? Response should be in YEARS only; unless subject has stopped consuming alcohol less than 1 year ago. If stopped less than 1 year ago, indicate the amount of time in months only

18d(ii): Main reason for stopping alcohol use:

Illness or condition: Participant has (or had) an illness or condition (i.e. heart attack, stroke, lung condition, cancer etc.) that encouraged or caused him/her to stop alcohol use.

Bad for health: Participant believes (or believed) that alcohol use is bad for their health and he/she decided to stop using alco- hol products

PURE Individual #062
#003

Plate #355

Visit

Subject ID:

Centre #	Community #	Household #	Member #
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Subject

Initials F M L

17. Tobacco Use (Refer to facing page for definitions):

a) What best describes your history of tobacco use (i.e. cigarettes, beedies, cigars)?

- i) Never used tobacco products (Go to Q17e)
- ii) Currently use tobacco products
- iii) Formerly used tobacco products

b) For BOTH current and former smokers:

i) At what age did you start smoking? Age (years) Unknown

ii) Average # of cigarettes/beedies smoked per day

i) Avg # cigarettes per day	<input type="text"/>	<input type="checkbox"/> Unknown	ii) Avg # beedies per day	<input type="text"/>	<input type="checkbox"/> Unknown
-----------------------------	----------------------	----------------------------------	---------------------------	----------------------	----------------------------------

c) For former ONLY:

i) How many years ago did you stop smoking? Years **OR** Months (if less than 1 year only) Unknown

ii) What was the main reason for stopping? Check ALL that apply

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Illness or Condition	High Cost	Health Care Worker advice	Family against smoking	Bad for health	Other	Unknown

d) For current ONLY:

i) How many times have you tried to stop smoking for more than 1 month?

Never One Two Three Four Five Six or more

e) Over the last 12 months, have you chewed tobacco regularly? N Ye **→** Unknown

Chewing Tobacco (includes tobacco added to paan)

18. Alcohol Use: (Refer to facing page for definitions)

a) What best describes your history of alcohol use?

- i) Never used alcohol products (Go to Q19)
- ii) Currently use alcohol products
- iii) Formerly used alcohol products

b) For BOTH current and former drinkers:

i) At what age did you start <http://etd.rwc.ac.za/inking?>

Age

(years)

Unknown

ii) Average # of drinks consumed:

c) For **former ONLY**:

i) Avg # of drinks

ii) Frequency

Daily

Weekly

Monthly

Unknown

i) How many years ago did you stop drinking?

Years

OR

Months (if less than 1 year only)

Unknown

ii) What was the main reason for stopping? Check **ALL** that apply

Illness or

High

Health Care

Family against

Bad

Other

Unknown

for

Condition

Cost

Worker advice

drinking

health

Questions Related to Diet

19. Have you changed your diet during the last three years?

No

Yes

19a. If yes, was it due to health conditions?

Yes

N

o 19b. If yes, what health conditions

20. Are you on any special diet?

No

Yes

→ If YES, what diets are you currently following - **Check all the apply**

a. Diabetic diet

b. Low fat Diet

c. Low salt diet

d. Weight reducing diet

e. Others, please specify _____

Facing Page Instructions

CRF 356

Red Meat: includes beef, pork, lamb, mutton, goat, veal consumed as main dish or as sandwich or mixed dish.

Vegetables: potato is not included in vegetable group.

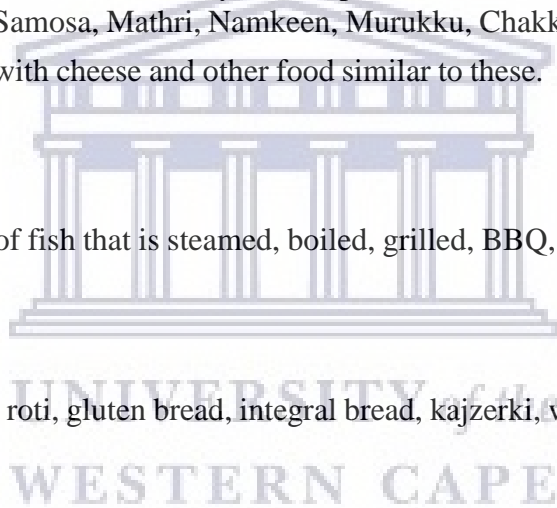
Soft drink: includes Coke, Pepsi, delister, Guarana, Gingerale, Fanta, Freezit (light and regular), Thums up.

