FOOD CONSUMPTION PATTERNS AND NUTRITIONAL RISKS OF WOMEN IN LOW AND MIDDLE INCOME COMMUNITIES IN KWANDENGEZI, KWAZULU-NATAL

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DEDICATION

This research study is dedicated to all the women caregivers residing in the community of KwaNdengezi Township, for taking time to participate actively in the conducting of this study.

Acknowledgements

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My husband and children, for their full support, motivation, patience, love and time they sacrificed to ensure the research became a success.

DECLARATION

This work has not been previously accepted in substance for any degree and is not concurrently submitted in candidature of any degree.

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Date:

Statement 1

This dissertation is being submitted in fulfilment of the requirements for the degree of Master of Applied Science in Food and Nutrition.

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The dissertation is a result of my own independent work/ investigation, except where otherwise stated. Other sources used in the study are acknowledged by the provision of references and a bibliography is appended. I did not make myself guilty of any plagiarism.

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ABSTRACT

Food consumption patterns have changed dramatically in the recent times, with traditional diets being replaced by so-called "westernised diets" and leading to nutritional risks such as malnutrition. Contributing factors are urbanisation, climate change, agricultural produce supply (food demand is greater than produce supply) and rising prices, to name but a few. The food security status is also in question as more and more South African households are said to be living in poverty and consequently undernourished even though the country was found to be nutritionally stable compared to previous years. Unemployment and lack of nutrition education also have an impact on communities, in terms of the food being purchased and consumed.

The study was conducted to determine the socio-demographic status, food consumption patterns and nutritional risk of a low-income and middle-income community that resides in KwaNdengezi Township in KwaZulu-Natal.

A sample of two hundred and fifty eight participants was required for the study. The households in both the north and south of KwaNdengezi Township were randomly selected by using the number of roads listed in the eThekwini municipality map. A sample of 130 households per area was targeted. The required number of households was selected by dividing the number of identified roads resulting in three households targeted in each of the 39 roads in the north section and five households in 26 roads in the south section being targeted.

Upon the agreement by participants, the study was conducted where data was collected by means of an interview setting, where participants were interviewed by fieldworkers using pre-designed and tested questionnaires. The follow up was conducted on the days following. The participants answered a three set of questionnaires including, a Socio-demographic Questionnaire (Annexure D), a Food Frequency Questionnaire (Annexure F), 24-Hour Recall questionnaires (Annexure E). The anthropometric measurements were taken in order to determine the BMI status of the participants. The participants were weighed using a Physician Scale for weight, the Stadiometer for height and non- stretchable measuring tape for waist circumference.

The north and the south sections of the township were both affected by unemployment, showing worrying rates that also corresponded with other studies illustrating that unemployment is a challenge in South Africa. The unemployment rate in the north section was very high, sitting at 78.5%, compared to the south section at 63.1%; even so both these communities are economically challenged. Food insecurity was more prevalent in the north section as 36.9% of the participants reported always not having enough money to purchase food whilst 0.8% of the participants in the south section reported the same, concluding that the north section is more vulnerable to hunger leading to malnutrition and poverty.

The education status of the participants in the north section was a point of concern as only 3.1% of the participants had graduated while almost 29.2% in the south section had graduated; this illustrates a very clear difference, which might also be due to unemployed household caregivers who cannot afford further education.

The mean Food Variety Scores (FVS) (±SD) for the north section for all food consumed from the various food groups during seven days was 34.44 (±8.419) and for the south section it was 33.87 (±10.670), indicating a medium food variety score where both sections had a good dietary diversity score ranging from 7-9 food groups, summarising the food group diversity as being in the majority in the north section at 63.85% (n=83) while in south section it was 60.77% (n=79).

The results of the energy distribution of macronutrients from the average of the 24-hr recall results when compared to the WHO dietary factor goals showed that the participants' diet was well balanced in terms of macronutrient intake for both sections while the diet for both sections was lacking in micronutrient intake.

The results of the women caregivers for both the north and the south sections illustrated a high consumption of the following foods out of the top twenty foods consumed by the community. The foods mostly consumed included sugar, maize, bread and rice for both the 19-30 and 31-50 years age groups ranging from 195.15-248.82g for maize, 17.61-18.90g for sugar, 82.73-108.16g for bread and 127.14-131.69g for rice, meaning that the respondents' diet was high in calorie intake, hence the doubled DRIs for carbohydrate.

Overweight and obesity tests showed alarming results as the majority (56.15%) of women caregivers in the north section were found to be obese while 63.8% of the women in the south section fell into the obesity classification, showing that the women caregivers for both sections are at risk of obesity related illnesses (NCDs). The results for waist circumference showed that 71.53% and 78.46% of the women in the north and south sections respectively were above the waist circumference cut-off point (≥88cm). When the weight-for-height ratio was measured for the whole sample most of the women caregivers (69.23%) were found to be at risk of developing metabolic syndrome.

The food consumption patterns illustrated in the study corresponded significantly with the results found. Both the communities consumed a diet high in caloric and fat intake but was low in fruit and vegetable intake. This leads to obesity, resulting in non-communicable diseases as well as micro-deficiencies, leading to malnutrition because of the lack of variety in the food consumed by the population. The lack of food variety is the result of not having enough money for food purchases, explaining the question why the community cannot meet the DRIs as a result of unemployment and poverty as well as a lack of nutrition education.

With that said the two communities did not show much of a difference in lifestyle and food choices being made except for the education level that was low for the north section and a bit higher for the south section, as well as livelihoods that also showed that the north section was at a lower economic level than the south section but both the sections were at risk of malnutrition and poverty and needed the same intervention in terms of assistance.

In the study it was recommended that policies drafted by the government and stakeholders should be focused and tailored more on women caregiver headed households. More nutrition knowledge should be geared towards educating the most vulnerable and poverty stricken communities. The micronutrient intake must be promoted at lower and middle income communities. The agricultural sector needs to recognise and promote women farmers as well as offer assistance in order to grow their standing as farmers. The government should devise and implement projects that empower women so that they not dependent on their male counterparts.

TABLE OF CONTENTS

LIST OF FIGURES **PAGE**

LIST OF TABLES **PAGE**

LIST OF ANNEXURES

Abbreviations and Definitions

AI - Adequate Intake

AIDS - Acquired Immune Deficiency Syndrome

ART - Antiretroviral Treatment

ARV - Antiretroviral

BMI - Body Mass Index

CCHIP - Community Childhood Hunger Identification Project

CHD - Coronary Heart Disease

CTA - Technical Centre for Agriculture

DDS - Dietary Diversity Score

CED - Chronic Energy Deficiency

DUT - Durban University of Technology

DoH - Department of Health

DRI - Daily Recommended Intake

EER - Estimated Energy Requirements

EAR - Estimated Average Requirements

ECD - Early Childhood Development

FAO - Food and Agricultural Organisation

FBDGs - Food Based Dietary Guidelines

FGD - Food Group Diversity

FFQ - Food Frequency Questionnaire

FRC - Faculty of Applied Sciences Research Committee

FVS - Food Variety Score

GDP - Gross Domestic Product

GNP - Gross National Product

HACCP - Hazard Analysis at Cost Control Point

HIV - Human Immunodeficiency Virus

H/H - Household

HSRC - Human Sciences Research Council

H2O - Water

IES - Income and Expenditure Survey

INP - Integrated Nutrition Programme

IREC - Institutional Research Ethics Committee

KZN - KwaZulu -Natal

MDG - Millennium Development Goals

MTech - Master of Technology

MPA - Mean Probability of Adequacy

N/A - Not Applicable

NAR - Nutrient Adequacy Ratio

NCD - Non-Communicable Diseases

NDP - National Development Plan

NKS - Nutrition Knowledge Summary

NPFNS - National Policy on Food and Nutrition Security

NSNP - National School Nutrition Programme

NFCS - National Food Consumption Survey

PIP - Policy Implementation Plan

Prof - Professor

RDA - Recommended Daily Allowance

SA - South Africa

SANHANES - South African National Health and Nutrition Examination Survey

SASAS - South African Social Attitudes Survey

SD - Standard Deviation

SDG - Sustainable Development Goals

SES – Socio-economic Status

STI - Sexually Transmitted Infection

TB - Tuberculosis

TV - Television

SD - Standard Deviation

UNICEF - United Nations Childrens Fund

UNISA - University of South Africa

UN - United Nations

US - United States

WBG - World Bank Group

WHO - World Health Organisation

WHtR - Waist for Height Ratio

SYMBOLS

µg - Microgram

* - correlation is significant at 0.05 levels (2 tailed)

** - Correlation significant at 0.01 levels (2 tailed)

Z - Z value

P - Percentage picking a choice

% - Percentage

CI - Confidence interval

m - Metre

Mm - Millimetre

N - Sample number

< - Less than

> - Greater than

kJ - Kilojoule

Kg - Kilogram

Mg - Milligram

CHAPTER 1

Introduction and Motivation for the Study

1.1Introduction

Historically women have been nurturers and caregivers in the household, taking care of their spouses, children, grandchildren and even subsequent generations. In the 21st century traditional roles have changed and now men can be seen taking on the roles of women and vice versa. Even though this transition is taking place women are still generally the decision makers when it comes to food purchasing decisions and nurturing the family but are the most vulnerable when it comes to certain factors in the community as they are often subjected to domestic violence, seen as inferior to the menfolk and are expected to put the needs of their families before their own needs, and as a result may have a diet lacking in micronutrients, hence, the study targets this group specifically (Steyn 2008).

According to Torheim (2010) women in poor settlements are at risk of more than one type of vitamin and mineral deficiency and lack a variety of micronutrients in the diet, especially in Sub-Saharan Africa, South and East Asia and Latin America.

1.2 Background to the problem: a global view

The World Bank and Poverty Reduction and Equity Group (2011) explained that over and above the already poor populations in the world, a further 44 million human beings were affected by poverty in low-income and middle-income countries as a result of food prices that have been rising since June 2010. As much as consumers are suffering, the manufacturers of staple foods are benefiting from the price increase. Also the United Nations (UN) argued in the 6th Report on the World of Nutrition Situation (2010) that although the Millennium Development Goals (MDGs) to combat hunger and poverty by 2015 were set, malnourished populations were increasing due to rising food prices and economic scares, which delayed the achievement of the MDGs. For example, the shrinking of the labour market in the United States of America between 2007 and 2008 led the country into a recession in 2007 and hence people became unemployed and the possibility of job creation faded, and due to this more and more people faced poverty and malnutrition (Miller and Branscum 2011).

The delay in the achievement of the MDGs posed a serious concern especially for the low-income communities in civilian society and policy makers hence proposed that the goals should

continue beyond the set date of 2015, thus continuing to combat poverty and address the changes in the environment as a result of climate change globally. In addition, the MDGs were adapted and renamed the Sustainable Development Goals (SDGs) (Sachs 2012).

According to Misselhorn (2012) food is important for the well-being of human beings, and vital to food security is human development. Food production globally has increased, trying to keep up with the demand, yet the world is faced with a billion people without enough food and another billion without adequate nutrition. Further to that the population is set to double over the next fifty years thus increasing the demand for food globally. The world has not yet fulfilled the human right that was established 63 years ago that all human beings must have access to enough, nutritious and safe food at all times and beyond this the human body must be able to process food in a manner that promotes the health of human beings.

When looking at the supply and demand side of the availability of food, many factors influence universal food security and the many determinants of food and nutrition security (Misselhorn 2004). The increasing global population is putting a greater demand on food security in African and Asian countries and is set to rise by 47% from 2000 to 2050, or from 6.1 billion in 2000 to 8.9 billion in 2050 (FAO 2009). Climate change is also a point of concern as it brings with it many changes affecting the production of crops and the production of food, more so in the developing countries, and a decline of 9-21% in the agricultural production by 2050 is predicted. The normal temperatures will change together with patterns and amounts of rainfall as well, affecting the production of food negatively in some regions or positively in others (Parry, Rosenzweig, Iglesia, Livermore and Fischer 2004).

A number of factors have affected the price of food and the number of people who are food insecure and this is reflected in the economic recession and price increases in the years 2008 to 2011. These factors include

- Urbanisation
- Low incomes
- Corruption
- Poverty
- Overburdening of social services
- Poor water and sanitation and

- Air pollution, leading to malnutrition (Nordin, Boyle and Kemmer 2013)

In contrast, Imamura, Micha, Khatibzabeh, Fatim, Shi, Powels and Mozafarian (2015) argued that dietary patterns that are healthy are the primary goal in assisting with the reduction of non-communicable diseases globally; however, neither global trends nor dietary patterns were well established but the aim was to describe the worldwide changes in dietary patterns both countrywide and regionally by assessing the heterogeneity (sex, age, dietary pattern and income), which is what this research study is also intending to do.

1.3 Background to the problem: an African view

In a study conducted by Olaoluwa (2012) the serious challenge for human well-being and economic development in Sub-Saharan Africa (SSA) is nutrition security. It is clearly apparent that in a number of SSA countries the insufficiency of food nationally cannot meet the needs of all their citizens. The deficiency of vitamins and minerals such as iodine, vitamin A, iron, folate and zinc affects about two billion people in SSA, causing problems around public health issues and resulting in many of the populations experiencing hunger and deficiencies in minerals that are fundamental to ensuring normal growth and functioning of bodies; Haidar (2012) also found the same results. The availability of data on socio-demographic information and the effect it has on nutrition should be able to assist those people developing policies to take crucial steps.

The SSA food and nutrition security is affected by:

- Social policies
- Increasing population growth
- Food consumption
- Hasty urbanisation and
- Migration and factorial changes (Olaoluwa 2012).

Crush (2012) also added that, with people moving from country to country, the population demographics are affected and changed, for example, the age, size, distribution and structure of the population is changed. The food culture of the migrants is affected when the usual foods consumed are not readily available causing them to resort to unfamiliar foods that are normally unhealthy such as fast foods (high in fat and salt). If the policy makers can take such issues

into consideration when making decisions about nutrition security, they will be able to endorse proper and healthy nutrition and food selections.

Nutrition security is also affected by urbanisation, which is the moving of people from rural areas to cities (urban areas). This movement causes a change in the population's lifestyle, nutritional health, normal living patterns and food choices. Even the education levels and marital status of the people are affected (Oldewage-Theron, Kruger and Egal 2014).

Currently the production of food is decreasing because of such migration causing people to neglect customary, healthier foods and resulting in them being unable to maintain healthy lifestyles.
Olaoluwa (2012) also reveals that many of these populations that move from rural to urban areas end up living in unfavourable conditions, such as informal settlements, overcrowded places and in deep poverty. Thus nutrition and food security is affected, and food intake patterns, food safety and the suitability of the environment all need serious investigation.

According to Hester (1999), many emerging economies that are in a rapid process of urbanisation are experiencing a health transition categorized by a double burden of diseases in which Non-Communicable Diseases (NCDs) have become more predominant and infectious diseases remain undefeated, causing 39% of all deaths in such countries. Stroke and Coronary Heart Disease (CHD) are causing about 12 million deaths yearly mainly in developing countries and, alarmingly, are affecting the younger population.

It is of great importance that the governments of the emerging economies understand the state of the population's nutritional status and development in order to make sound and viable decisions that will benefit the population and alleviate nutrition insecurity. Even if such research is minimal it is of considerable importance to conduct such studies in order to assist the governments in their policy development. The South African Constitution states that every person living in the country has the right to access to enough food and that safe water should be available to ensure that this goal is achieved, especially ensuring that the population has nutritious food and can lead a healthy and fruitful life (Thulile 2014).

Women are still faced with inequality in many SSA countries where in some cases women cannot make decisions about their own well-being and that of the children they bear. This is

one of the factors affecting the growth and nutrition of the population. Sustainable Nutrition Research for Africans that was conducted in the year 2012 recommended that women should be empowered with strategies and policies that drive the improvement of the nutritional status of women in society on all levels.

Data on socio-demographic statistics is not always available hence the need for more research to be conducted in the SSA countries so as to get a clear and undoubted-perspective on food and nutrition security on the African continent. One of the objectives in this research study was to establish the KwaNdengezi population's nutritional status by collecting and combining data from the selected sections, the low and middle income sections, within the area and then comparing the findings. The research study also seeks to find out which section is more likely to be affected by NCDs and micronutrient deficiencies.

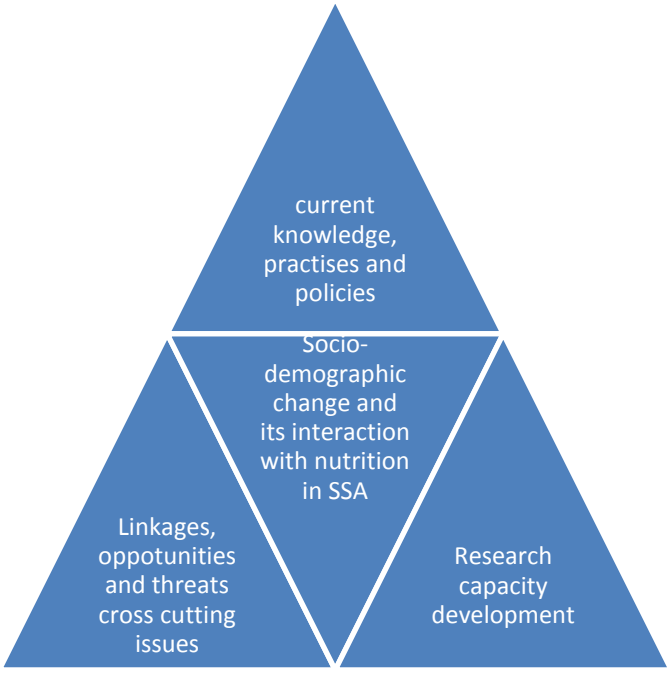

Figure 1.1: Proposed pillars of research priority on nutrition and socio- demography (SUNRAY 2010:64)

Figure 1.1 illustrates the proposed pillars when conducting research on nutrition and socio-demographic factors. This is to assist with finding the important points that can be used in decision making as far as nutrition security is concerned.

According to Sunray (2010), the proposed four pillars can only be fully implemented when working together as a whole, with none being excluded. Central to the relationship between the pillars are the socio-demographic changes and their interaction with nutrition in Sub-Saharan

Africa and these can be discovered when interacting with research capacity development, with current knowledge, practices and policies and the linkages and cross-cutting issues.

1.4 Background to the problem: the South African view

According to Puoane, Bradley and Hughes (2006), from 1994, after the previous apartheid era, the number of black Africans living in urban areas accelerated at a rapid pace mainly because of the belief that the urban areas provided improved work opportunities and basic needs such as health services and education. Even though urbanisation often means that a traditional diet has to be largely replaced by a more western diet, it seems that food traditions that were adopted during early socialisation are often still followed. While food is vital to satisfy basic personal needs, eating more food than is necessary for the body to function leads to poor health. The increasing occurrence of NCDs such as type two Diabetes Mellitus, hypertension and obesity has emphasized the need to examine factors that are related to food intake in this population (Goedecke, Jennings and Lambert 2005).

The South African government together with the rest of the world agreed to work towards the Millennium Development Goals that target issues such as eradicating poverty and hunger (Aliber, Peters, Steyn, DOH, Stats SA and UNDG 2010) and promoting gender equality and empowering women (Budlender, Govender, Crown, Kabeer, Sherperd, Steinberg, Wilson and Wolpe 2010).