Snack: includes chips, all types of chocolate, candy, sohan, pofak, faloodeh, keropok, ikqn, jeruk buah, drops, tulum- ba, lokmo, hanim, Samosa, Mathri, Namkeen, Murukku, Chakkli, Kachori, Pakora Vada, Bajji, Bonda, sweet made with cheese and other food similar to these.

Fish, cooked: includes any type of fish that is steamed, boiled, grilled, BBQ, roasted or baked

Bread: includes chapati, paratha, roti, gluten bread, integral bread, kajzerki, wroclawskie, pide, ekmek, esmer, khameer, khbuz.

Rice: includes sticky rice, rice noodle, white rice, brown rice





**PURE Individual #062
#003**

Plate #356

Visit

Subject

Subject ID:

Centre # Community # Household # Member #

Initials F M L

During the past year, on average, how often have you consumed the following foods and drinks?

(please check the appropriate box)

		Never, <1/month	1-3/mo	1/wk	2-4/wk	5-6/wk	1/day	2-3/day	>4/day
21. Whole milk	Avg Serving 1 cup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Skim milk or low fat milk	1 cup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Eggs	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Chicken with skin	90-120g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Chicken without skin	90-120g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Red meat with fat	90-120g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Red meat without fat	90-120g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Fish, cooked	1 fillet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Fish, fried	1 fillet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Fish, salted	20g	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Whole wheat/multigrain bread	1 slice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. White bread	1 slice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Fruits	1 medium	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Vegetables (fresh/raw)	1/2 cup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Vegetables (cooked)	1/2 cup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Vegetables (fried)	1/2 cup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<http://etd.uwc.ac.za/>

37. Vegetables (stir-fried)	1/2 cup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Soft drink (reg)	1 glass/can	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Soft drink (diet)	1 glass/can	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Fried foods (potatoes etc.)	1 cup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Snacks		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Rice	1 cup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. How often do you eat meals at a fast-food/non-fast food restaurant?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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#003 Subject ID:

Centre # Community # Household # Member #

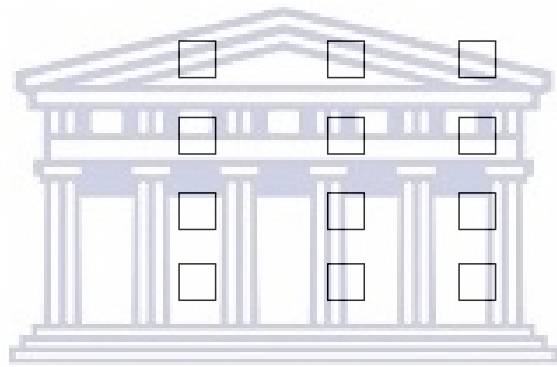
Subject Initials

F M L

Transportation:

44. How often do you travel:

	Never or less than once/yr	Less than once/mo	1-3/mo	1/wk	2-4/wk	5-6/wk	1/day	Unk
a) By foot (Walk)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) By Bicycle (Non-motorized)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) By Bus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) By Train	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) By Truck	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) By Boat (Ferry)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) By Auto Rickshaw/Taxi	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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	Never or less than once/yr	Less than once/mo	1-3/mo	1/wk	2-4/wk	5-6/wk	1/day	Unk
h) On a motorized two wheeler	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If one of these options are checked, answer h(i)

h(i) Do you wear a helmet when traveling on the two wheeler?

No Yes Sometimes Always Not applicable Unk

h(i)-b As a passenger No Yes Sometimes Always Not applicable Unk

i) In a car

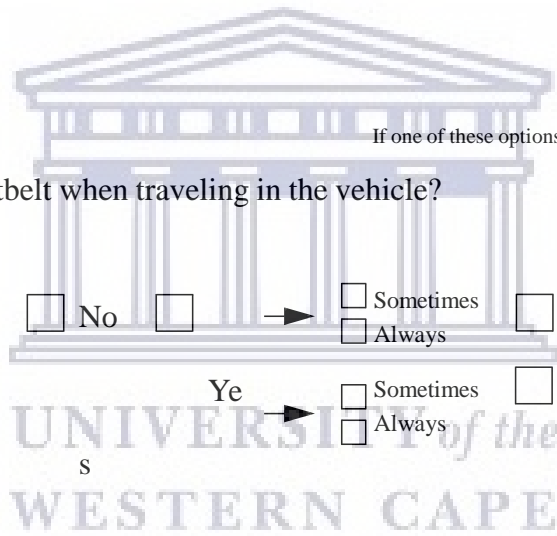
Never or less than once/yr
 Less than once/mo
 1-3/mo
 1/wk
 2-4/wk
 5-6/wk
 1/day
 Unk

If one of these options are checked, answer i(i)

i(i) Do you wear seatbelt when traveling in the vehicle?

i(i)-a As a driver No Yes Sometimes Always Not applicable Unk

i(i)-b As a passenger No Yes Sometimes Always Not applicable Unk

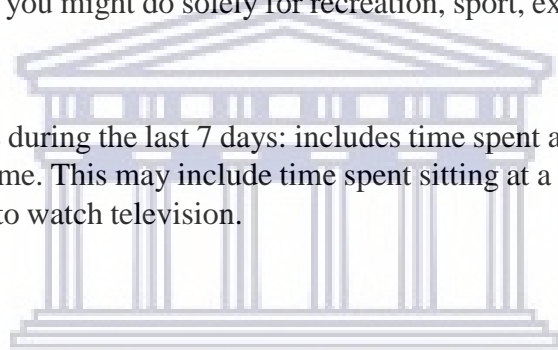


Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.

Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

Time spent walking in the last 7 days: includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure

Time spent sitting on weekdays during the last 7 days: includes time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.



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**PURE Individual #062
#003**

Plate #358

Visit

Subject ID:

<small>Centre #</small>	<small>Community #</small>		<small>Household #</small>			<small>Member #</small>			

Subject

--	--	--

Initials F M L

Questions Related to Physical Activity

45. During the **last 7 days**, on how many days did you do **vigorous** physical activities for at least 10 min?
(e.g. heavy lifting, digging, heavy construction, aerobics, fast bicycling, tiling, harvesting, competitive sports)

Usual time spent on one of those days doing **vigorous** physical activities Days per week →

--	--

 hrs.

--	--

 min.

No **vigorous** activity → Go to Question 46

46. During the **last 7 days**, on how many days did you do **moderate** physical activities for at least 10 min?
(e.g. carrying light loads, bicycling at a regular pace, Tai chi, recreational sports) - Do not include walking.

Usual time spent on one of those days doing **moderate** physical activities Days per week →

--	--

 hrs.

--	--

 min.

No **moderate** activity → Go to Question 47

47. During the **last 7 days**, on how many days did you **walk** for at least 10 mins at a time?

Usual time spent on one of those days doing **walking** Days per week →

--	--

 hrs.

--	--

 min.

→

<http://etd.uwc.ac.za/>

No walking

Go to Question 48

48. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

hrs/day. min./day

Don't know/ Not sure



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Q49. Current Disability (questions a to m inclusive)

A No or Yes response is required for each question (49a to 49m).

Q49. Current Disability (questions n to r inclusive)

Over the **past month**, indicate if you've had any difficulty with any of the activities listed. A response to each question is required.

Q49 [o, p, q, r]:

If you do not play games, read books, take medications, drive a vehicle or take public transportation, please check the 'Never performed/Do not need to perform' box accordingly.





**PURE Individual #062
#003**

Plate #359

Visit

Subject ID:

<small>Centre #</small>	<small>Community #</small>		<small>Household #</small>		<small>Member #</small>		

Subject

Initials F M L

49. Questions Related to Current Disability:

No Yes

- | | | |
|--|--------------------------|--------------------------|
| a. Do you have any problems using your fingers to grasp or handle? | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Do you have any trouble walking about? | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Do you have any trouble bending down and picking up an object from the floor? | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Do you require a walking stick, cane or walker to move about? | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Do you have any trouble reading or seeing the individual grains of rice/corn on your plate?
<i>(with glasses worn)</i> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Do you have any trouble seeing a person from across the room? (12 feet/3.5 meters)
<i>(with glasses worn)</i> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Do you have trouble speaking or being understood? | <input type="checkbox"/> | <input type="checkbox"/> |
| h. Do you have any trouble hearing what is said in a normal conversation? | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Do you have difficulty bathing or showering? | <input type="checkbox"/> | <input type="checkbox"/> |
| j. Do you have difficulty preparing a hot meal? | <input type="checkbox"/> | <input type="checkbox"/> |
| k. Do you have difficulty shopping for groceries? | <input type="checkbox"/> | <input type="checkbox"/> |
| l. Do you have difficulty making telephone calls? | <input type="checkbox"/> | <input type="checkbox"/> |
| m. Do you have difficulty managing money, such as paying bills and keeping track of expenses? | <input type="checkbox"/> | <input type="checkbox"/> |