The South African government sought to bring growth and equality to all populations by removing poverty and fighting hunger. This goal was set as the first goal to be achieved by 2015 by assisting communities surviving on $1 a day for the poor populations and $2.50 for the semi -developed populations in achieving food security (Aliber *et al* 2010). As the MDGs have not been entirely met, the introduction of the SDGs has changed the first MDG to cover a broader spectrum where the global population will now be able to access safe and sustainable water, adequate nutrition, basic infrastructure, sanitation and primary health services. These goals have been developed with the global population in mind and it is not just a case of the rich helping the poor but rather every country developing ways to sustain and develop the continent while working together (Sachs 2012).

Misselhorn (2012) states that because of the demand factor on food security rising globally, South Africa is one of the countries that are most vulnerable as the population is estimated to increase twofold to 2 billion by 2050.

Labadarios, Steyn and Nel 2011 assessed the state of food security in South Africa, looking at food utilization, availability and accessibility. The survey revealed a great decline in food security from 1999 to 2008. The undernourished populations (consisting of 814million people) are mainly found in countries that are at a development stage and the Sub-Saharan African countries accommodate about 204 million of this population and South Africa is one of these countries.

Since 1994 South Africa has seen economic and political improvements but is still greatly affected by unemployment and poverty, increasing interest rates, increased energy tariffs, international economic crises and very high food and petrol prices, putting extreme pressure on the general population of South Africa who are already unable to make ends meet.

The study further showed that the poorer communities spent relatively little money on food and ate less than eight different kinds of food in one day and night whereas the more food secure communities ingested about sixteen different foods in one day and night (Labadarios *et al* 2011).

The constitution drafted by the Policy Implementation Plan (PIP) in South Africa indicated that it is every residents' right to have enough accessible food and safe drinking water, with the state taking reasonable legislative measures and availing its resources and ensuring that the right to enough food is realized. A combined method ensuring the distribution of food security programmes has been followed through the execution of the Integrated Food Security and Nutrition Programme. The government of South Africa authorised the National Policy on Food and Nutrition Security (NPFNS) and the Household Food and Nutrition Security in 2013 to continue responding to food challenges in the country (Thulile 2014). The policies and strategies that empower women would also lead to improvement in the nutritional status at all levels of society.

1.5 Research Setting

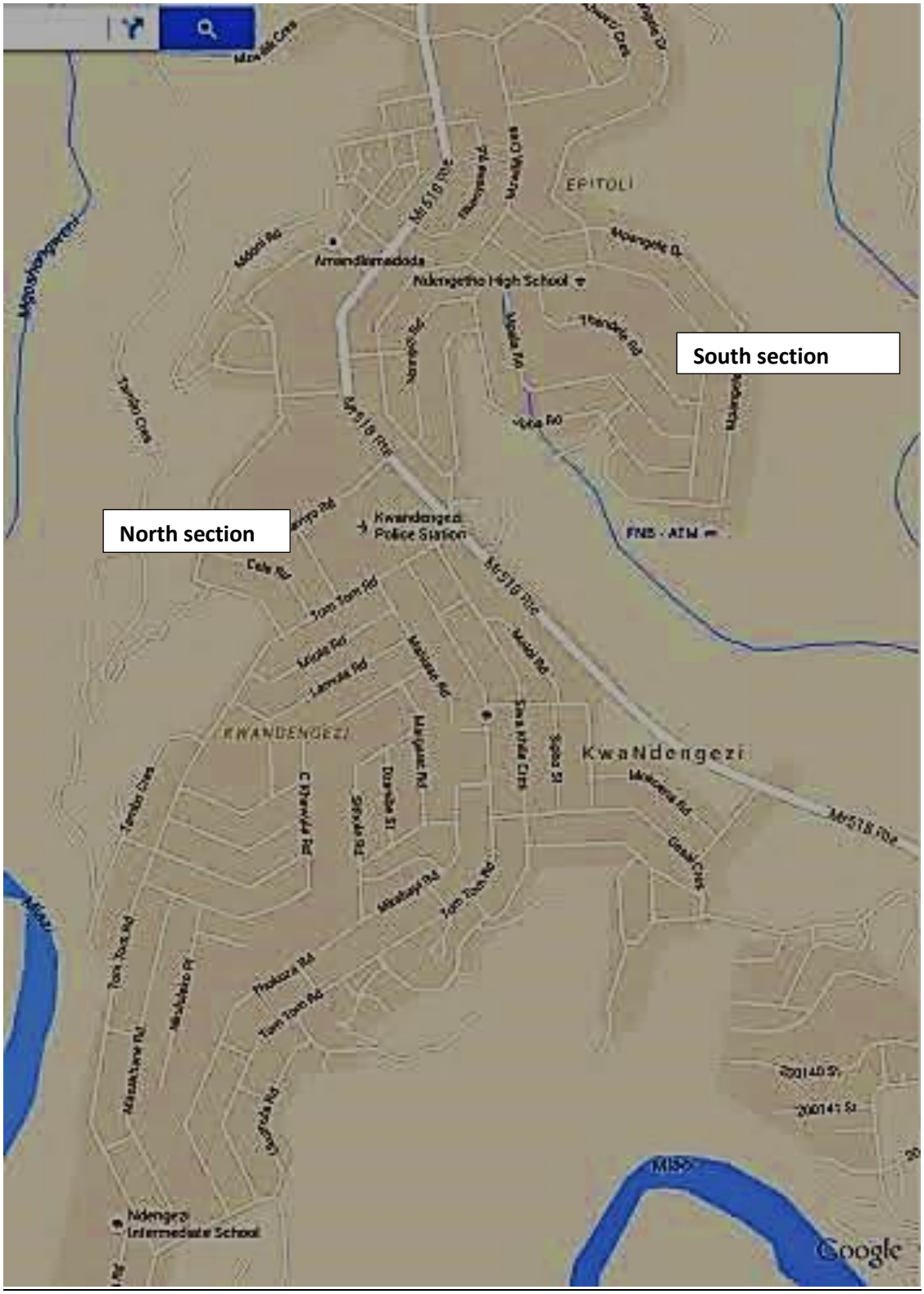

Figure 1.2 Map illustrating the KwaNdengezi Township (EThekwini Municipality 2012)

KwaNdengezi is a township in the province of KwaZulu-Natal in South Africa the second-largest province in the country with 10, 45 million people (estimated to be about 10 919 077 by the year 2015) with a female population of 52%, (Statssa 2009 and Statssa 2015). Residing in the area are about 32 088 people (eThekwini Municipality 2012).

North section South section

Figure 1.3 Images of typical houses in the north and south sections of KwaNdengezi Township (home.mutual 2014)

The KwaNdengezi area is about 13.99 km² with a population size of 53 843 people and 13357 households. Females make up 51.87% of the population and men account for 48.13% of the population. Black African people make up the main population at 99.38% with 85.96% speaking IsiZulu (Census 2011).

KwaNdengezi has two main sections (so named by the population living there) divided by a road but according to the official area map (Census 2011) the main area is divided into ten sections. This study was undertaken in eight of the ten sections. The north section comprises of semi-detached houses with two bedrooms for a single family. These houses were built by the previous "apartheid government" for the black communities when the people were being moved from their original land to townships (see Figure 1.3).

The south section comprises of houses that were built later for the working middle class community comprised of, for example, teachers, nurses and policemen. These houses are now sold to the general public and anyone who can afford them; they are mainly three to four bedroom houses with a garden area. Both these sections have electricity, running water and

proper sanitation. The south section houses are mostly paid for by using the mortgage (bond) system.

Figure: 1.4 South section type of house

Table 1.1 Food security studies conducted in South Africa during the last ten years.

Author and reference	Study population	Measuring instruments	Summarized results
Rose, Bourne, and Bradshow. 2002. Food and nutrient availability in South African households. Development of a nationally representative database: *Health and development research group and the burden of disease research unit.*	**28 704 Households from the October 1999 Income and Expenditure Survey (IES)**	**Statistics SA Data, Medical Research Council Data and other sources of data. Meta-analysis, 24-hr recall IES data.**	**In the rural areas most households consumed the largest amount of cereals and the Northern Province was the leading area followed by the Western Cape (rural). The urban Western Cape consumed a substantial amount of vegetables and fruit while urban Gauteng consumed the greatest amount of meat. The white race group had the highest intake of a variety of food.**
Misselhorn, A. 2004. What drives Food Insecurity in Southern Africa? *A Meta-analysis of Household Economy studies*. Available: http://www.elservier.com/locate/gloenvcha 15: 33-34	**49 Households**	**Meta-analysis used to collate the empirical evidence from case studies generated by humanitarian field agencies making use of the household economy approach in analysing the food insecurity vulnerability.**	**Results showed rooted cycles of vulnerability in food insecure populations in Southern Africa where issues of socio-economics appear conspicuously. Environmental stressors, conflict and poverty directly caused the food insecurity accounting for fifty percent of the recognized unintended drivers of food insecurity.**

Table 1.1 (continued) Food security studies conducted in South Africa during the last ten years.

Labadarios, Swart, Maunder, Kruger, Gericke, Khuzwayo, Ntsie, Steyn, Schloss, Dhansay, Jooste, Danhauser, Nel, Molefe, and Kotze, T. 2005. National Food and Consumption Survey- *Fortification Baseline (NFCS-FB-1)*. South Africa	**1-9 years (12-108 months) children and females of reproductive age residing in same homes in South Africa. Included in the survey were 226 Enumerator Areas, and 107 urban-formal, 23 urban-informal, 15 rural-formal and 81 tribal areas.**	**Validated questionnaires. Socio-demographic, Knowledge, Attitude and Behaviour questionnaire (KAB), Food Procurement and Household Food Inventory and Hunger Scale. Blood and Urine sample to assess micronutrient status. Tap water and maize sample taken to test for Iodine and Vitamin A.**	**In the survey there was a 91% response rate.** **Countrywide about 20.5% of the children of 1-9 years of age had received an increased dose of the vitamin A supplement in the last half of the year whilst 10% of the respondents were found to be unsure if the child had received the vitamin A supplement.** **About fifty percent of the country's households were headed by men (husband/father). One third of the h/hs were headed by women or the respondent's father whilst the grandfather and husband headed 2% and 17% of the homes respectively. Countrywide about 55% of the households received a monthly income of between R1-R1000, where the informal urban h/hs had the highest levels of no income and 35% reported an income of between R1- R500.** **Households that obtained water from taps were six out of ten, while a communal tap was used by one in four h/hs and 9% and 4% obtained water from a river/dam or borehole/well respectively.** **Radio and television that worked was found in one out of two h/h, mainly using the radio to receive most information.** **An improvement was observed in terms of the socio-economic conditions of the nation's population from 1999 but a significant number of the population at the time of the study still resided under hostile conditions calling for intervention to assist in the improvement of the population's nutritional status.**

Jacobs, F.T. 2009. The Status of Household Food Security targets in South Africa. Agrekon. *Agricultural Economics Research, Policy and Practice in Southern Africa*. Available: http://dx.doi.org/10.1080/03031853.2009.9523834. 48(4): 410-433.	**N/A**	**Household survey. Food balance sheets. Household Expenditure models, Food Expenditure Ratio, Income Elasticity Poverty Hunger Index, Rose Charlton Indicators and Food Security Gap Index.**	**Low spending levels were reported at high percentages in both the urban and rural households but being under the costs of the Estimated Dietary Energy. Consistent with the recent surveys, one in five households can afford only the usual dietary energy costs.**
Labadarios, D., Mchiza, Z., Steyn, N., Genake, G., Maunder, E., Davids, Y. and Parker, W. 2011. Food Security in South Africa: *A review of national surveys.*	**1999 Census Sample and 2001 Census Sample (2894 and 2469) respectively.**	**The Community Childhood Hunger Identification Project (CCHIP) Index NFCS 1999 and NFCS 2005.**	**At the individual and household level food insecurity obviously decelerated in South Africa from the years 1999 to 2008. In both the urban and rural areas food insecurity decelerated by almost half a percentage, from 52.3% to 25.9% for both areas and separately, the urban area from 42.0% to 20.5% and the rural area from62.0% to 33.1%.**
Labadarios, Steyn and Nel. 2011. How diverse is the diet of adult South Africans? *Nutrition Journal*. Vol. 10:33. Available: http://www.nutritionnj.com/content/10/1/33	**n=3287**	**Household interviews. Validated 24-hour recall, Dietary Diversity Score (DDS)**	**Limpopo at 61.8% and Eastern Cape at 59.6% were the only areas with the greatest occurrence of poor dietary diversity; (<4) however, the Western Cape respondents had the lowest score. The worst affected were the rural and informal areas at 63.9% and 55.7% respectively. Cereals and roots, meat or fish and dairy were the most commonly consumed foods other than Vitamin A rich foods and vegetables.**

Table 1.1 (continued) Food security studies conducted in South Africa during the last ten years.

Shisana, Labadarios, Rehle, Simbayi, Zuma, Dhansay, Reddy, Parker, Hoosain, Naidoo, Hongoro, Mchiza, Steyn, Dwane, Makoa, Maluluke, Ramlagan, Zungu, Evans, Jacobs, and Faber. 2012. SANHANES- 1: *The Health and Nutritional Status of the Nation*. 2014 Edition	**Individuals of all ages residing in South Africa and occupying a household excluding individuals residing in old-age homes, uniformed-service barracks, hospitals and educational institutions.**	**Interviews conducted using questionnaires, combined with health measurements from clinical examination, four clinical tests and blood samples for biomarker analysis.**	**Education - the Indian and White participants were found to have the highest number of matriculants at 33.5% and 23.9%, with more whites (38.3%), followed by Indians (13.0%) who had completed tertiary education.** **Cost of living - the most participants that reported not having enough money for food and clothes resided in urban informal (57.8%) and rural informal (51.2%) areas as well as a minimal 28.9% residing in urban formal areas.** **Monthly income - more women than men were in the lower income rating of R1- R800 at 15.5% and 4.7% respectively. At the rating of R801-R3200 men and women were at an almost similar percentage of 31.1% and 31.8% respectively.** **Income source - salaries and wages were mostly received by more males (45.5%) than females (32.4%), with females receiving income as pensions, UIF payments and grants.** **Health status - both globally and locally the NCDs have risen, with mainly cancer, diabetes, cardiovascular diseases and lung diseases in developing states contributing mostly to poor health and socio-economic strains.** **Physical activity - physical inactivity is seen as the fourth leading factor of mortality and is responsible for 6% of NCD risk like type 11 diabetes, coronary heart disease, colon and breast cancer. Attributable to physical inactivity and NCDs are 6 out of 10 deaths being responsible for almost half of the disease burden in the world.**

			Obesity and overweight are on the rise, with the highest prevalence being seen among socio-economically disadvantaged and black African females.
De Schutter, O. 2012. Report of the Special Rapporteur on the Right to Food on his Mission to South Africa. *General Assembly*.	**N/A**	**Field visits**	**In the first part of the decade the number of people living in poverty decreased. The people that were suspected to be living in income poverty were at 60%. Women-headed households were the ones mostly affected by poverty and were even poorer than the ones headed by men. Households that only had access to severely inadequate food amounted to 20% in the year 2008. Also the prevalence of HIV and AIDS at 10.5% puts a strain on the food accessibility for adults aged 15-49years at 17%.**
Country Report. 2013. Millennium Development Goals. Republic of South Africa.	**11.2 million households in 2001** **14.5 million households in 2011**	**Population Census 2011**	**Population in extreme poverty in 2010 numbered 1.2 billion. The first MDG supported by the government of South Africa was to eliminate poverty and hunger by 2015. A decrease in the poverty levels in South Africa was seen during the years 2000 to 2009; however, an increase was apparent during the year 2006 to 2009 partially due to the worldwide economic decline.**

Table 1.1 (continued) Food security studies conducted in South Africa during the last ten years.

Pereira, L. 2014. The Future of the South African Food System: what is research telling us? *South Africa Food Lab*. South Africa	**209 Articles.**	**Previous data - Reviewed Literature from 1999 to 2014**	**At national level South Africa is deemed to be food secure with the levels of hunger dropping since 2002 but at the household level findings are different in both urban and rural populations as the occurrence of stunting and wasting and vitamin and mineral deficiencies are prevalent in relation to the socio- economic aspect. There is an increase in the peer-revised studies connected to food security and the food systems in South Africa for the past fifteen years.**
Leung, C., Epel, E., Ritchie, L., Crewford, P. and Laraia, B. 2014. Food Insecurity is Inversely Associated with Diet Quality of Lower- Income Adults. Available: http://elx.doi.org/1016/jjand 2014.06.353]	**8129 Lower income adults**	**Food Insecurity - Household Food Security Survey module. Dietary intake - 24-hour recall. Diet Quality - Healthy Eating Index 2005 and Alternate Healthy Eating Index 2010. Linear Regression models. Data from the 1999- 2008 NHNS.**	**The highly affordable foods were the ones mostly consumed by the low income food-insecure adults. These foods include salty snacks and high-fat foods when compared with the lower-income food secure respondents. Sugar - sweetened beverages, more red/ processed meats, nuts and legumes were also associated with food insecurity. When associated with the lower Healthy Eating Index, 2005 and Alternate Eating Index 2010, food insecurity was insignificant.**
Oldewage-Theron, W., Kruger, R. and Egal, A. 2014. Socio-Economic Variables and Nutrient Adequacy of Women in the Vaal Region of South Africa. *Ecology of Food and Nutrition.* 53: 514- 527.	**722 women (10-90yrs)**	**Socio-demographic data 24-Hour recall dietary data intake.**	**The women did not meet the whole required nutrient intake for EAR but only for the CHO, Vit. B12 and Phosphorus. Extremely high were the energy intakes among those who had low income (p=.028), were unemployed (p=.015) and uneducated at (p=.015).**

1.6 Rationale and Motivation

According to a study conducted by the University of South Africa (UNISA) and Momentum, Vollgraaf (2012) investigating free housing and social grants to South Africans it is reported that certain factors were looked at to measure how well households were coping financially. These factors included environmental, income statement and education levels of household members. It showed that the households of both groups whether free housing (low income) or bought houses (middle income) both performed well financially if the members had an improved education level. There was not much difference between the employment and unemployment levels of household members in any one of the two housing groups, except for the gap shown for education. This served to prove that government's free housing and social grants only assist households in a small way as 47.6% of households still live in poverty in South Africa.

Women in households at risk of food insecurity in SA lived in informal housing, had a lower education level, had the lowest monthly income and spent the lowest amount of money on food per week in the country compared to households not at risk (Labadarios *et al* 2005).

According to Pena (2002) poverty has a significant link to health, with nutrition as an intervening factor. The argument was that people cannot be called poor just because of a minimum income level but other factors contribute to the increase of poverty that can lead to malnutrition such as no access to health services, little/ no access to water, low education and prejudiced rights and needs. Poverty leads to the deterioration of health and ill-health can lead to poverty as sick people cannot be fully productive and earn full wages. Malnutrition does not only apply to undernourished populations but also includes overnourished populations in the form of obesity as it may lead to multiple NCDs. Twenty percent of women in SA are overweight and 9.6% obese (Steyn and Nel 2006).

Berge, Arikian, Doherty and Neumark- Sztainer (2011) looked at the community through the eyes of the families it hosted. It found that nutritional choices that individuals make are also influenced by other family members. When parents eat correctly and exercise their children are more likely to do so. The purchasing decisions that women make shape the type of family it becomes. Families argued that barriers to healthful choices and activities were price, residential area, seasonality of foods and safety. Lynch, Holmes, Keim and Koneman (2011) argued that often women made wrong purchasing decisions since although these women knew which foods

were healthy and which were less healthy they did not know why such foods were healthy or unhealthy whilst women in a study by Miller and Branscum (2011) preferred foods that were high in fat and sugar because of lower cost opposed to the healthier more expensive foods.