Over the past month, how much difficulty have you had with the following:

	None	Mild	Moderate	Severe/ Stopped due to difficulty	Never performed/ Do not need to perform
n. Remembering things that happened a few days before? (e.g. conversation, people visiting)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
o. Playing a game or reading a book that requires concentration? (e.g. games, crosswords, checkers, chess cards)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p. Organizing and taking your medications?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q. Driving (see facing page for instructions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r. Using public transportation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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Spirometry Measurements

The **first 5 study participants in each community** will complete Spirometry measurements using both OLD and NEW Spirometers. To complete the spirometry measurements during follow-up visit, please alternate OLD and NEW for the 5 study participants

Example:

In Community 001 for the first 5 participants, use the suggested method (similarly for all communities) Participant 01 - OLD and then NEW

Participant 02 - NEW and then

OLD Participant 03 - OLD and

then NEW Participant 04 - NEW

and then OLD Participant 05 -

OLD and then NEW



Record the spirometry measurement data for the OLD and NEW spirometers in the appropriate section on the CRF. When completing the clinic visit, measure the Blood Pressure first and then the first Spirometry measurement (either OLD or NEW), complete the remaining measurements and then complete the second Spirometry measurement (NEW or OLD).

Please ensure that the time between the OLD and NEW measurements are at least 30 minutes apart

When the first 5 participants are complete, all remaining participants will complete spirometry measurements using the NEW spirometry only.

Q50. Spirometry measurements are required for each participant at follow-up. If however, a participant refuses or is not able to perform any of these tests (for whatever reason), indicate NO to question 50 and provide reason(s) why. Otherwise, indicate YES to question 50 and also indicate if participant requires measurements using both OLD and NEW spirometers (applies to first 5 participants only), or NEW only.

Q51. Spirometry results, using OLD spirometer

A minimum of three tests/readings are expected for each participant. Record the results of the 3 tests using the OLD spirometer in the appropriate section of the CRF.

Q52. Spirometry results, using NEW spirometer

<http://etd.uwc.ac.za/>

52a. A minimum of three tests/readings are expected for each participant. After each test/maneuver is performed, enter the quality message code (that corresponds with the message provided by the spirometer) in the boxes provided. For example, if the machine shows 'Blast out faster' after the first test, indicate code 02 in Test # 1 Code box. Repeat maneuvers until message 'Test Complete' appears on the spirometer, or until the participant refuses to perform any additional tests (if this occurs, press 'Exit' vs. 'Next' on the machine).

52b. At the end of 3 complete tests, an overall quality grade will be provided by the machine. Check the appropriate grade box or 'No grade provided' (this should only occur if the participant performed less than 3 maneuvers).

52c. After the overall quality grade is provided, the predicted Best Trial result will appear on the machine. Record the results of the best trial in the boxes provided, or check 'No predicted BEST trial results provided' (this should only occur if the participant performed less than 3 maneuvers).

52d. Print off a copy of the spirometry test results (which should be setup on the machine to show the 3 best trial results, with flow and volume graphs included) and provide a copy to the Project office.





PURE Individual #062
#003

Plate #360

Visit

Subject ID:

Centre # Community # Household # Member #

Subject

Initials F M L

50. Was spirometry performed?

N

- Participant refused
- Participant not able to perform spirometry tests
- Telephone/Mail-out visit only
- Other, specify _____

See facing page for details about using OLD and NEW spirometers

Yes

Pt. requires

both OLD and NEW spirometry tests
(complete both OLD and NEW sections below)

NEW spirometry tests ONLY
(complete NEW section only)

51. Spirometry Results (using OLD spirometer):

	Test # 1 Results	Test # 2 Results	Test # 3 Results
a) FEV1 (Litre):	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>
b) FVC (Litre):	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>
c) PEFr (Litre/min):	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>

52. Spirometry Results (using NEW spirometer):

52a. Record the **quality message**, as provided by the spirometer, for **each test performed** (min of 3; max of 8).