In a study by Steyn, Wolmarans, Nel and Bourne (2008), women in rural areas had lower levels of certain micronutrients such as iron, folate, calcium and Vit. B6. Six out of ten women in KZN were vitamin A deficient. Country-wide at least 20% of women were iron deficient (Labadarios *et al* 2005). Government intervened in the form of food fortification to address micro-nutrient deficiencies in the South African population. However, in the NFCS it was stated that 60% of women did not look for the fortification logo when making food choices (Labadarios *et al* 2005).

In a study by De Schutter (2012) poverty was found to be higher in households that were headed by women. De Schutter (2011) also stated that women are primarily responsible for caring for minors in the households and need to be equipped with nutrition information to make proper food purchasing decisions; yet women and children were suffering most when compared to men.

1.7 Research Aim

This research seeks to establish a true reflection of the nutritional status and food intake patterns of the two communities participating in the study and the factors affecting this in order to determine if a low income community is really in a more disadvantaged situation when it comes to nutritional status, food intake and food security.

1.7.1 Research Objectives

The main aim of the study is to determine the food intake of and identify the nutrition risk between the two KwaNdengezi communities. The specific objectives were:

- To determine the socio-demographic profile of the communities in the two sections in KwaNdengezi township using the socio-demographic questionnaire.
- To determine the food group diversity and food variety status of the two communities using the food frequency questionnaire.

- To determine the nutritional status of the community by weighing, measuring and determining the waist circumference of the participants.
- To compare the findings between the two sections and make recommendations.

1.7.2 The conceptual framework of the study

The framework of the research study is illustrated in Figure 1.5 and was developed by the researcher under the supervision of Prof C. Napier

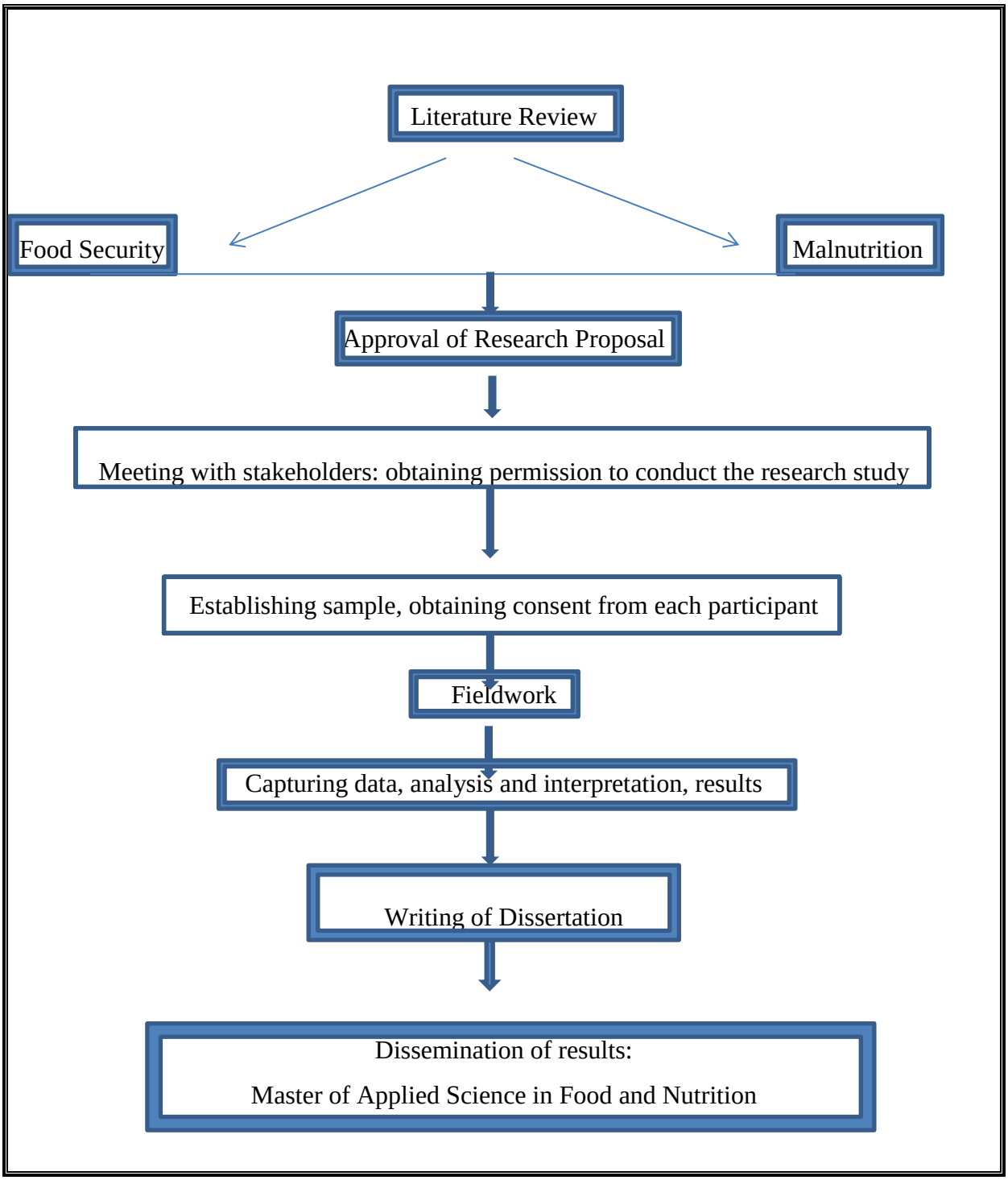

Figure 1.5 Framework of the research

1.8 Structure of the Dissertation

An overview of the dissertation is illustrated in figure 1.5 that represents the summary for each chapter conducted by the researcher under the supervision of Prof. C. Napier

CHAPTER 1

INTRODUCTION AND MOTIVATION FOR THE STUDY

Introduction
Background to the problem: A worldwide view
Background to the problem: An African view
Background to the problem: The South African view
Rationale and Motivation
Research Objectives
Conceptual framework of the study
Structure of the Dissertation
Conclusion

CHAPTER 2

LITERATURE REVIEW

Definition of malnutrition
Nutritional needs of adults
Causes of malnutrition
Factors affecting food intake
Methods to determine dietary intake and nutritional status
Strategies to address malnutrition
Economic impact of malnutrition
Conclusion

CHAPTER 3

METHODOLOGY

Introduction
Setting
Permission and consent
Empirical study design
Sampling strategy
Study type
Responsibility of fieldworkers
Study variables
Administration of measuring instruments
Procedure for collecting anthropometric
Measurements
Statistical analysis of data
Conclusion

CHAPTER 4

RESULTS AND FINDINGS

Introduction
Socio-demographic results
Dietary assessment
Anthropometric indicators
Correlation
Discussion
Conclusion

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Introduction
Limitations to the study
Main findings
Recommendations
Conclusion

1.9 Conclusion

The research being undertaken consists of a descriptive study and a theoretical structure. The dissertation consists of five chapters outlined in figure 1.5, framework of research.

Women that reside in informal housing are at risk of food insecurity as a result of a lower education, lowest monthly income and spend the lowest amount of money on food per week in the country when compared to households not at risk. The nutritional choices that individual make are influenced by other family members. Barriers to healthful choices and activities are price, residential areas, safety and seasonality of food.

In chapter two, a literature review will be presented supporting the theoretical underbuilt for the study

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The health status of women and girls is still in transition, even though some aspects such as social, economic, political and demographic aspects have substantially improved. In the past few decades there are still important women's needs that have not yet been met. The transformation and population ageing in the social determinants of health have increased the coexistence of disease burdens related to reproductive health, infections and nutrition and developing widespread chronic and non-communicable diseases (NCDs) (Langer, Meleis, Knaul, Atun, Arreoal-Ornelas 2015).

According to Langer *et al* (2015) the priorities in women's health globally have been diverted from streamlined emphasis on birth and child health, to a much more diverse structure of procreation and sexual health, as well as to encompassing the idea of women's health established along a life-progression approach. This broadened vision incorporates health problems. The health problems affect women beyond their procreation years and those that they share with their male counterparts. Findings and indicators that affect females show a misbalance that occurs due to organic, social and gender determinants. An increased focus on health systems is required because of the difficulty of the problems experienced by females across their life cycle. This requires an increase in the number of women working as caregivers in the health labour force, in their positions as primary nurturers at both the domestic and public levels.

The alleviation of undernutrition in developing countries is the main focus of public health programmes. However, in South Africa, just like other developing nations, the population is bombarded by a swift increase of urbanisation categorized by an over burdening of illnesses, where non-communicable diseases (NCDs) occur more frequently, yet the infectious illnesses still remain unbeaten. Research in this regard needs to be prioritised, while exploring the possible mechanisms by which the contribution of undernutrition to the double burden of NCDs is experienced (Vorster, Bourne, Venter and Oosthuizen 1999).

According to Steyn and Temple (2008) the available educational tools designed to acquire nutrition knowledge are very important and even vital in giving guidance in respect of knowledge about nutrition as well as keeping information flowing.

The Human Sciences Research Council (HSRC) has established the South African National Health and Nutrition Examination Survey (SANHANES- 1) that will be regularly undertaken as a means to address the health needs that are always changing in South Africa, as well as to give a wider and more complete podium to study the health and nutritional state of the country regularly. The SANHANES provides the country with important knowledge to plot the rising pandemic of NCDs, and further scrutinize the fundamental economic, social, environmental and behavioural factors contributing to the state of health of the population. Information on the severity of and tendencies in non-communicable diseases and other rising health problems will be essential in promoting the country's control and prevention programmes, checking the effects of intervention and evaluating the status of the health of the nation (Misselhorn 2004).

The Academy of Nutrition and Dietetics (2013) has positioned itself appropriately and promotes that all individuals should have an ongoing right to access an appropriate and nutritious food and water diet, characterized by adequate health services, a sanitary area and care that ensures all households and persons live an active, healthy lifestyle. In order to accomplish nutrition security and self-sufficiency and at the same time, ensuring sustainability in terms of the economy and the environment, the Academy supports systems, programmes, policies and practices that work together towards nation development.

The World Health Organisation (WHO) put forward a proposal that health be secured and endorsed by means of environmental development that ensures that actions are sustainable at the level of the worldwide population, the country and the community. The development of Food Based Dietary Guidelines, such as food pyramids, has been undertaken in a number of developing nations so that they distribute nutrition education to the widespread community. However, more recommendations are required, together with knowledge on leading a healthy lifestyle as well and not only a healthy diet (Gil, Ruiz- Lopez, Fernandez-Gonzalez and de Victoria 2014).

South Africa is rated together with other nations globally that have the highest income inequality level. When compared to other nations SA has a severely increased rate of complete

poverty. The government had given its full attention to reducing poverty by 50% between the years 2004 to 2014 and in meeting that objective, combating food insecurity at domestic level is a vital issue. Food and water accessibility is necessary to human development and optimal existence. South Africa as a nation may have achieved food security but at a domestic level many people remain food insecure and the relationship between food security in households, poverty and income is unending (Altman, Hart and Jacobs 2009).

In a study conducted by Labadarios *et al* (2011) where the CCHIP (Community Childhood Hunger Index Project) was used to measure food security in the country with the 2005 NFCS (National Food and Consumption Survey) and SASAS (South African Social Attitudes Survey) it was found that during 1999 and 2008 food insecurity was reduced profusely. With that said, there was an ongoing tendency for women caregivers in poorer homes to give what should actually be their own meal to the household children and also to serve the children an unbalanced diet. The findings also showed that the poor households consumed a diet with a minimal variety of food items, sometimes as low as eight, whereas in food secure homes a variety of sixteen food items was regularly consumed in twenty four hours. The South African government thus needs to put measures in place and implement strategies to eliminate food insecurity.

Continuous behavioural transformation is to be regarded as the primary goal of effective nutrition knowledge. To have this happen, it is vital that nutrition educators narrow the gap between the simple delivery of nutrition knowledge and the improvement of nutrition information and endorsement of the real dietary practice (Love, Maunder and Green 2008).

Many women continue to suffer discrimination in respect of accessibility to productive and natural resources such as land, water, seeds, education, stable employment and sufficient incomes, social security and healthcare grants and in addition, they also suffer discrimination in respect of sexual and procreation rights, protection from violence and political, cultural and social participation. With that said, a number of global instruments were created to endorse gender equality and human development. This discrimination establishes an abuse of women's human rights and blocks the whole, independent and active exercise of their capacities, in the delivery of acceptable food and nutrition for themselves, their families and their societies (Castro and de Lara 2015).

2.2 Definition of Malnutrition

According to the Nutrition Knowledge Summary (NKS) (2012), malnutrition is defined and referred to as all types of poor nutrition as a result of serious factors, that include inadequate diets in respect of both under- and over-nutrition.
The Food and Nutrition Security Plan (2014) also adds that malnutrition is closely linked to food consumption and infectious diseases like measles, acute respiratory infections and diarrhoea. Research also found that the stunting rate increased between 2005 and 2012 from 23.4% to 26.5%.

A diet that has inadequate protein, energy and micronutrients and where the population cannot maintain a healthy lifestyle and fully process the food consumed as a result of sickness results in malnutrition (Steyn and Temple 2008).

According to the European Union, FAO, CTA and World Bank Group (2013) malnutrition is being reduced significantly globally. However, under-nutrition is still prevalent hence more work is required. Nevertheless a positive response regarding the political obligation to deal with malnutrition was made at the 2012 World Health Assembly.

In all its varied manifestations, malnutrition is still the main contributor to the illness and mortality of women and minors. Under-nutrition continues to cause challenges across the board especially in respect of those who are most vulnerable. In the low and middle income communities, overweight that results in obesity is rapidly increasing, causing NCDs and other health services to incur costs associated with NCDs. It was at this point that accelerated implementation to improve the state of nutrition security was seen as necessary, to speed up and reach health development goals by 2015 (PMNCH 2012).

2.2.1 Over-nutrition

Obesity and Diseases of Lifestyle
Over-nutrition is defined as the excessive and abnormal accumulation of fat that impairs health resulting in obesity and overweight (WHO 2015).
Over-nutrition results in obesity and related chronic diseases, such as non-communicable diseases (NCDs) that include heart attack, stroke and type11diabetes. According to the NKS (2012) over-nutrition is the result of globalisation of food supplies and the migration of

populations from rural areas to urban areas. The food industry also promotes the consumption of highly refined foods with minimal nutrition value or no nutritional value at all.

In the United States of America alone about 65% of adults are overweight or obese. The people mainly affected are those who reside in low-income areas. Populations most at risk are the Black and Hispanic communities, who present with a high rate of deadly illnesses such as type 11 diabetes and obesity exacerbated as a result of a low socio-economic level (Townsend 2006). Popkin and Gordon-Larsen (2004) further stated that such behaviour and transition was normally seen in high-income urban persons but it now affects the broader society. Society is moving from a state of a high birth and a low death rate to a state of a low birth and a high death rate (demographics) as a high occurrence of infectious illnesses closely linked with malnutrition decreases, while a high occurrence of deadly (chronic) illnesses closely linked with urbanisation increases.

According to Brawbach and Schoeppe (2007), Europe was also faced with the obesity issue with about four million of the adult population having a Body Mass Index of > 25kg/m² (overweight). Amongst the population of 130 million persons above the BMI of 30 (obese), 28% to 78% of females were overweight and 7% to 36% were obese. Apparently the results of the population's state of obesity and overweight resulted in an increased number of persons presenting with dyslipidaemia, hypertension, weakened insulin resistance and major NCDs. Germany reported alarming rates of obesity and overweight with 36% of women overweight and 19% obese.

The SANHANES-1 media release (Shisana *et al* 2013) reported that the participants in the study reported a family history of high blood pressure at 30.9% and high blood sugar at 20.7% whilst fewer participants reported cases of stroke at 8.9% and heart diseases at 7.6%, all non-communicable diseases.

Obesity is progressively becoming predominant among women, especially in developing and low-income countries as access to a greater quantity of inexpensive, tasty and convenient foods increases. SANHANES-1 reported a tremendous increase in obesity in females from 27% in 2003 to 39.2% in 2012. According to Townsend (2006), the foods that are potentially contributing to overweight and obesity are high energy-dense foods including sweetened

liquids, foods with a high dietary fat content, fast foods eaten in restaurants, massive portion sizes, constant snacking, as well as low intakes of fruits and vegetables; in addition a low activity rate contributes to the problem.
The occurrence of obesity at 39.2% and overweight at 24.8% was found to be considerably higher in females than in males. The females had a waist circumference of 68.2% placing them at risk of metabolic problems. The waist-hip ratio also showed a similar threat at 47.1%.

Premature deaths and continued morbidity resulting from malnutrition can be avoided through coordinated efforts across sectors such as the departments of health, social welfare and agriculture and the food sector.

In a study conducted by Vorster *et al* (1999) the findings were similar, as the occurrence and increase of the NCDs was also associated with rapid urbanisation, resulting in many diseases being left undefeated. When people move from rural areas to urban areas they tend to reside in informal settlements that are crowded, with poor sanitation and no infrastructure.

The changes in people's health status, diseases and mortality are as a result of societal, demographic and economic changes, also known as the global health transition. The study showed that NCDs were replacing infectious diseases as a principal source of illness and death, causing about 39% of mortalities, especially in young people in developing countries rather than those in already developed countries. The increase in overweight and obesity is also concurrent with the steady increase in the per capita food supply of protein, total calories and fat (Pereira 2014).

Urbanisation in South Africa has mostly affected the black (African) population, and the diet the black urban population is consuming consists of about 30% fat (Popkin and Gordon-Larsen 2004). However, the black population residing in the rural parts of the country consume a diet which is very low in fat, about 20%.

Ahmad, Tukin and Takruri (2006) also found that the increasing prevalence of obesity and overweight (33.9%) in Badia may also be as a result of the ongoing developments in the area. The factors that were significantly ($p<0.05$) associated with BMI among the Badia young women included non-smoking, being married, not having chronic disease, unemployment, being settlers and low uneducated status.

According to the research conducted by the Scientific Advisory Committee (2003) one of the risk factors in cardiovascular disease, which is also a non-communicable disease, is hypertension commonly known as "high blood pressure". The main and most common source of hypertension is increased levels of salt (sodium) intake and many people are at risk where their salt intake level is high.

A diet high in vegetables, fruits, reduced saturated and total fat and low fat dairy products results in a major reduction of blood pressure. The reduction of the salt level, in one's diet over a period of six months in order to reduce the blood pressure level was found to be unsustainable. Most processed food products have a high salt content, making it challenging for individuals to steer clear of salt (Scientific Advisory Committee 2003).

Over-nutrition can also be as a result of a micronutrient overdose, due to supplementation of certain micronutrients in the form of tablets, pills and drops. Instances of micronutrient over-nutrition have been associated with iron fortification, where persons are overloaded if hereditary haemochromatosis is present but African populations are less affected by such conditions even then treatment is available. On the other hand, Africans can show signs of thalassemia resulting from iron toxicity and genetic history. Hence, iron supplementation for certain iron deficient individuals is approved. Transient side effects result from increased vitamin A dosage apparent in children showing symptomatic behaviour of fever, diarrhoea, headache and nausea. Fortunately all these symptoms disappear after two days without treatment (Steyn and Temple 2008).

2.2.2 Under-nutrition

Under-nutrition means that women and men lack or are deficient in a number of micronutrients (vitamins and minerals) in order to have optimal health and life. This results in one being underweight for age, wasted (too thin in relation to height) and stunted (too short for age).

Under-nutrition seriously affects a person's health status and productivity levels. Under-nutrition is typically shaped by the country's economic and social development (Steyn and Temple 2008).

2.2.2.1 Micronutrient Deficiencies

In a study by Steyn *et al* (2008), women, especially in the rural areas, were found to have very low levels of certain micronutrients such as iron, folate, calcium and Vit. B6.

About two billion persons worldwide are affected by vitamin and mineral deficiencies amongst which are zinc, iodine, iron and vitamin A. This results in decreased cognitive ability, stunted growth, decelerated levels of mental and physical capacity, as well as greater severity of infection rates, further adding to the illness and death burden in the country. Persons most affected by an iron deficiency include women, pregnant women, as well as HIV and AIDS patients, who are also affected by a vitamin A deficiency.

According to Torheim (2010) women in poor settlements are at risk of more than one type of vitamin and mineral deficiency. Women also lack a variety of micronutrients in their diet intake, especially in Sub-Saharan Africa, South and East Asia and Latin America. Research calls for the need to do further intense studies on the topic as the data collected to date was of poor quality in a number of studies.

The NKS (2012) found that mothers and young adult women faced many fundamental challenges that were seen as obstacles preventing them from fulfilling their nutritional needs. Amongst those challenges were a lack of education about a diet that is healthy, including caring for infants, living in poverty and inadequate access to safe foods, sanitation and healthcare. What also exacerbated women's unequal access to adequate nutrition included the cultural norms and values that restricted women as well as gender inequality.

Iron deficient anaemia was found to be commonly severe in women in developing communities with one out of two pregnant women said to be anaemic.

The SANHANES-1 Shisana *et al* (2013) media release reported that females of reproductive age who participated in its study in South Africa had almost double the occurrence of anaemia when compared to men at 22.0% and 23.1% respectively. The depletion of iron was at 5.9% and deficiency of iron at 9.7% for women.

A study conducted by Pereira (2014) found that 22% of women in the country were affected by anaemia, whilst the occurrence of the iron and vitamin A deficiency was most apparent in females of child-bearing age at 9.2% (iron) and 13.3% (vitamin A) respectively.

The most common foods consumed by the greater part of the population, such as maize meal, sugar, tea and wheat flour, mainly contained minimal to no essential micronutrients, contributing to the deficiency problem (Steyn *et al* 2008).

2.2.2.2 Protein Energy Malnutrition (PEM)

Scheinfeld and Khadori (2015) define PEM as a cluster of connected ailments that include kwashiorkor and marasmus. Kwashiorkor refers to a state of not having enough protein yet having enough energy and signifies a maladaptive response to starvation. On the other hand, marasmus refers to a state of not having enough protein and energy intake and is categorized by thinness, signifying an adaptive response to starvation. Kwashiorkor shows signs of oedema but this is not apparent in marasmus. PEM patients may also suffer from micronutrient deficiencies contributing to dermatosis.

PEM in the United States was found to be very common in hospitalised patients as a form of nutritional deficiency. Malnutrition was apparent in about fifty percent of patients admitted to hospitals (Scheinfeld and Khadori 2015).

Das and Bose (2010) conducted a study in the Purulia District in India on adults with the aim of finding out the population's state of nutrition. Sadly, it was found that most people, especially women, were severely undernourished. Statistically the gender difference was greatly significant ($p<0.001$). Both genders showed signs of severe stress levels as a result of undernourishment, leading to dangerous and serious nutritional deficit. It was recommended that the government needed to take note and fix the nutritional challenge faced by the population. The community reported extreme levels of CED (chronic energy deficiency), more so in women.

Webb (2010) attested that the number of severely undernourished populations was extremely high in 2009. Even though it had been halved between the years 1969 and 2000, undernourishment is affected by worldwide predicaments. Under nourishment was estimated to be at 923 million in 2007; however, simply providing more food is not the solution to the predicament.

Undernourishment results from an increased intake of "junk food". It has a higher influence on women and children, who at the same time suffer from poverty and food insecurity (Castro and de Lara 2015).

2.2.2.3 Eating Disorders

Ekern (2014) describes eating disorders as sicknesses concerned with severe distress about body shape or weight and irregular eating habits. Eating instabilities might include not eating enough food or excessive food consumption patterns that damage one's health. Commonly known eating disorders that affect both males and females include anorexia nervosa, bulimia nervosa and binge-eating disorder (BED). Eating instabilities occur during the teenage and young adult stages but can occur at any point in life. The illnesses and symptoms of eating disorders can be damaging and fatal if not addressed, but effective treatment is available for certain types of disorders. Other conditions exist together with eating instabilities, such as depression, anxiety and substance abuse.

Anorexia nervosa occurs when an individual who excessively fears gaining weight has an unrealistic body image perception and refuses any body weight maintenance. Most individuals with the illness quantify the meals ingested and view themselves as fat even if underweight. Individuals with anorexia have an increased fatality risk. The illness leads to individuals displaying damaging signs such as bone density loss, brain damage, heart problems and organ failure.

Bulimia nervosa is a result of binge-eating followed by excessive exercise, extreme laxative usage, and forced vomiting. Individuals with the illness show signs of unhappiness with body image and size and generally fear gaining weight. The binge-eating and purging circle is secretly done, resulting in shameful feelings of lack of control and guilt. An electrolyte imbalance develops in individuals with bulimia causing severe hydration, heart problems and gastrointestinal difficulties (Ekern 2014)

Binge-eating disorder has a slight similarity to bulimia nervosa but without the compensatory behaviours like excessive exercise, purging and fasting. Hence, the individual with the illness may be found to be overweight or obese, leading to a risk of cardiovascular disease conditions. Feelings of embarrassment, guilt and distress arise in people with BED even though the binging and purging series occurs in secret. The following negative emotions might encourage the eating disorder progression.

The factors that cause such eating disorders include:

Psychological factors

- negative body image;
- low self-esteem.

Environmental factors

- careers and professions demand weight loss and being thin e.g. ballet, modelling;
- childhood and family trauma e.g. trauma and sexual abuse;
- life changes that are stressful;
- peer and cultural pressures;
- dysfunctional household dynamics;
- aesthetically oriented sports e.g. gymnastics and rowing.

Biological factors

- nutritional deficiencies;
- genetics;
- abnormal functions of the body (Ekern 2014).

According to Ronquest-Ross, Vink and Siegge (2015), South African adults' food intake patterns have been shifting towards a more westernized diet, which is affecting the adults' diet negatively as it results in NCDs and obesity. The shift towards a more westernized diet means that South African adults now consume a diet high in kilo calories (energy), processed and packaged meats, sweetened liquids, an accelerated intake of animal-sourced foods, carbonated soft drinks, highly fattening foods and a moving away from including vegetables in the diet. The South African adult population's food intake was previously mainly composed of maize meal, tea, bread, sugar, potatoes, vegetables and wheat (flour).

2.3 Nutritional Needs of Adults

2.3.1 Nutritional needs of 18-50 year-old women caregivers

Steyn and Temple (2008) state that adult nutrition should focus and put enough emphasis on a diet that prevents illnesses and maintains wellness.

According to WHO recommendations, an adult's dietary intake should include 15-30% of dietary fat intake of the total energy intake, provide 55-75% of total carbohydrate of energy intake, provide 10-15% of protein as well as not more than 10% of free sugars. A minimum of

400g of fruits and vegetables should be consumed daily, as well as 25g of dietary fibre as well as a maximum of 2g of sodium or 5g of sodium chloride daily (Steyn and Nel 2006).

Table 2.3.1 DRI for women caregivers aged 18-50 years (Harvard 2016; National Institutes of Health 2016; Mutch 2011 and Schmidt 2013)

Nutrient	**RDA g/day**	**EAR g/day**	**AI g/day**	**UL mg/day**	**Food source**	**Role in the body**
Energy	10 093/ kJ				Starchy foods (maize, rice, potato, bread)	Increased body tissue. The normal growth process.
CHO	130	100			Starch and sucrose (sugar). Bread, rice and maize. \	Source of metabolic energy, starches and sugars. Important as a source of energy for the brain.
Fibre			25*		Bran, dry beans, fruits and vegetables	Increase the bulk of the intestinal content. Increase the viscosity of the intestinal contents.
Total fat					Animal fats lard, butter, margarine,	Essential in the development of the central nervous system and maintaining body temperature. Also functions as transport for the absorption of fat-soluble vitamins.
ω- 6- puf.a.			12d		Fish oil, vegetable oil	Essential for brain and muscle development. Produces hormone-like messengers. In the nervous system, functions as a transmitter of nerve impulses.

Table 2.3.1 (continued) DRI for women caregivers aged 18-50 years (Harvard 2016; National Institutes of Health 2016; Mutch 2011 and Schmidt 2013)

ω- 3 -puf.a.			1.1d		Fish and vegetable oil	Important part of all cell membranes throughout the body and affects the cell receptors functioning in these membranes. Provides catalytic function in the making of hormones that regulate contraction, blood clotting and relaxation of artery walls as well as inflammation.
PRO	0.80	0.66			Red meat, poultry, fish and soya beans, legumes, milk	Dietary essentials and constituents of all living cells. Very useful in the repair and maintenance of tissue, formation and growth of new tissue.
Minerals	Mg/day	Mg/day		g/day		
Calcium		580	1000∗	2500	Milk, cheese, yoghurt	Play an important role in the excitability of nerve tissues, contraction and regulation of metabolic process and the control of muscle contraction.
Phosphorus	700	265		4.0		Occurs in food as phosphate.
Magnesium	320		320∗	350	All green plant foods	Involved in the metabolism of ATP. An essential mineral.
Trace elements	**Mg/day**	**Mg/day**	**Mg/day**	**Mg/day**		

Table 2.3.1 (continued) DRI for women caregivers aged 18-50 years (Harvard 2016; National Institutes of Health 2016; Mutch 2011 and Schmidt 2013)

Iron	18	8.1	18*	45	Red meat, spinach, beetroot, red beans	Required by the human body for essential functions. Required in the production of haemoglobin for red blood cells, transferring O2 from the lungs to tissues as well as transporting enzymes and electrons in all cells.
Zinc	8.0		3.1*	40	Oysters, poultry, red meat, nuts, beans and other seafood types.	Essential for normal growth by the protein synthesis processes, neuropsychological function and skeletal development.
Fluoride		95		10		
Iodine	150	45	150*	1100	Iodised salt	Prevents and controls goitre. An essential constituent of thyroid hormones.
Selenium	55		55*	400	Shellfish, fish, red kidney beans, bread, lentils, mung beans, liver, kidney, veal and pork.	Acts as an antioxidant and also compensates for vitamin E deficiency.
Chromium			25*		Chromium salts.	A dietary essential. Together with nicotinic acid helps facilitate the insulin interaction with receptors on the surfaces of cells.
Fat- soluble vitamins						
Vitamin A	700	500	5*	3000	Carotene: carrots, butternut and other green vegetables. Retinol: animal products i.e. fish liver oils, liver, milk, kidney and butter.	Antioxidant that assists with cell differentiation and visual pigmentation in the retina.

Table 2.3.1 (continued) DRI for women caregivers aged 18-50 years (Harvard 2016; National Institutes of Health 2016; Mutch 2011 and Schmidt 2013)

Vitamin D		12		50	Ultraviolet light (sun), fortified margarine, butter, egg yolk and fatty fish.	Mobilizes bone minerals, calcium balance maintenance and enhances absorption in the intestines.
Vitamin E	15			1000	Vegetables, vegetable oils and seeds.	An antioxidant that assists in the formation of cell membranes.
Vitamin K			90*		All green plants.	A coenzyme that functions in the formation of carboxyglutamate in enzymes of bone matrix and blood clotting.
Water soluble vitamins						
Thiamine	1.1	0.9			Enriched wholegrain cereals, breads, meat, potatoes, peas, yeast.	A coenzyme in pyruvate and double oxo-glutarate dehydrogenases as well as transketolase and plays a role in transmission of nerves
Riboflavin	1.1	0.9			Eggs, cheese, liver, yeast, pulses and dairy products.	A coenzyme in reduction reaction, oxidation and prosthetic group of flavoproteins.
Nicotinic acid	14	11		35	Found in most foods that are good sources of protein. Is also formed in the body from amino acid tryptophan.	A coenzyme in the oxidation and reduction reaction and a functional part of nicotinamide adenine dinucleotide (NAD)

Table 2.3.1 (continued) DRI for women caregivers aged 18-50 years (Harvard 2016; National Institutes of Health 2016; Mutch 2011 and Schmidt 2013)

Vitamin B6	1.1	1.3		100	Meat, nuts, wholegrain cereal, beans and fish.	Plays a role in steroid hormone action. A coenzyme in decarboxylation and transamination of amino acids and glycogen phosphorylase.
Folic acid	400	320		1000	Kidney, liver and green leafy vegetables.	A coenzyme in the transfer of carbon fragments
Vitamin B12	2.4	2.0	2.4*		Meat, eggs, dairy products.	A coenzyme in the metabolism of folic acid and transfer of one carbon fragments
Pantothenic acid			5.0*		Yeast, liver, fresh vegetables and kidney.	Plays a functional part of CoA and acyl-carrier protein
Biotin			30*		Cooked egg, kidney, liver, yeast, vegetables, nuts and grains.	A coenzyme in the carboxylation reaction in gluconeogenesis and the synthesis of fatty acids.
Vitamin C	75	60		2000	Citrus fruits, broccoli, strawberries,	A coenzyme in the hydroxylation of lysine and proline in collagen synthesis, antioxidant and in the enhancement of iron absorption.
Choline			425*	3500	Occurs in a variety of foods.	Essential in acetylcholine and neurotransmitter formation as well as methyl group metabolism.

RDA- Recommended Daily Allowance
EAR- Estimated Average Requirement
AI- Allowance Intake
UL- Tolerable Upper Intake Level
g- Grams
Mg- milligrams
*- AI value
d- Median intake of

2.4 Causes of Malnutrition

2.4.1 UNICEF Framework

A conceptual framework for the causes of malnutrition and hunger was launched by the United Nations Children's Fund (UNICEF) in 1990. The foundation analyses nutrition challenges as well as nutrition solutions. The framework adds to the broadening of the nutritional sciences to be extra applicable to policy. The causes of malnutrition arise from many factors such as not taking health into account, inadequate caring practices and lack of food. Shown in the framework are the categorised causes of malnutrition. The categories include basic, immediate and underlying causes, in which factors influence each other at certain levels. The framework guides health policy decision makers in the analysis and assessment of the causes of nutrition challenges. The causes, as emergency factors, should be included in health responses and planning for emergency situations and settings (Steyn and Temple 2008).

Although the framework is aimed at children it can be applied to the women in household as well as, they care for the children.

In order to appropriately and adequately address nutrition challenges, it is vital to understand the level of the community. The level of the community is dependent on the community's capacity and ability to act, assess and analyse nutrition challenges, supported by a nutritionist or dietician. The macro-economic, institutional and political determinants of the nutrition state are required in the full application of the conceptual framework and should be understood by every nutritionist and dietician in the country. Hence the conceptual framework must engage South African policies, programmes and trends.

The state of nutrition is one categorized by both over- and under-nutrition. Certain situations arise when the causes of malnutrition are explored, more so in babies and young children over the indicator level. These include:

- The immediate causes of malnutrition relate to low energy density of staple food consumed, disease and low frequency feeding.
- The main and underlying causes of malnutrition relate to the inadequate caring capacity of vulnerable populations and food security in households.
- Additionally, weaknesses in and an inadequate quantity and quality of health and education services, , social services and basic services together with an unhealthy environment also relate to the causes of malnutrition (Black, Allen and Bhutto 2008).

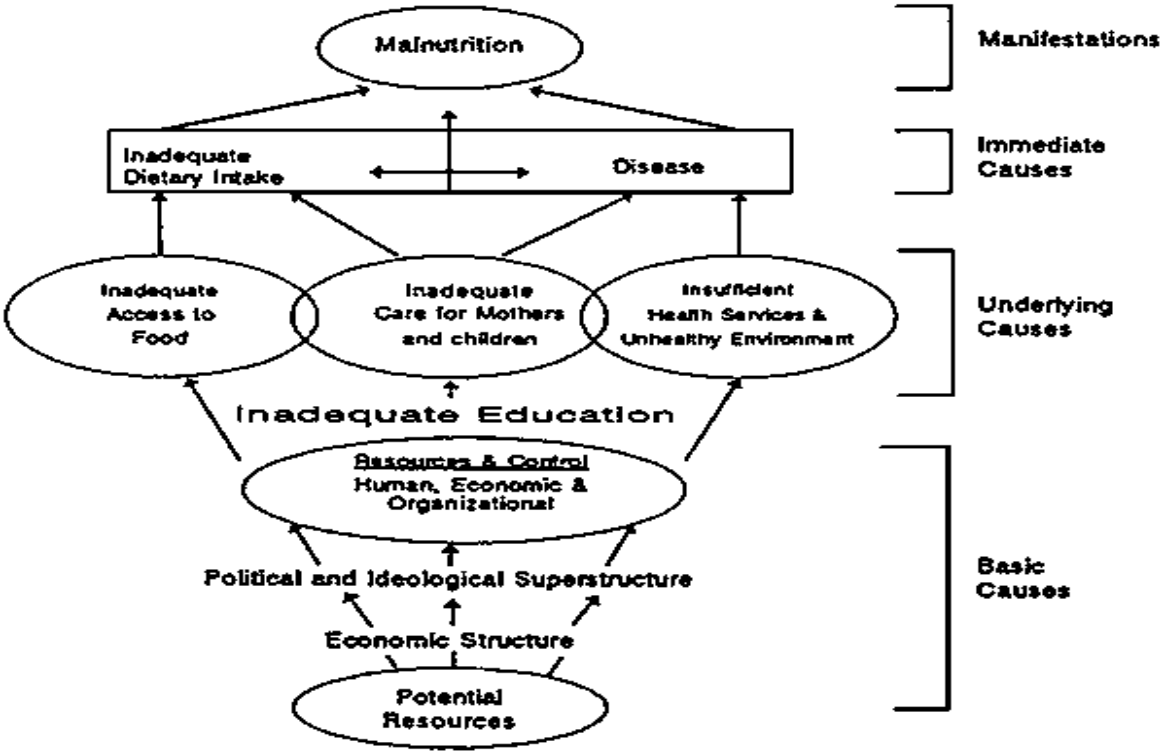

Figure 2.1: UNICEF Conceptual Framework: Causes of malnutrition (Karim *et al* 1993)

2.4.2 Inadequate dietary intake

Food insecurity is simply defined by Laing (2011) as a population living at a risk of having no access to food at certain times in a year, leading to hunger. Furthermore he states that two billion individuals globally experience recurrent food insecurity and 850 million individuals experience hunger almost daily. In South Africa alone some parts of the population are still susceptible to food insecurity. Twenty percent of the country's households have minimal or even no access to food, where women are more at risk of food insecurity than the males. This is as a result of gender discrimination within the household (De Schutter 2011). Misselhorn (2012) states that food security faces increasing pressures on the supply and demand-side, mainly because of stressors such as the increasing population, change in climate, diseases, the globalising world, urbanisation and changing food consumption patterns. Due to these pressures and failures, a billion people are food insecure, lacking enough food to eat and proper nutrition (see Figure 2.1)