See quality messages and associated codes in table to the right.

Enter the message code (that corresponds with the quality message that appears on the spirometer) in the boxes below, for each test performed

Quality Message Codes

- 01: Don't hesitate
- 02: Blast out faster
- 03: Blow out longer
- 04: Good effort; do next
- 05: Blast out harder (only in frontline mode)

Test # 1

Code

Test # 2 Code Test # 3 Code Test # 4
Code

Test # 5 Code

Test # 6 Code

Test # 7 Code

Test # 8 Code

06: Wait until buzz before blowing out

07: Cough detected; try again

08: Deeper breath

09: Test complete

NOTE: When 3 acceptable tests have been obtained (in at least 3 tests or more), quality message 'Test Complete' will appear on the spirometer, followed by an overall **quality grade** (for 3 complete tests). Record the quality grade in Q53b..

52b. Overall Quality **grade** (at the end of 3 complete tests) as indicated on the spirometer (check ONE only):

Grade A

Grade B

Grade C

Grade D

Grade F

No grade provided

52c. Record the predicted BEST trial result, as provided by the



No predicted BEST trial results provided

spirometer **OR**



Predicted BEST Trial Result

a) FEV1 (Litre):

b) FVC (Litre):

c) PEFr (Litre/min):

52d. Provide a copy of the spirometry test results (showing 3 best flow and volume graphs) to the Project Office

Q53: Physical**Measurements:**

If NO physical and/or BIA measurements were obtained (b/c the subject refused or if the follow-up visit was performed via telephone), indicate NO to question 53 and proceed to Q54.

If any physical and/or BIA measurements were obtained, indicate YES to question 53 and provide details of each. If any individual measurements were not obtained (i.e. waist circumference was not obtained), indicate 'Not done' beside the corresponding measurement.

Sitting Right Arm Blood

Pressure:

Subject must be resting and calm for 5 minutes, should not have smoked, exercised or eaten in the last 30 minutes, and should not have climbed the stairs in the last 15-30 minutes before taking this measurement

Subject should be seated upright and relaxed with his/her right arm supported at

heart level Record two readings at least 3 minutes apart.

Q54. Urine**Samples:**

For India participants ONLY: Urine samples are to be collected and shipped to Bangalore for analysis. Record the urine sample label # in the boxes provided.

Q55. Blood Samples (local labs only):

If you are analyzing samples in your local lab, provide results/reports to the participant and record all details in Q54. If any of these individual tests was not obtained/analyzed, indicate 'Not Done' for corresponding test.

k) Metabolic age Not done

Not done

Not done

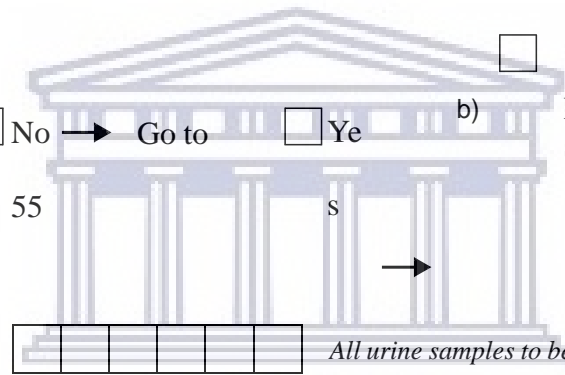
Not done

l) Bone Not done

m) Visceral fat Not done

Urine Samples (India ONLY)

54 Was urine sample obtained? No → Go to 55 Yes b) Fasting sample Non-fasting sample



c) Please print Urine label #: *All urine samples to be shipped to Bangalore for processing*

Blood Samples - Local labs ONLY (applicable to all sites)

55 Were LOCAL blood samples obtained? No → Go to 56 Yes b) Fasting sample Non-fasting sample

c) LOCAL LAB RESULTS OBTAINED AT THE FOLLOW-UP VISIT:

i) Plasma Glucose (fasting) mg/dL Not done mmol/L

ii) Cholesterol (fasting) mg/dL Not done mmol/L

iii) Triglycerides (fasting) mg/dL Not done mmol/L

iv) HDL (fasting) mg/dL Not done mmol/L

v) LDL (fasting) mg/dL Not done mmol/L

Name of Interviewer: _____ (please print) Last Name

First Initial

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Date *year*

month

day



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