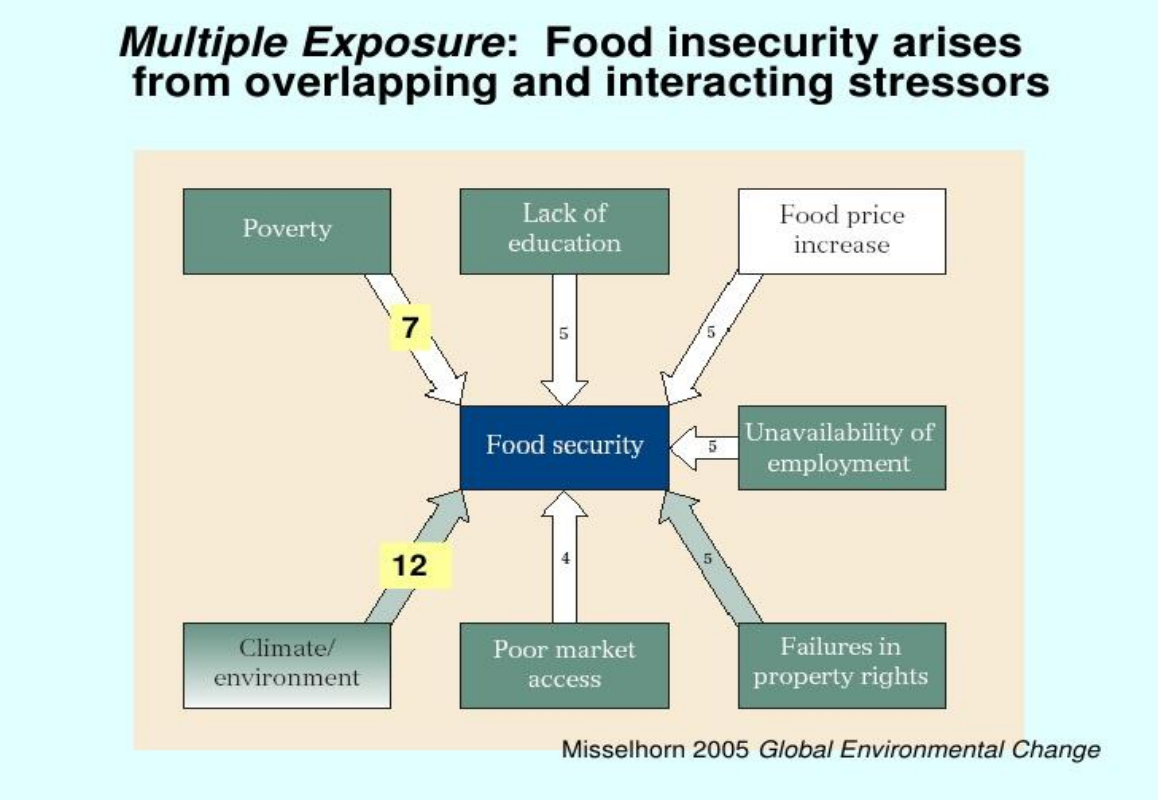

Figure 2.2: Interacting stressors giving rise to food insecurity (Misselhorn 2005)

Hunger is defined as the condition of the physical and mental state, stemming from populations not having adequate food to consume, and due to not having sufficient economic resources inside the immediate household, or even the community. These factors are used as a measure of food insecurity (Labadarios *et al* 2011).

Altman *et al* (2009) adds that a structural food insecurity problem faced by South Africa is caused primarily by the widespread chronic poverty and unemployment. Even though there has been a massive decrease in national food insecurity recently, when measured in terms of the availability of food, there is more fluctuation into and out of hunger than might have been foreseen. A growing number of households unaffected by hunger previously may face it in the following year. It has also been found that a larger number of households that are hungry reside in urban areas. Labadarios *et al* (2011) also adds that although the prevalence of food insecurity has reduced by more than half in South Africa from 52.3% to 25.9%, the number of people affected by food insecurity did not change. It was noted that the reduction of food insecurity showed both in rural and urban areas as it reduced from 42.0% to 20.5% and 62.0% to 33.1% respectively.

According to Altman *et al* (2009), in the household survey conducted in 2007, 10.6% adults were sometimes or always hungry. In a clear distinction the NFCS of 2005 found that 52% of households experienced hunger and further stated that another 33% of households were under threat of hunger. Pereira (2014) also adds that there is unsettling proof at the household level of a great occurrence of wasting, micronutrient deficiencies and stunting, more so in children. This is related to socioeconomic issues. When food insecurity is looked at demographically the African (black) population has the greatest occurrence at 30.3%, followed by the coloured race group at 28.5% and with 13.4% of Indians at risk of hunger.

According to Labadarios *et al* (2011) the fact that food is obtainable in markets does not necessarily mean that households have access to it.

In a study conducted by Dewbre (2010) it was argued that food insecurity imposed an instant disaster and risk to long-term well-being. Families were found to reduce the intake of foods like vegetables and fleshy foods when faced with starvation.

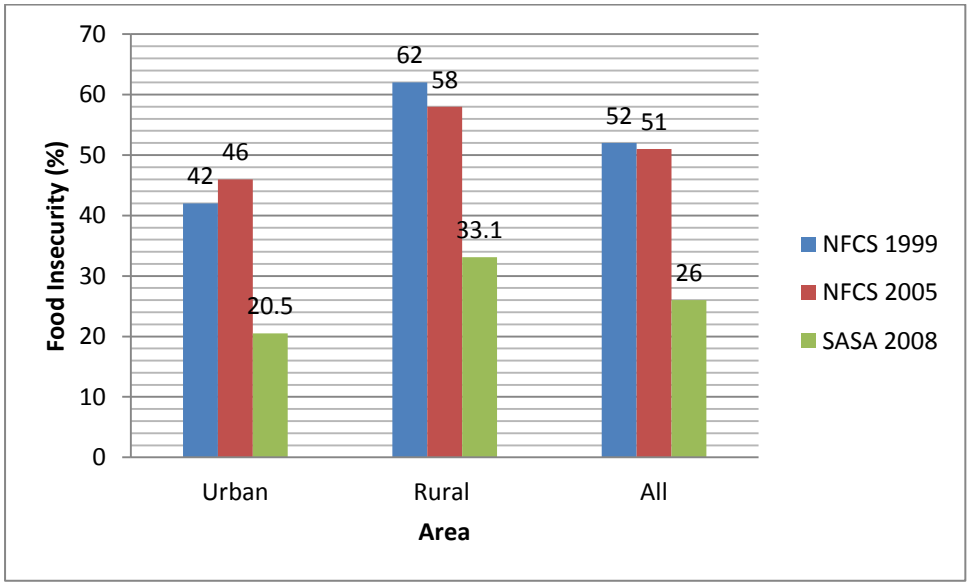

Figure 2.3: Food Insecurity in Urban and Rural Areas according to the three national surveys spanning 1999-2008, South Africa (Labadarios 2011)

Figure 2.3 outlines the changes in food insecurity from 1999 to 2008, taken from a survey conducted by the NFCS in 1999-2005 and SASAS in 2008. The decrease in food insecurity was apparent in both the urban and rural areas, where it reduced from 42.0% to 20.5% (urban), as well as 62.0% and 33.1% (rural). The whole population's combined status showed that food insecurity decreased from 52% to 26% (Labadarios *et al* 2011).

The unemployment level and poverty have resulted in about twenty percent of food insecure domestic areas. During the last decade, food production costs have accelerated. The fact that South Africa buys most of its essential products from international companies puts a strain on food costs, resulting from the high prices of the imported products (Department of Agriculture, Forestry and Fisheries 2014).

2.4.3 Illnesses

According to Joubert and Ehrlich (2007) non-communicable diseases such as stroke, hypertension, heart disease, type 2 diabetes and obesity have also reached epidemic proportions in all groups of people in South Africa. In countries that are developing it was found that this is a result of the transition in the nutritional state, as people are changing their diets from the much healthier normal/ traditional diet to the less healthier western diets that are high in fat, sugar and salt, whereas the traditional diets are low in fat and higher in fibre.

Coupled with HIV, Tuberculosis (TB), disease infections and the slowing down of economic growth, inadequate food intake is also among the factors that are burdening South Africa's disease experience. The need for nutritional surveys has since arisen in order to ascertain the nutritional status of the population and implement solutions where problems arise. These nutritional surveys are carried out via anthropometric and dietary surveys which include the use of socio-demographic questionnaires, Food Frequency Questionnaires and 24-hr Recalls (Joubert and Erhlich 2007).

Vorster, Bodham and Venter (2013) also add that nine out of seventeen risk factors that cause increased mortality levels, directly relate to nutrition. These nine risk factors are: high blood pressure, high BMI and overweight, the harmful effects of alcohol consumption, iron deficiency anaemia, vitamin A deficiency, childhood and maternal underweight, high cholesterol, low fruit and vegetable intake and diabetes. The rest of the risk factors are indirectly linked to nutrition. These are urban air pollution, smoking of tobacco, indoor air pollution, physical inactivity, exposure to lead, domestic violence, unsafe sanitation and water and poor hygiene.

According to Steyn and Temple (2008) the nutritional deficiencies that are associated with reducing the integrity of the immune system and increasing the infection risk have been demonstrated by familiar clinical and pandemic evidence. The immune system comprises of two primary levels, known as the antigen- specific and non- specific. Both processes assist in

restricting the spread of infection and eliminating any attacking organisms effectively and specifically. Mechanisms that interfere with the antigen-specific and non-specific systems contribute to the reduced resistance to infection used by malnutrition. Any deficiency associated with nutrition will negatively interfere with infection-resistance especially if severe. The greatest public health threats, which are highly prevalent include protein-energy and iron deficiency in this regard (Scrimshaw 1997).

2.4.4 HIV and AIDS

Global Perspective

In 2011 people who were living with HIV numbered 34 million worldwide whilst Sub-Saharan Africa accounted for 70% of the more severe populations affected by the HIV pandemic and estimates prove that 6.1 million persons by 2012 will be living with HIV (The Department of Health of South Africa 2013).

The HIV epidemic is worsening and hence even the number of populations at the advanced HIV infection stage is increasing. Efforts are being made to make anti-retroviral therapy/ treatment (ART) more affordable to the low and middle income communities as it is generating more positive feedback by reducing the number of deaths from those infected.

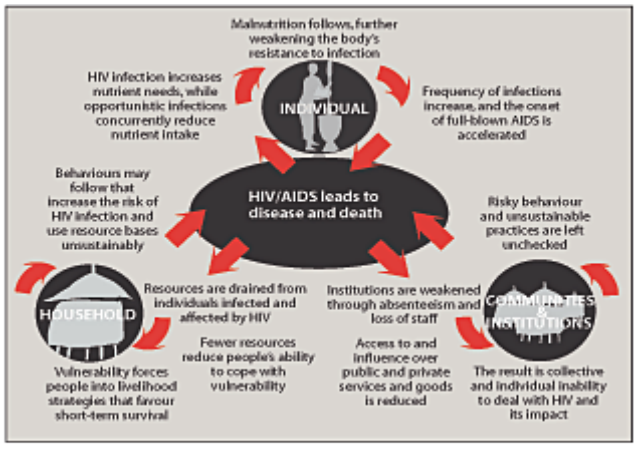

Figure 2.4: Impacts of HIV/AIDS cycle (FAO 2010)

AIDS is a disease brought into being by a virus known as the immuno-deficiency virus which impairs and attacks the body's characteristic immune system against infections and disease (FANTA 2001). The epidemic is significantly impacted by nutrition and food security. The epidemic initially strikes the main productive caregiver in the household.

When such members are sick, the ability to feed the family, work and provide for themselves is greatly strained. AIDS development, which is characterised by loss of appetite, affects nutrient absorption and adds more demand on the nutritional status required by the body, resulting in malnutrition that is aggravated by food insecurity, as seen on Figure 2.3 (FAO 2010).

2.4.5 Insufficient household food security

Food security is defined by Laing (2011) as having access to sufficient food for healthy living. Misselhorn *et al* (2012) adds that over and above this, the food must have a nutritious value and be prepared properly so as to be processed by the body in a manner that is profitable to human health. This is, however, affected by many factors, e.g. the way food is stored, the quality of the water the community is using, the diseases that populations are experiencing and the cultural aspects of food preparation and consumption. The conclusion is that food security is not based on one specific aspect but relies on a number of factors before it is achieved.

According to Altman *et al* (2009), in order to have an understanding of the state of food security within a household, investigating the workings of the distribution systems and resources of food is a necessity in determining the accessibility of food within the household. Unfortunately, the meaning of food security or even insecurity is not as clear as it looks. South Africa does not have a specific and accepted instrument to measure food insecurity. At the moment even a regularly used way of observing it has not been developed. For a middle income nation with a high level of food-insecure homes, this is definitely unacceptable.

The Academy of Nutrition and Dietetics (2013) also points out economic factors, safety of food and individual preferences, stating that the four food pillars are sustainability, accessibility, availability of food (referring to its supply and productive state) and how the food is utilized (see Figure 2.1). From the above information it is clear that households or communities cannot be food secure only by having enough access to food. Multiple factors need to be looked at and incorporated in order to ensure that households reach a level of food security and understand what it means to be food secure. This study not only looks at how much food the households have access to, but also the other influences such as sanitation, nutrition education, food preparation, dietary factors of the households, economic factors and social behaviour.

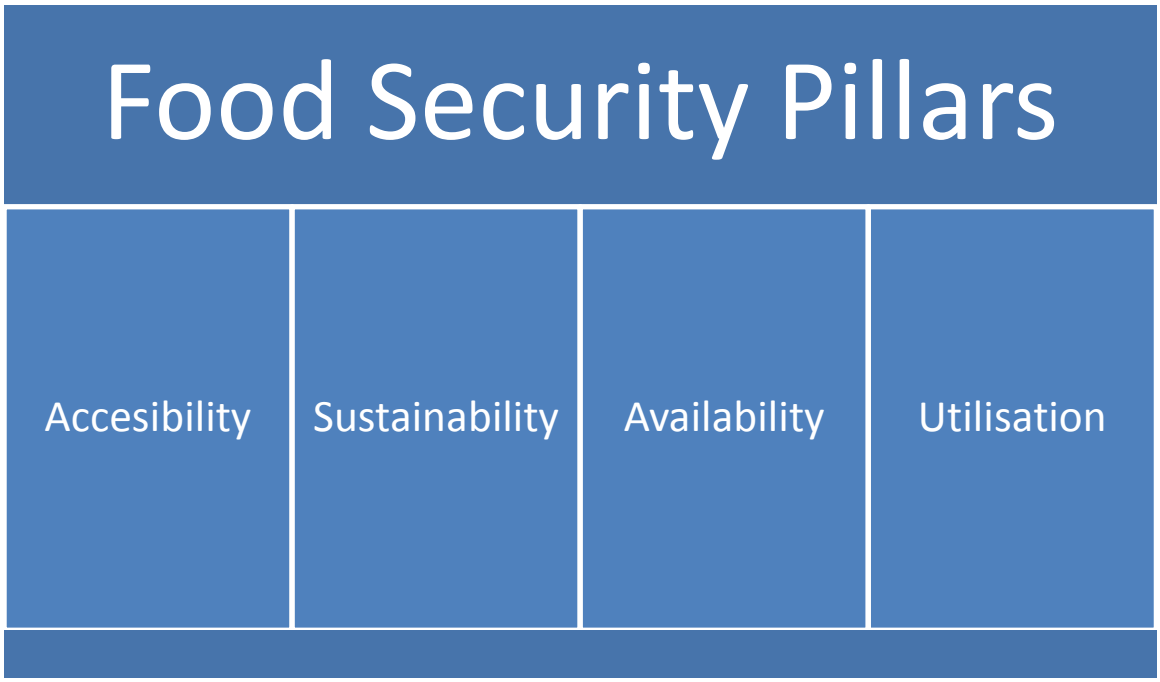

Figure 2.5: Food Security Pillars (The Academy of Nutrition and Dietetics 2013)

2.4.5.1 Accessibility

This is the population's ability to get adequate food and be able to feed itself and ensure that nutritional needs are met by providing optimum quality for fruitful lives. Food access is measured using the hunger that the household members experience (Labadarios *et al* 2011).

Food access has shown a positive shift over the last decade, so much so that obesity has risen beyond the acceptable rate and has become a global challenge. To ensure that, worldwide, nutritional requirements are met, food flexibility and that of its macro- and micronutrients are important. Sadly, a billion persons remain food insecure as a result of a number of burdens and disappointments in the worldwide food systems that, when combined, disable populations from receiving enough healthy foods partly due to both the increase in cost and low incomes (Misselhorn *et al* 2012).

2.4.5.2 Sustainability

Sustainability and infra-organizational competence is often quoted as a measure for successful nutrition observation systems. The acknowledgment of the profound interlocking nature of social, economic and environmental systems, calling for combined and multi-disciplinary examination and sectoral cross-scale approaches to decision-making, are fundamental to the notion of sustainability (Misselhorn *et al* 2012).

2.4.5.3 Availability

Food availability is defined as the counted food items in the cupboard, determined by income and access to food in a safe and nutritious state, but the diet consumed by South Africans is deeply influenced by agriculture and tradition. Women caregivers living in these homes have difficulty buying the required amount of food to be able to accommodate the whole family. Household procurement and inventory data are used to measure food availability (Labadarios *et al* 2011).

In a study conducted by Rose *et al* (2002), it was found that, stated as a percentage of energy; cereal consumption was uppermost within the rural African population and lowest within the urban white population, whilst a different configuration was discovered in terms of the availability of meat within the populations. The available mean meat intake by South African households was at 2480 Kcal daily per adult woman respondent. Fat content in the diet was lowest within rural Africans and uppermost within urban whites. However, when explained as an energy percentage, it was uppermost within the Indian race and lastly, the cholesterol and saturated fat availability was uppermost within the rural white community and lowest within the rural African community.

2.4.5.4 Utilization

Certain aspects play a role in the utilization of food such as sanitation, adequate nutrition, preservation and storage of food, safety of food, cultural suitability, disease management, food preparation knowledge, proper access to health services, time and caregivers' capacity to care (Holben and Riely 1999). According to Steyn and Temple (2008), food utilization is a requirement for proper nutritional standing and states a person's final use of food at domestic level.

How the body utilizes food is also affected by the presence of disease and physiological standing. HIV and AIDS, tuberculosis, malaria, diarrhoeal disorders and infections of the respiratory tract are foremost diseases that have a substantial influence on how food is being utilized, more so in Sub-Saharan Africa where disease prevalence is extremely high. Loss of appetite leads to food intake reduction, opening the door for malnutrition and an immune system that is weakened (De Klerk, Vogel, Swardt and Kirsten 2004).

Anthropometric measures such as weight and height, blood nutrient levels and dietary intake are used to measure food utilization (Labadarios *et al* 2011).

Altman *et al* (2009) argues that, in as much as South Africa may be food secure when viewed as a country, the households within the country itself present food insecurity. Adequate food accessibility progressively depends on how food distribution and market systems function at household level rather than total agro-food output only.
According to the Shisana *et al* (2014) media release, in 1999 food security was at 25.0% but increased in 2012 to 45.6% when observing the households at that time that had access to enough food for the whole household to lead an active and healthy lifestyle according to the National Food Consumption Survey (NFCS). This indicates a positive result in terms of food security in households.

Food security is still an issue of great importance in South Africa. Food security needs serious investigation, especially because the country's population consumes a diet of peripheral diversity, requiring improved nutrition information and dietary modification (Shisana *et al* 2014). The diet that the population consumes is also influenced by agricultural and traditional practises.
Sadly, the white population was the only one with the highest level of food security at 89.3% when compared to other races in South Africa (Pereira 2014).

Gender inequality was also found to be a main problem to the development of women and food security. Women are at the centre of rural economies all over the developing world. As much as that is the case, women continue to have less admittance to opportunities and fruitful resources than men (Misselhorn *et al* 2012).

2.4.6 Education and Ignorance

The Census conducted in 2011 stated that the majority of the population at 33.6% had secondary education, followed by the percentage of the population with Grade 12 at 28.2%, while12.6% had some primary education. Whilst 12.3% had higher education, 8.7% had no schooling at all and only 4.6% had completed primary education (Statssa 2011).
In many places in Asia and Sub-Saharan Africa when poor girls are compared to poor boys, the girls were less likely to get an education (Langer *et al* 2015).

According to the study conducted by Ahmad *et al* (2006), it was found that the Badian young women with better educational status had a BMI mean higher ($p<0.05$) than the young women of a lower educational status.

In the survey that was conducted by the 2012 National Antenatal Sentinel HIV and Herpes Simplex Type-2 Prevalence Survey in South Africa, The Department of Health (2013), found that amongst the participants in the survey 73.99% had a secondary school education level, having 29.7% living with HIV; however, the survey found that all the women have the same risk coverage of contracting the HIV, regardless of the education level.

2.4.7 Sanitation

According to the census conducted in 2011 by Statssa (2011), households that had tap water inside the premises were at 46.5% whilst the households with tap water on a shared community standpoint were at 6.2% decelerating from 12.4% in 2001. The households without tap water decreased to 8.8% in 2011 from 15.6% in 2001.
More than half of the population, 60% in 2011, used a flush toilet system.

In a study conducted by Langer *et al* (2015), the changes in the environment were found to be gender un-neutral, as females still took more responsibility domestic-wise. The inaccessibility of sanitation and water contributes majorly to the burden of illnesses in Asia, Africa and America. About 50% of the low income and middle income populations have either a single or many main illnesses caused by inadequate water supply and poor sanitation.

2.4.8 Agriculture

The growing environmental pressures on agriculture such as climate change are the cause of multiple uncertainties. It is said that the lack of a food supply results in hunger. Arguments also arise that food hunger is due to populations not being able to afford to purchase food and is not as a result of food unavailability. As important as it is, the agricultural sector cannot on its own remove the food shortage but when more of the other non-agricultural sectors participate it is beneficial because the local consumers' buying power accelerates, providing the opportunity to buy food more cheaply and export its own produce (Dewbre 2010).
Dewbre (2010) also adds that in 2003 the importing of grain accounted for 17% of the intake when compared with 8% in 1970 and 55% of vegetable oils were also imported compared to 9% in 1970.

According to the Food and Nutrition Security Survey (2014), agricultural productivity was mostly emphasised instead of the many dimensional factors of food and nutrition security. A comprehensive understanding of accessibility, availability, stability and utilisation elements is very important in addressing the poverty, food insecurity and malnutrition problem in South Africa.

According to Webb (2010), food price increases were set in an era of plenty not one of shortage. In 2008, countries like Australia were affected by drought causing agricultural exports to increase and prices to be high, leading to global cereal production rising by 7%, which was a 6% increase when compared to the year 2006, and replenishing supply exactly at the same time the stock was falling to its lowest rate since the 1980s. Unfortunately, cereal carryover was predicted to increase and be at its highest by 2010 as more stock was replenished even though the price index put together by the FAO was much higher in 2009 than it was in the years 2000 to 2006.

Neglected agriculture was immediately followed by an increasing food demand. Government attention and donations to developing countries disappeared and food demand was thus even greater in such countries. The agricultural development assistance received from other outside countries dropped from 15% in 1980 to less than 3% in 2007. Agriculture's share of government expenditure at country level dropped in 1980 by 15% to 9% in 2002 in Australia as well as from 6% to 4.5% in Africa and in Asia. Shrinking and diminishing agricultural systems, rural credit, seed multiplication and public extension are a result of such declines (Webb 2010).

For the many undernourished populations, productivity is yet to translate to food accessibility. This is because the most in need do not experience any of the benefits. In Sub- Saharan Africa, parts of South Asia, West Asia and North Africa, the cereal production per capita is being overturned or delayed. As the growth of urbanisation proceeds, it increases the poor homes' share whilst the markets continue to dictate market prices for consumed food. This is leading the developing nations to a point where they are now expected to produce 86% of their own cereal intake by the year 2030 (Webb 2010).

The European Union, CTA, FAO and World Bank (2013) reported that agriculture is an important matter with regard to nutrition as about 80% of the population of developing areas

is employed in this sector. Agricultural growth is at least twice as effective in reducing poverty as most of the GDP stems from inside the sector where about 40% of labourers are women. In addition the EU also dominates the small-scale food- processing sector by 50%.

The multi-functionality of agriculture is apparent as it contributes to and yields medicine, food, livelihood, culture, tradition, social stability, ecological services and non-food items in order to make sure that humans, plants, animals and the soil receive various nutrients to perfect health and growth. Agricultural systems mapped around nutrition are required, pushing forward the production of enough healthy food combined with the impact on and defence of sustainability of the environment (The Academy of Nutrition and Dietetics 2013).

The study conducted by Misselhorn *et al* (2012) stated that close to 70 percent and 60 percent of women in both Southern Asia and Sub-Saharan Africa respectively were employed as workers in the agricultural sector. Hence the understanding that if women received the same access to agricultural contributions, an increase of 20% to 30% in farm profits would be apparent in the developing world, increasing the agricultural exports as a whole by 2.5% to 4% in the developing nations and by so doing removing from the slumps of hunger about 100 to 150 million people.

Opportunities and platforms are minimal for small-scale farmers to get into the market and take part in the activities of production economy. The need for the agricultural sector to efficiently and sufficiently supply the population with food starting now and continuing into the near future resonates from the highly increasing food demand (Department of Agriculture, Forestry and Fisheries 2014).

An interesting point made by Watkins, Hammock, Newman and German (2001) in the research study undertaken, stated that the similar approach in bioinformatics (used in prescription drugs) used in the study of human metabolics has the identification and validation potential to improve personalized nutritional health, which serves to define added value for the next generation of crops and food. Knowledge application of the person's metabolism will revolutionize the nutritional ability to deliver health benefits through food in a similar manner that genomics knowledge will revolutionize the treatment of individual diseases with medicines. At the present moment the nutritional improvement goal of agriculture is to create changes in food and produce that will have beneficial results for all persons. Minimal changes to existing supplies that conform to a standard such as this one can be imagined as a result of the

heterogeneous and intricate formation of human beings. The development of genomics was to identify similar elements of genetics and assign biological purpose to these elements.

2.4.9 Climate change

Climate change and poor terrestrial management, together with the use of land for mining and urban development, pose a danger to household production of food (Department of Agriculture, Forestry and Fisheries 2014).

Amongst other factors, the increasing fears and occurrences of climate change and related disturbances to the well-being of food systems interact together causing food and health injustices that affect the poor globally and lead to even more poverty and malnutrition. In food insecure nations climate change is, to a great extent, able to perpetuate the food intake and production limitations already in place. Climate change will lead to changes in severe weather patterns, temperature, rainfall amounts, droughts and floods which will have a positive and negative effect in yields and change in production costs depending on location. The impact of climate change is predicted to decrease agricultural productivity by 9% to 21% by the year 2050 (Misselhorn 2012). The worldwide food source worsened as a result of serious challenges such as climate change in addition to the already existing ones such as the demand on worldwide food and animal feed, food crops diverted to biofuels in Europe and the United States and the decreasing focus on food agriculture policy assisting in the development of agriculture (Bloem, Sumba and Kraemer 2010).

From the year 1906 the level of weather temperatures has accelerated by 0.74 percent and between the years 1995 to 2006 the warmest temperatures were experienced. Besides the global concerns, greenhouse gas emissions in the air will scale -up and because of the African continent's low adjusting capacity, the continent is more susceptible to and will experience climate variables such as droughts and floods (Department of Social Development and Department of Agriculture, Forestry and Fisheries 2013).

According to Misselhorn (2004), both the long-term and short-term climatic and environmental stressors are endemic to the livelihoods of rural South Africans. The ability to adjust and absorb to such stress is dependent on the level of vulnerability and resilience. Resilience is in turn determined by the environmental stressors themselves.

Climate change, natural disasters and environmental degradation effects manifest globally. Consumption patterns that are not sustainable increase environmental diversity with opposing effects on the development that is sustainable. Ecological ruins and disasters pose a threat to marginalised and poor people residing in unstable households and surrounding areas relying solely on the environment for their survival (Langer *et al* 2012).

According to the National Planning Commission (2011), the failures of the policy makers and the market have caused the worldwide economy to enter an era of ecological shortfall. Biological assets such as marine life, earthly biodiversity, ground water, produce and land cropping are being corrupted, tarnished or exhausted faster than they can be used yearly in an ecosystem with unending limitations. Global warming is affecting people's way of life. There has been an escalation in the warming of the planet of almost one degree Celsius, for the past one hundred and fifty years. Alarmingly, the world could be five degrees Celsius warmer than it was in the previous centuries before this current period ends. To be exact, the earth has not been hotter than three degrees Celsius than the 19th century levels for three million years or five degrees Celsius hotter in the last thirty million years.

The implications of the above are most likely to cause the population to immigrate to other parts of the world where they feel life is better, resulting in the increased chance of severe worldwide uncertainties which have prevailed over a longer period. The greenhouse gas emissions need to have decreased yearly no more than 44 billion and 35 billion tonnes of the carbon equivalents by the year 2020 and 2030 respectively, in order to achieve a 50% opportunity of keeping the acceleration to two degrees Celsius. Climate change is almost certainly not fair to the general population. The well developed nations, with about one sixth of the global population, are accountable for almost two thirds of gas emissions. The factors associated with climate change are apparently droughts and desertification, water storms, floods, increasing sea levels and backlogs (National Planning Commission 2011).

2.5 Factors Affecting Food Intake

Statistics about food intake in KZN are limited and it is recommended by Van Heerden and Schonfeldt (2011) that food intake studies in SA be prioritised. Very little information is available about what South Africans are eating in order to plan for fortification and interventions.

Populations have different views regarding food intake and the reasons for purchasing, preparing and consuming food. Some of the points raised by households were that decisions about food were influenced by body size, social standing, health status, community values and changes in values.

In a study conducted by Ronquest-Ross *et al* (2015), findings showed that South Africans had an increased intake of meat, especially chicken, as the more consumed animal protein. The country's population is consuming a diet significantly high in fats, sweetened beverages and oils together with an increased consumption of animal fat. The most dramatic shift was seen in packaged foods and beverages with over 50% consumption in carbonated drinks, dressings, sauces, savoury snacks, and sweets. Indulgence, convenience and health and wellness were seen as the primary drivers for the acceleration of packaged food consumption as from 1994. The study concluded that South Africans' food consumption patterns tended towards a diet of increased animal source food intake, sugar-sweetened drinks, added caloric sweeteners as well as increased amounts of processed and packaged foods.

2.5.1 Insufficient health services and unhealthy environment

Improperly planned environments in urban areas, dangerous informal settlements, unsafe neighbourhoods, poor quality housing and unhealthy lifestyles put the health of women and girls as well as men and boys at risk. Gender norms, limited facilities, overcrowding and street insecurity prevent women's chances of being involved in physical activity. Urbanisation also changes dietary practices and is linked to a decrease in the intake of fruit and vegetables, causing an increase in prolonged occurrence sicknesses and NCDs (Langer *et al* 2015).

From the study that was conducted by Labadarios *et al* (2011), it was indicated that environmental aspects are essential causes that are related to household food security. Nevertheless, it is just as important to understand that improving the environment is not going to lead to improved household food security if persons do not have access to food.

Healthcare was also seen as a contributing factor to nutritional security since those who were chronically ill (by insinuation many were HIV+) or disabled had double the chance of having

low dietary diversity scores (DDS). Indeed, the majority of environmental risk factors are the straight consequence of poverty and are inter-connected (Labadarios *et al* 2011).

2.5.2 Cultural beliefs and traditions

Langer *et al* (2015), states that globally traditional social practices normally break down in urban areas. Overcrowded city neighbourhoods decrease social solidity; as a result neighbours do not intervene in household affairs. This escalates close partner violence among city women. On the other hand, an urban lifestyle can liberate women and girls by providing them with more educational opportunities, more access to resources and more independence than in rural areas.

In the rural communities, food was used as a source of caring, happiness and ubuntu (humanity). If a visitor is not served any type of food the family was considered less giving and without kindness. Some people within the population had an understanding that certain foods such as high fatty food resulted in NCDs. If certain foods were excluded from the diet of especially children, this resulted in malnutrition.

Because of certain deprivations experienced in the past, probably due to socio-economic or political factors, populations feel they can now eat anything and as much as they desire, because certain stresses have been dealt with and this is now the time of freedom and wealth. Certain (unhealthy) foods are eaten on certain occasions and at specific seasons such as Christmas, Easter, funerals, weddings and parties (Van Heerden and Schonfeldt 2011).

According to Walter, Oenema and Valente (2015), the intake of bottled sugary drinks was found to be significantly high in rural areas. Soft drink manufacturers perpetuated the intake of such beverages by decreasing prices below congress tax and using monopolistic norms. This contributes not only to the prevalence of diabetes but also encourages rejection of and a shift away from the traditional, healthier drinks to sugary soft drinks.

2.5.3 Poverty

In a study done by The World Bank and the Poverty Reduction and Equity Group (2011), it was found that, over and above the already poor populations in the world, a further 44 million human beings were struck by poverty, especially in the low- and middle-income countries. This was as a result of food prices that had been rising since June 2010. The consumers were

suffering greatly whilst the manufacturers of staple foods were gaining positively from the price increase. The United Nations (UN) also argued in the 6th Report on the World of Nutrition Situation (2010), that as much as the MDGs to combat hunger and poverty by 2015 were set, under nourished populations had increased, due to the recently rising prices and economic scares, delaying the achievement of the MDGs. The decrease in the labour market of the United States of America between 2007 and 2008 led the country into a total recession. People became unemployed and the possibility of job creation faded. Due to this more and more people faced poverty and malnutrition (Miller *et al* 2011).

In a study by Pena (2002), poverty was found to have a significant link with health and nutrition as an intervening factor. The argument was that people cannot be called poor just because of a minimum income level, but other factors contribute to the increase of malnutrition such as having no access to health services, little/no access to water, low education and biased rights and needs. Poverty leads to deprivation of health, whilst ill-health leads to poverty as sick people cannot be fully productive. Malnutrition does not only apply to undernourished populations but also to those who are overnourished in the form of obesity as it leads to multiple non-communicable diseases (NCD).

In a study by De Schutter (2012), poverty was found to be higher in households that were headed by women. De Schutter (2011) stated that women are primarily responsible for the caring of minors in the households and need to be equipped with information to make proper decisions. Women and children were suffering most compared to men and out of every seven people in the world one suffered from starvation.

According to Langer *et al* (2015), economic transition has likewise had mixed effects on the reduction of poverty, the MDG's overall target and the MDG's health framework. As much as this transition has been able to halve the rate of extreme poverty by 50% only a few countries such as Brazil, China and India have seen positive results and these countries have the most populous populations in the world. In many countries the overall gains have failed to reach the disadvantaged people, creating large inconsistencies. Women are the most affected by poverty and inequality. Gender inequality aggravates the effects of poverty and is more apparent among poor communities. Households that were headed by women had fewer opportunities of owning farmland than those headed by men.

Unfortunately India is still one of the most poverty-stricken nations globally. India accommodates about a billion people and there is a high rate of fertility. Over 50% of the world's undernourished persons are in India, have a very low BMI and are in a highly undernourished state. These statistics challenge the public's health status, particularly adults in rural countries with minimal privileges (Das and Bose 2010).

The Academy of Nutrition and Dietetics (2013) also reported poverty as an ongoing challenge especially in rural areas, where a billion (70%) of the global population lives. Populations (80%) that live in rural areas are affected by hunger on a daily basis. Such populations are employed as small-scale farmers in the breeding of fish, domestic animal herds and production of crops. However, they remain hungry regardless of the employment opportunities. It is in Sub-Saharan Africa where the populations do not have access to nutrition security and energy source foods, and this also affects a considerable number of persons in Asia.

Steyn and Temple (2008) stated that the main cause of malnutrition is poverty. The poor communities are the most affected by severe micronutrient deficiencies and under-nutrition. Non-communicable diseases caused by over-nutrition also contribute to poverty, accompanied by a lack of proper sanitation, adequate food, education and basic government services. The nutritional well-being of poverty-stricken people is affected by the worldwide food supply that faces serious new obstacles stemming from climate change, and economic and related crises which have resulted in limited access to nutritious foods. The poor populations choose calorie rich foods with less nutritional content in order to cope with poverty and hunger. This leads to accelerated vitamin and mineral malnutrition because of a decline in the quality and quantity of food. Malnutrition was perpetuated by the already present vulnerabilities leading to even more decreased income, poorer health status, and decreased intellectual and physical capabilities (Bloem *et al* 2010).

Thousands of women are being subjected to injustice and material scarcity. This poverty is particularly apparent among rural women and is indistinguishably connected to their own undernourishment and that of girls and boys (Castro and de Lara 2015).

2.5.4 Urbanisation

Individual values changed and shifted because of urbanisation. In the past, communities in rural areas shared the little food they had amongst each other and their lifestyle was not expensive.

In the city, food is pricey and the lifestyle, including its maintenance, is expensive (Puoane *et al* 2006).

According to Langer *et al* (2015), in the previous eras urbanisation provided substantial examples of transformation, such as social changes altering females' health, well-being and status. This means that, globally, more and more populations moved from rural areas to urban areas. Urbanisation is an integral part of social change for women with the opportunity for improved health. Urbanisation affects household structures, education, health-related behaviours, social norms, employment and accessible services. These factors affect the circumstances of caregivers and women's health status.

2.5.5 Religion

According to Puoane *et al* (2002), in some households certain foods are only consumed on specific occasions. Such occasions include funerals and circumcision ceremonies. When certain people are in mourning milk and meat are not consumed and only black tea is taken. When it is initiation period, initiates only ingest un-spiced boiled foods, such as cabbage, potatoes, meat and samp. At funerals and other celebrations, people are served with food as a token of appreciation for their support. On celebratory occasions, such as weddings and parties, people eat ice cream, cakes and sweets. At social gatherings, food is expected and people are satisfied when food is served. However, eating of such foods on these occasions is not enough to make a significant impact on an individuals' diet whether negative or positive.

2.5.6 Employment

A study undertaken by Altman *et al* (2009) found that one of the key causes of households deteriorating from a condition of not being hungry in the year 2006 to being hungry in the year 2007 was a reduction in the average number of employed adults per household and moderate growth in grant income per capita. Expanding the employment opportunities, could ideally address poverty and food insecurity. However, even though the employment rate became higher during the 1990s, it has not been adequate to reduce household poverty in any meaningful sense. To address food insecurity it is important to include a vital factor, namely income security.

In a survey conducted by Statssa (2012), results showed a decrease in employment by 75 000 in the first quarter of the year 2012, increasing the number of the unemployed by 282 000

quarterly. The decline may also be as a result of the festive season, where employment decreases during the month of December.
The job creation rate in the last quarter of the year 2012 was higher than it had been since the year 2008. Consecutively, in the three quarters up to and including the second quarter of 2011 employment remained at a constant rate. However, in the fourth quarter of 2011 it increased.

From the beginning of the fourth quarter of 2011 to the first quarter of 2012 a decrease in employment was apparent in about five of the regions in South Africa. The highest loss of about 47 000 jobs was observed in the Eastern Cape, and also in KwaZulu-Natal it was 43000 and in the Free State it was 16 000. In contrast, the Gauteng and Limpopo provinces experienced an increase in job opportunities with 25 000 and 11 000 new jobs respectively during the same period.

In South Africa about 3.9 million people are unemployed. During the recession period a drastic increase in unemployment was experienced in the country, hitting the 4.4 million mark in the first quarter of 2010, continuing into the second and third quarters. There was an increase of 4.5 million in the unemployment rate in the second quarter of 2011 but a decrease was observed in the last half of 2011. The increase in the number of unemployed people reached 28 2000 by the second quarter of 2012, which reached the same mark as in the second quarter of 2011, 4.5 million.
The unemployed male counterparts when compared to females increased by 51.8% and 48.2% respectively, resulting to in unemployment increase among male and females of 6.9% and 6.4% respectively (Statssa 2012).

Results also showed that over 80% out of the 162 000 unemployed people were men. Studies have previously shown women to be more unemployed than men. The same statistic is also apparent in this study as more women were found to be unemployed. The trend is confirmed by data collected in 2008 when in the first quarter of 2008, 27.1% of women were unemployed while the percentage for men stood at 6.6%; the gap narrowed in the fourth quarter of 2011 by 4.7%.
The rate of unemployed women was still at the highest level compared to the country's average from the first quarter of 2008 to the first quarter of 2012, decreasing by 1.7%. The rate of unemployment for both women and men continued to accelerate in the first quarter of 2012 where females were more unemployed than males by a further 1.2% (Statssa 2012).

The Statssa (2012) also found that increased levels of education were associated with decreased rates of unemployment. As of the first quarter of 2008, people without matric had the highest rate of unemployment compared to those with a matric and a higher education level.

Langer *et al* (2015) also found that, as much as rapid growth of market economies, globalisation and women entering the workplace gives an opportunity to change inequitable gender roles, the possibilities of employment are still unequal. Women are job insecure, paid less than men and are less likely to join a union than men are.

2.5.7 Food Safety

Approximately 1.8 million people (especially minors) yearly in developing countries perish as a result of diseases such as diarrhoea caused by contaminated food and water. Global studies have recognized that the unsafe handling of food at household level requires attention. Household food poisoning and the time that passes before the onset of sickness are normally ignored by consumers. Hence, people do not take appropriate measures to avoid outbreaks, as many foodborne diseases present symptoms similar to the normal flu. As a result consumers may not receive treatment or even have a proper diagnosis from a professional physician (Steyn and Temple 2008).

Food intake cannot be discussed without involving food safety. For an extensive period of time, food safety has been a worldwide issue of concern in the food trade industry. Indications of food borne infections and incidences have long been apparent especially at household level to such an extent that in 1960 the Hazard Analysis Critical Control Point (HACCP) designed for the food industry was established in order to make sure that there was food safety. The safety of food would be ensured by applying control measures where hazardous and critical points were identified. The critical points would give an indication of the safety level of food before consumption. If risks were detected the food would then be discarded. An environment that is not hygienic together with poor food safety practices in households indicated a risk factor that results in infectious illnesses and thus childhood diarrhoea. Therefore, food safety is as much of a serious burden as is health and malnutrition (Nesamvuni 2014).

According to Steyn and Temple (2008), consumers have a right to safe food. The consumer is to be protected against harmful products, dangerous services to one's health or life and production processes in the perspective of trade and industry. Hence, safety and quality

measures for food products and related services, the testing and safety certification of facilities, important consumer goods and services and quality must be ensured by businesses, government and the public. Over and above this, policies governing the manufacturers should be put in place, in order for consumers' food purchases to be compensated, replaced and/or substituted if any are in any way defect or contaminated.

According to Fukuda (2015), it is challenging for food safety and food security to be assured by all stakeholders involved in the increasingly evolving world. The unsafe food risks are substantial and very challenging to group together. More than two hundred illnesses caused by harmful parasites, food contamination, food viruses, chemical or radio-active substances, poisons and bacteria begin as infections and can lead to serious cancers. The need for a variety of foods is ever increasing, which necessitates a more complicated and extended food chain. Hence, the WHO has decided to look seriously at the matter of food safety.

The WHO (2014), presented the key facts in terms of food safety, including:

- Accessibility to adequate amounts of nutritious and safe food is key to maintaining life and endorsing proper health.
- Diarrhoeal illnesses caused by food and water result in the mortality of 200 million people with minors involved per year.
- Unsafe food produces a malicious cycle of illnesses leading to malnutrition, especially in respect of more vulnerable people such as the elderly, the sick, minors as well as babies.
- Diseases stemming from food obstruct the development of socioeconomic factors, by putting pressure on the health-care system, hurting the country's economy, trade and tourism.
- As a result of globalisation, food is now able to be exported and imported all over the world. Proper cooperation among state officials, manufacturers and food purchasers can assist in ensuring the safety of food.

The main food-caused diseases include salmonella, campylobacter and enterohaemorrhagic escherichia coli, listeria and vibrio cholerae (WHO 2014).

King and Burgess (2000) have presented consumers with ways to keep food clean and safe in a domestic setup:

- Purchase fresh food products preferably on the day they are to be used and consume before the date of expiry.
- Refrain from purchasing food or food products with danger signs.
- Thaw frozen foods in the refrigerator; do not leave them to thaw out at room temperature or in warm water.
- Keep food covered and always at the right temperatures.
- Consume meals straight after preparation.
- When fetching water use clean and covered containers.
- Use safe or sterile water at all times.
- Always wash hands with soap and running water prior to the preparation of food or the eating of meals, and after touching animal, soil or other unclean places and after using the lavatory.
- Keep food at the correct temperatures when preparing, cooking and serving food.
- All food utensils are to be washed thoroughly with soap and water before preparation, cooking and consumption.
- Fruit and vegetables are to be washed before peeling, cooking and consumption.
- During food preparations avoid spitting, coughing and touching the body.
- Cover rubbish bins at all times.
- Animals are to be kept away from food preparation areas.

Regrettably, food safety covers and emergency management systems are not at all times available to help populations who are unable to meet their food requirements or alleviate the impact of human and natural disasters (Department of Agriculture, Forestry and Fisheries 2014).

2.5.8 Eating away from home

Many people nowadays eat away from home more often than was previously usual. Such individuals eat at corner stores, vending machines, restaurants and take- away outlets. Eating out confuses many individuals and is believed that it is difficult to eat healthily when one eats away from the home. The Canadian Diabetes Association (2014) has come up with ways to make eating away from home as healthy as possible. Complementary physical exercise and healthy food consumption assists in preventing or delaying the occurrence of NCDs.

People often find the following as barriers to eating healthily when one is eating away from home:

- Prepared food is easy to eat without being mindful of one's health
- Cooking and serving methods are not healthy
- Big portions are often served
- Food choices are limited
- Peers make unhealthy choices
- Treating oneself to unhealthy choices
- Unhealthy choices are more tastier
- Tempting buffets encourage one to overeat.

It is advisable to choose meals or foods that have more vitamins, minerals and fibre. Avoid foods high in sodium, sugar and fat (The Canadian Diabetes Association 2014).

Possible solutions to assist one in making healthier choices when eating away from home without going overboard include:

- Before deciding on a particular food choice first check out all available options
- Do not continue eating once one is full.
- Avoid unnecessary nibbling by drinking water.
- Request meals to be cooked differently e.g. grilled, baked or steamed.
- Request sauces on the side to limit how much is added on food.
- Order smaller portions each time.
- Avoid buffets by ordering from the menu.
- Find healthier choices one enjoys.
- Share portions with friends or family members.
- Decide on places that offer healthier meals. (The Canadian Diabetes Association 2014).

2.5.9 Peer pressure

Younger females had some information about over-eating certain foods that cause overweight and certain diseases, while under-consuming meant losing weight and becoming slimmer. Other females believed that having more food indicated wealth as well as that one was being well taken care of (Puoane *et al* 2006).

According to Puoane *et al* (2006), certain young females seemed to be aware of body weight and hence selected certain types of food to be eaten. The young females reported the preference of thinness and ate meals that had less fat. The young women did not have time for physical exercise, therefore they chose to consume minimal food. The young females concluded that a

state of thinness was considered cute on television (TV) and as a result being overweight was avoided by all means, so as not to be without a boyfriend or fashionable clothing.

2.6 Methods to Determine Dietary Intake and Nutritional Status

2.6.1 Dietary intake

2.6.1.1 Food Frequency Questionnaire (FFQ)

These questionnaires include a list of foods that add to the energy and nutrient intake the population consumes. Existing questionnaire lists can be used to conduct such surveys in order to meet the desired objectives of the population. Already existing lists are more reliable and valid as they have already been tested and validated and very minimal mistakes arise (Dyett, Rajaram, Haddad and Sabete 2014). The participants are interviewed by a fieldworker to specify how frequently they have ingested the type of food, the amount of food ingested on those days and its state. This is a review reflective of the food ingested whether daily, weekly or even monthly. The FFQs differ in size. Some are very short while some are lengthy and quite complicated, ranging from nine different foods, where a single nutrient is required, up to three hundred foods respectively. FFQs are normally used in epidemiological research for groups of people rather than for single persons to acquire the relationship diet has with certain diseases.

2.6.1.2 24-Hour Recall

These are reflective of the dietary intake, where participants are asked to recall the food and liquids they have ingested in the last twenty-four hours. This can be done on a once-off or on a number of occasions. The interviewer is allowed to help the participant articulate exactly the food items and liquids consumed and the size e.g. gramage in milligrams and kilograms. A number of 24-Hour Recalls collected over different seasons from an individual present more accurate information of the participant's food intake pattern than one 24-Hour Recall. These are mainly used to collect information for larger populations, not less than fifty, determining the tendencies in intake patterns (Labadarios *et al* and FAO 2011).

2.6.1.3 Food record

The respondent records the type and amount of food or beverage exactly at the time of consumption, ranging from a day to seven days. The food is quantified by the respondent, by estimating portion amounts using other household measures or using scales to measure food or

beverage quantity. The participants must be trained and equipped to be able to measure and weigh accordingly. The participants must also be able to record all ingredients contained in certain foods. Food records are normally the most correct method of assessing food consumption (Joubert and Erhlich 2007).

2.6.1.4 Diet history

Information is collected from a participant through a one-on-one interview on the history of the participant's diet. The aim is to acquire information about food intake patterns and the influence of food variables selected by the individual over a month or a year. The candidates detail exactly the number of meals eaten daily, food dislikes, appetite, any vomiting or nausea, supplement intake etc. Accuracy of information cannot be determined over one recall, but a number of recalls is recommended to acquire a typical intake trend of the individual. However, this needs to be followed by a three day record of food or a 24-hr- recall to check and validate data collected. Diet histories are a full and detailed method of collecting relevant data on an individual or minor group (Joubert and Erhlich 2007).

2.6.2 Nutritional Status

Anthropometric Indicators

Anthropometric indicators are used to obtain the physical measurements of a participant and to link them to the participant's nutritional and health status. This enables the researcher to identify any signs of malnutrition, whether over- or undernutrition (Ahmad *et al* 2006).

Anthropometry measures are used to measure weight, height and waist circumference. The measurements enable researchers to retrieve fat percentages, in order to predict any dangers participants might be in, such as obesity. The indicators are simple and it's important that the information collected is as accurate as possible using the correct procedures (Lee and Nieman 2003).

Height

- Height is measured of all participants that are part of the survey or study. Besides the ones who cannot stand properly, or who are wheelchair bound, individuals with high hairdos will hinder the appropriate use of a height measuring scale.
- Participants need to remove shoes each time the measurement is taken.

- If the measuring rod being used to take height measurements is attached to the balanced beam scale, no more setting up procedures are required as the scale is properly placed for weighing.
- Tape the height ruler vertically, ensuring the upper part of the rod is vertical and straight and taped to a hard wall surface with base standing on a flat floor surface, if using a stadio-meter. To check the vertical placement rule use a carpenter's level.
- Always place or use on a hardened floor otherwise put a wooden platform under the height ruler base.
- Anchor steel, taped to a flat wall with a wooden headrest, that enables measurements to be administered vertical to the top of the head can be used (Ahmad *et al* 2006 and Steyn and Nel 2006).

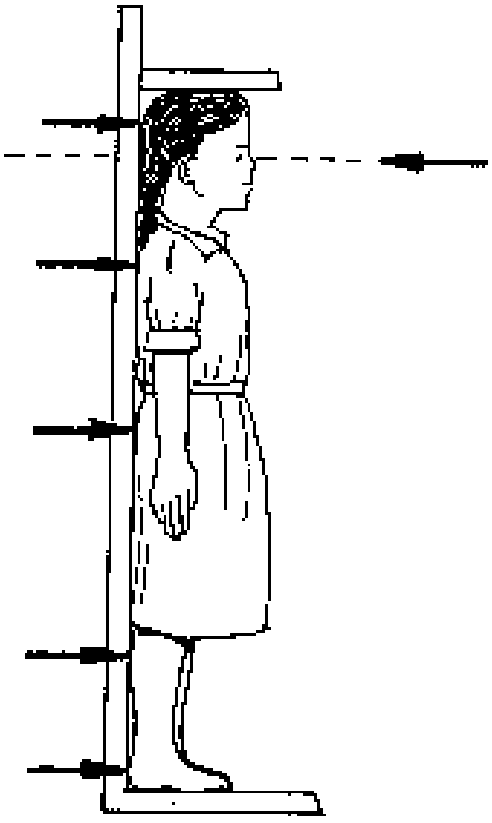

Figure 2.6: Height measurement (Gross 1997:18)

Weight

- Weight is measured using a calibrated physician scale, measuring to the closest 0.1kg.
- Participants get measured in light clothes without shoes (Ahmad *et al* 2006). Heavy clothing such as jerseys should always be taken off before weighing.

- The scale should be put on a flat hard place, or a hard wooden platform should be placed under the scale.
- The scale should always, before and after weighing be calibrated and corrected to 0.1kg, if it's greater than 0.2kg.

Skinfold thickness

- The composition of the body fatness is measured using the skinfold calliper.
- A number of skinfold areas are measured, such as subscapular, biceps, triceps, medical calf and supra-iliac.
- A skinfold calliper is used to measure the double fold of the skin in millimetres.
- Skinfold measurement is accurate but accuracy may be altered and lowered due to body fat increase.
- In a study by Ramirez-Zea (2006), the skinfold thickness was measured to the closest 0.1mm, using a Holtain Calliper. Subscapular, triceps, abdominal and suprailiac was measured using Holtain calliper (Joubert and Ehrlich 2007).

Figure 2.7: Skinfold calliper measurement (SANHANES 2007)

According to Ronquest-Ross *et al* (2015), proportional food consumption data is useful in recognizing tendencies in eating patterns countrywide or between other interested populations. Food consumption patterns education is required to look at nutrient outlining purposes, quotation and assembling of typical food baskets. This is for the invention and trend analyses applicable to the food industry pricing policies to endorse healthier food procurements also addressing food insecurity and emerging and monitoring development against food-based dietary guidelines.

The Department of Agriculture, Forestry and Fisheries (2014), also emphasises the requirements for the enhanced availability of enough applicable and suitable data for monitoring, analysing and reporting on the food security status.

BMI

- When the data is obtained it is possible to then calculate one's BMI (Body Mass Index) using the BMI formula. Weight in kilograms is divided by height in square metres.
- BMI= $\frac{\text{weight in kg}}{(\text{Height in m})^2}$

- The study conducted by Whirlock, Lewington, Sherliker, Clarke, Emberson, Halsey, Qilizibash, Collines and Peto (2009) concluded that the BMI was able to foretell the actual reason behind mortality, whether below or beyond the ideal BMI classification (22.5 to 25kg/m²). Seemingly a person's life expectancy is reduced by two to four years if the BMI is at 30-35kg/m² and reduced by eight to ten years if BMI is at 40-45kg/m². But if mortality resulted at BMI at 22.5kg/ m² it was probably related to smoking diseases.
- The equation enables researchers to be able to classify participants according to the BMI classification (see Table 2.1), obtained during anthropometry measuring such as underweight, normal weight, overweight or obese (WHO 2015).

Table 2.1: BMI classification (WHO 2009)

Classification	BMI (kg/m²)	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00-16.99	16.00-16.99
Mid thinness	17.00-18.49	17.00-18.49
Normal range	18.50-24.99	18.50-22.99
		23.00-24.99
Overweight	≥25.00-29.99	≥25.00

Pre- Obese	25.00-29.99	25.00-27.49
		27.50-29.99
Obese	≥30.00	≥30.00
Obese class 1	30.00-34.99	30.00-32.49
		32.50-34.99
Obese class 11	35.00-39.99	35.00-37.49
		37.50-39.99
Obese class 111	≥40.00	≥40.00

When all these dietary assessments are done, researchers are then able to conclude findings such as the one in a study undertaken by the SANHANES-1 Shisana *et al* (2012). It was found that 39.7% of the respondents had a diet that was of nutritionally poor quality. An 18.3% score was reported for respondents who ingested a high fat diet, 19.7% for a diet high in sugar with 25.6% for a diet low in fruits and vegetable. Also, in a study by Das and Bose (2010), the women were severely undernourished when compared to men at 30.6% and 63.45% respectively.

Waist circumference

- Waist measurement is taken using a non-stretchable tape, placing it at the thinnest part of the waist and below the rib margin and iliac crest. The non-stretchable tape is placed horizontally, all the way around the body.
- A calibrated length rod is used to check and validate the non-stretchable tape used for measuring the waist circumference.
- The non-stretchable tape is normally 150 centimetres long and if the tape stretches, it cannot be used.
- In some studies a body length mirror is used by placing it against the wall, making sure the grid lines on the mirror are horizontal next to the measurement area (Steyn and Nel 2006).

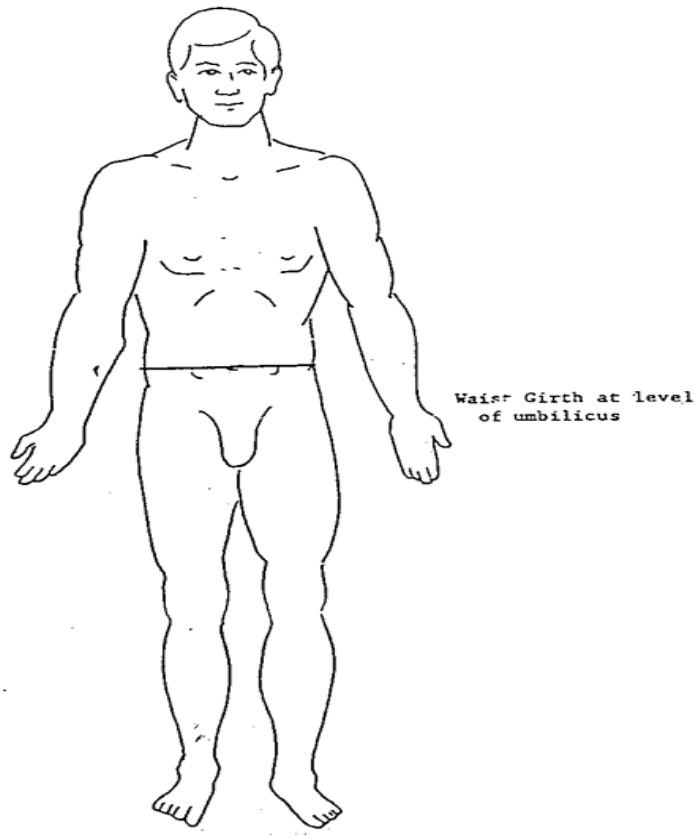

Figure 2.8: Waist measurement (Murabito 1997)

2.6.3 Socio-demographic surveys

Demography scientifically describes the population's characteristics and embodies all features of the structure of the population and its changes which can be numerically measured. This mainly involves the measurements of the population's size, sex, age, composition and distribution by region as well as changes in the number of people. The major factors that lead to the population's alteration are fertility, mortality and immigration (Steyn and Nel 2006).
Such questionnaires are better administered in a household or individual set-up.

2.6.4 Health surveys

When using a variety of research methods, researchers are able to clearly understand health care. Epidemiology investigates the determinants and distribution of health outcomes and forms a huge scale of research in health services. Such research includes health economics, organisational research, clinical epidemiology, operations research and qualitative research (Joubert and Erhlich 2007).

2.7 Strategies to Address Malnutrition

2.7.1 Food Based Dietary Guidelines

The South African government adopted the Food Based Dietary Guidelines (FBDGs) to help with the country's food security and as a means to educate the population about nutrition. The FBDGs were adopted to promote much better use of the food and resources available, putting the needs of the consumer first by having to look at the over-burdening constraints, circumstances and challenges related to nutrition (Steyn and Temple 2008).

According to Vorster *et al* (2013), FBDGs are evidence-based, short and positive notes aimed at diverting the normal person's eating patterns to a more ideal diet that simultaneously protects persons against NCDs, while meeting the nutrient and energy requirements.

Love *et al* (2008) conducted a study in KwaZulu-Natal, to determine if the consumers were able to appropriately apply the FBDGs in terms of identifying food and drinks according to the FBDG food categories and the perceived importance of and the barriers applying to each FBDG and planning a typical days' meal to reflect the FBDGs. The findings concluded that the use of FBDGs could be a powerful tool to empower and educate the rest of the population to adopt a healthier diet that is able to combat the health challenges of both under- and overnutrition throughout the course of one's life.

The revised FBDGs adopted by the Department of Health of South Africa include the following:

- Individuals need to be active.
- Enjoy a variety of food.
- Ingest many fruits and vegetables daily.
- Drink lots of safe and clean H2O.
- Use sugar and foods and drinks high in sugar sparingly.
- Have milk, maas or yoghurt every day.
- Lean meat, fish and chicken or eggs can be eaten daily.
- Regularly include legumes, beans, peas and soya in one's diet.
- Make starchy foods part of most meals.
- Fat is to be used sparingly. Choose vegetable oils rather than hard fats.
- Use salt sparingly (Vorster *et al* 2013).

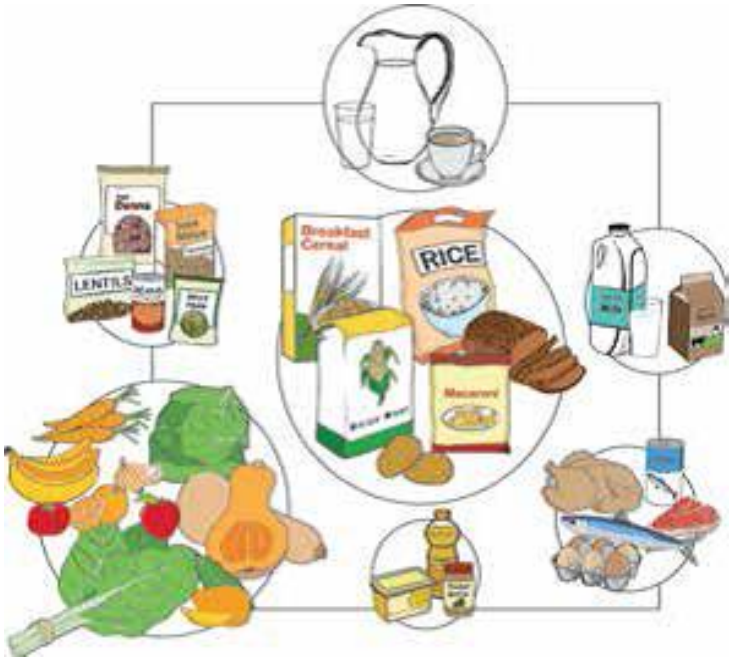

Figure 2.9: The Food Based Dietary Guidelines adopted for South Africans (Vorster 2012)

2.7.2 Food Fortification

The Vitamin A deficiency showed a tremendous improvement than in previous years at 13.3% because of the food fortification programme put in place by the government through the Department of Health in 2003 (Shisana *et al* 2013).

The Department of Health established a national mandatory Food Fortification Programme as a result of the National Food and Consumption Survey carried out in 1999. The programme fortified the main staples in South Africa, such as maize meal and wheat flour (bread) in order to combat micronutrient deficiencies, commencing in October 2003. The main staples were fortified with vitamin A, riboflavin, thiamine, niacin, Iron, zinc, folic acid and vitamin B6 (Steyn *et al* 2007).

According to the FAO/ISLI (1997), the effectiveness of food fortification is more apparent when food that is readily available and consumed on a daily basis or frequently by the majority of the population is fortified. It should be able to withstand any rate of preparation from the production to the end consumption stage.

There have been numerous positive responses and successful results that have stemmed from the fortification of certain foods, such as the fortification of sugar with vitamin A in Guatemala (Phillips, Sanghvi, Suarez, McKigney and Fielder 1996) and the fortification of wheat flour with iron for adults, and maize meal for the younger population even though it is expensive (Faber, Kualsvig, Lambard and Benade 2005). The fortification of salt with iodine and maize, wheat and milk products with zinc was successful (Gibson 2006).

2.7.3 Food Supplementation

This is an interim strategy to decrease the vitamin and mineral deficiencies in populations until more substantial measures are invented.

Vitamin A supplementation is delivered via preventative, universal or targeted supplementation. The preventative approach includes integration of vitamin A supplementation with the expanded programme for immunization. The universal approach includes the delivery of vitamin A supplements via community programmes or as a vertical activity. Targeted supplementation restricts delivery of vitamin A in health facilities to the severely undernourished, with infectious and respiratory infections as well as with xerophthalmia. High dose vitamin A supplementation is administered to pregnant women from six to eight weeks before delivery and to infants from six to 60 months of age. Vitamin A endorsements have been developed as well as training provided to the health care workers (Steyn and Temple 2008).

In the treatment of iron deficiency anaemia, iron supplementation is administered. The recommended iron dosage for adults is 60ml/ day and 30ml/day for children. Iron is more effective when used in conjunction with vitamin A supplementation in reducing iron deficiency anaemia. Iron and folate supplementation increases weight and height in pregnant women.

Where iodised salt is unavailable, resulting in iodine deficiency disorders, iodised oil is suggested.

In order to increase zinc status, zinc supplementation is recommended but only in populations at risk of the deficiency. Such people include low birth weight infants, pregnant women and malnourished minors (Steyn and Temple 2008).

2.7.4 Dietary Diversification

Dietary diversification refers to the consumption and production of vitamin and mineral-rich foods. Although the benefits of dietary diversification are not sudden, it is the most sustainable and easy method to implement. The implementation of dietary diversification can be coupled with micronutrient supplementation in order to attain short-term results. It also addresses

vitamin and mineral deficiencies. Production of vitamin and mineral-rich foods can be achieved by keeping family-sufficient community fruit and vegetable gardens, commercial manufacture of micronutrient-rich foods, school-based gardens and poultry, small animal and fish production.

An adequate labour force, accessibility of water, credit or capital to buy inputs, regular seed supply, availability of fertiliser and pesticides, training on growing and caring for crops, access to markets and fencing are the main resources required for the success of such projects. However, the component of nutrition education must be linked to such projects, to ascertain increased intake of vitamin and mineral- rich foods (Steyn and Temple 2008).

2.7.5 Nutrition Education

There is an ample indication base for school curriculum-based nutrition education programmes in terms of self-efficacy, improved knowledge and attitudes that lead to enhanced nutritional behaviour. Over and above this, if coupled with healthy foods and plenty of variety in the primary school nutrition programme, provision of both access to food and nutrition will be possible. It is also important for schools to reinforce the type of food sold in order to promote healthy eating behaviour (Labadarios *et al* 2011).

2.7.6 Government Interventions

The South African Government seeks to bring growth and equality to all populations by removing poverty and fighting hunger. This goal was set as the first goal to be achieved in the year 2015 by implementing the one dollar a day for the poor populations and $2.50 for the semi-developed populations (Aliber *et al* 2010).

A great promise that actually showed positive results was created by the Global Fund to fight AIDS, TB and Malaria. It promised the accelerated penetration of the generic ARVs. The President's Emergency Plan for AIDS Relief and Resource Availability for the countries that run AIDS programmes sees 15 million people before the year 2015 being put on the ART programme (Vella 2015).

WHO changed the guideline on when to give out ART to HIV-positive patients by proposing that the ART initiation be immediate and not look at the CD 4 cell count and age of the individual (Stefano 2015).

The World Bank (2007) reassured its global communities of its commitment to helping them fight the HIV and AIDS pandemic. The pandemic endangers the development of multiple populations, mainly in African countries. According to the World Bank Strategy (2007), the number of people in low and middle income communities on ART was 1.3 million and that was only 20% of the amount in need of treatment by the end of 2005.

The World Bank is still committed to financing the intervention in respect of HIV and AIDS as and when countries are in need of assistance and advice, project strengthening, logical services and united health systems.
The bank will contribute by making improvements to efficiency and meeting the capacity of the supply of ART. The bank has committed itself to supporting the HIV and AIDS programmes financially and the health systems in a number of ways, such as:

- Accountability enhancement
- New kinds of financing
- Financial space creation and alteration reductions
- Increase support, predictable and long-term funding.

The Global Coalition on Women and AIDS together with the UNAIDS country offices, collaborated and decided to provide funding that will strengthen women's organisations and network institutional capacity of HIV-affected women in eight republics (UNAIDS 2007).

The European Union *et al* (2013) reported that through the food-security and agriculture involvement, the European Union has committed to using 3.1 billion pounds in assistance to nutrition-sensitive interventions. This will be achieved in partnership with the Food and Agriculture Organisation (FAO) that is devoted to zero hunger, where agriculture is economically and gender sensitive and environmentally and socially sustainable. Concurrently the two will be working to improve the effectiveness of food nutrition and food systems and working together with other nations' stakeholders in the elimination of malnutrition, hunger and food insecurity. This can be achieved by ensuring that the evidence base and knowledge is strengthened, and that building nutrition capacity, programmes, investment planning and governance is improved.

The joint team is to be made up of Technical Centre for Agriculture (TCA) and rural cooperations, obligated to functioning with women's groups, the youth, different stakeholders

and research and education institutions. The initiative is especially targeted to organisations lead by farmers, by developing the value chains, policies and strategies that improve nutrition and food security as well as promising to back capacity building, raise knowledge and awareness in order to promote nutrition sensitive agriculture by using vast networks. Lastly the team was joined by the World Bank Group (WBG). This initiative aims to extend funding programmes involved in mother and childhood nutrition in developing nations from 230 million US dollars from 2011 to 2012 to 600million US dollars by 2013 to 2014. The bank is committed to the funding, over and above the support already given to other sectors like agriculture, and revising agricultural projects with the aim of improving nutritional results (European Union *et al* 2013).

In South Africa, currently food safety and quality control systems are fragmented between different entities putting into place measures with various regulations determined by differing parts of the legislation including:

- The Department of Health regulating the food inspection services;
- The Department of Agriculture, Forestry and Fisheries regulating the Perishable Products Export Control Board; and
- The Department of Trade and Industry, regulating the South African Bureau of Standards (Department of Agriculture, Forestry and Fisheries 2014).

2.7.7 Grants

In a study conducted by Altman *et al* (2009) findings indicated that the government social grants had played an important role in improving household food security since the year 2001.

Labadarios *et al* (2011) also found that the social grants such as old age pensions, foster care grants, child support grants and disability grants were put into place to directly decrease food insecurity. Social grants assisted in increasing women's access to food as well as their buying power. He added that from 1999-2003 alone, 2.6million people in the country received grants and that number increased to 12million in 2007.

2.7.8 National Development Plan (NDP)

The NDP was created by the National Planning Commission that was established in 2011. Among its other plans, it strives to reduce inequality and eliminate poverty by the year 2030.

According to the commission, poverty is an important factor affecting good health. If the poverty issue is addressed successfully it will impact the nation's health positively. The commission proposed that all wards countrywide should have enough facilities for populations to participate in sporting and basic exercise activities. Employers should be sponsored by government to give their employees the opportunity to access vital knowledge on healthy dietary practices and physical exercise. This will establish and ensure a culture of well-being at work and in the community at large (National Development Plan 2011).

The South African government is working towards enabling all the communities within its boundaries to access all opportunities that are presented. The plan is to assist citizens, particularly the youth, to shift the life uncertainties that still exist, where the population was crippled by the history of apartheid, to a more positive lifestyle (Millennium_Development Goals 2013).

The National Development Plan proposes the writing of a new story for the country. This story involves every person caring for another person's well-being and the development of the other, to create a caring South Africa. The population should draw from the solidarity that has assisted the country be where it is today. The following are what the NDP proposed in order to enable a South Africa that is beneficial to all:

- Infrastructure expansion
- Urban and rural area transformation
- Education and training improvement
- Quality health care provision
- The shift towards a low-carbon economic state
- Job and livelihood creation
- Unite the country and transform society
- Improve accountability and fighting corruption and
- Construction of a proficient state (NDP 2011).

2.7.9 Integrated Nutrition Programme (INP)

According to Steyn and Temple (2008), the Nutrition Committee that was appointed in 1994 by the Minister of Health recommended the establishment of an Integrated Nutrition Programme in order to develop a nutrition strategy for the country. The INP has a vision of optimal nutrition for the entire nation. The mission of the INP was to improve the state of South

Africans' nutrition by applying integrated nutrition activities. In order to address the causes of malnutrition, the INP combined both direct and indirect nutrition interventions through a broader policy context.

The direct interventions of the nutrition programme include food fortification, nutrition education and promotion, disease specific nutrition, nutrition support and counselling and micronutrient supplementation. On the other hand, the indirect interventions of the nutrition programme include the provision of clean, safe water, parasite control, and improved steps to access food and health care service provision. In addition, the INP embraced the UNICEF's Conceptual Framework to clarify malnutrition.

Furthermore, the Food and Nutrition Security Implementation Plan (2014) stated that, since the democracy privilege, through its policies and programme interventions, South Africa has gradually engaged in the fight against hunger and poverty. Through the implementation of the Integrated Food Security and Nutrition Programme (NPFNS) an incorporated approach to ensuring delivery of food security programmes has been followed. The South African government in 2013 approved the Household Food and Nutrition Security and the National Policy on Food and Nutrition Security strategies as a means to continue responding to the hunger challenges in the country.

The NPFNS provides a shared positioning for all players in confronting food and nutrition insecurity problems. The NPFNS puts an emphasis on co-operation that will limit undue repetition and incompetent placement of resources. The government strategically assigned specific ministers to co-lead its commitment areas by identifying the importance of applying the food and nutrition security plans and programmes.

The Household Food and Nutrition strategy identifies methods, including feeding schemes, moderation of food prices, subsistence farming support, staple fortification and social grants. The strategies seek to address household-level food and nutrition insecurity (FNSIP 2014).

2.7.10 South African Millennium Development Goals

The South African government, together with the rest of the world, agreed to work towards the Millennium Development Goals. The Millennium Development Goals target issues such as the eradication of poverty and hunger (Aliber *et al*. 2010) and promoting gender equality and empowering women (Budlender *et a*l 2010).

South Africa admits to still having problems regarding achieving some of the millennium goals the government has set but prides itself on the few achievements the country has seen. These include reducing the poverty level by 50%, even though relative inequality is consistently on the rise, partly because of the country's decreasing labour force and high unemployment rate. The country also prides itself on achieving the goal towards education access for all but not excluding the importance of quality, efficiency and results of the system of education (Manual: MDG 2013).

MDG 1

The first millennium development goal in South Africa was the eradication of severe poverty and hunger (Labadarios *et al* 2011). The South African government believed that poverty cannot be eradicated by only using programmes that do not require funds, and sought ways to address such a setback in the millennium development goal. The government has implemented plans such as the "social wage" with the intention of decreasing the living costs of the poor citizens by targeting the triple problem of unemployment, inequality and poverty. The social wage was formed in such a manner that targets a number of areas. These include the social grants, RDP housing, schools with a no fee policy, free primary health care and basic needs provision to households divided amongst sanitation, sewerage, water provision, waste management and electricity, especially to the impoverished groups (Millennium Development Goals 2013).

MDG 2

The second MDG, as targeted by the South African government, sought to attain widespread education for all minors of school-going age, regardless of gender or age. South Africa's Constitution after the apartheid era in 1994 was amended: it now states that education is a human right and it should be available and provided to all even at tertiary level. (Act no. 108 of 1996) (MDG 2013).

The government introduced compulsory learning for all children aged seven to fifteen years, who are expected to have completed grade nine within the allocated period, and further adopted the outcomes based education (OBE) policy. Educational policies and strategies were incorporated with the aim of reducing any inequalities in the system of education. The country allocated 20% of the nation's budget to education in the year 2013. This was actually the

biggest allocation at 6% of the country's profits and just 4% is divided between basic and secondary education.

As much as the country has achieved the goal before the estimated date (2015), many challenges are apparent. The goal requires ongoing work that has not only to do with providing education to all but also to transform the state of education. The transforming is required in terms of the quality, efficiency and functionality of the education system (MDG 2013).

MDG 3

According to the Millennium Development Goals (2013), the third goal was put in place in order to promote gender equality and the empowerment of women. Education had been a means to empower women but it is not the final solution. Since 1994 South Africa has established a number of laws targeted towards addressing all gender issues, has ratified a range of gender-relevant international conventions and instruments and has established a structure that addresses gender issues.

The South African government continues to be prominent in delivering a legislative structure that is based on human rights in order to accomplish equality that is gender based. However, there is the continual necessity to ensure that the population as a whole supports and observes gender equality. The general population, together with the civil and private sectors in cooperation with global agencies, needs an on-going channel of communication. This channel is concerned with the promotion of awareness, education, support, political and socioeconomic rights and privileges of women and girls (MDG 2013).

MDG 6

The Millennium Development Goal number six is the combating of HIV and AIDS, TB, malaria and other diseases. These diseases are the main public health challenges across the whole of Sub-Saharan Africa, destabilizing the continent's development. The country's solution towards the epidemics continues to concentrate on regulating the HIV and tuberculosis pandemic. The solution includes investing significantly in preventions and treatments that are based on evidence. The main mediations included in the efforts to control HIV and AIDS and TB, are to increase free ART treatment and increase condom access (MDG 2013).

The MDG (2013) also adds that the commitment given to HIV and AIDS, TB and STI pandemics was also apparent in the objectives of the National Strategic Plan for year 2012 to 2016. The objectives include:

- ✓ Dealing with the impact and care of HIV, TB and STI framework and social obstacles.
- ✓ Avoiding the occurrence of HIV, STI and TB infections
- ✓ Health and wellness sustainability, as well as
- ✓ Improving the protection of human rights and accessibility of justice.

The Department of Health of South Africa (2013) also aimed at fulfilling the sixth Millennium Development Goal. The goal is to reduce the occurrence of HIV among the 15 to 25 year olds by two thirds by the year 2015.

This study focuses only on the four MDGs as presented because they relate to the objectives and concerns of the study being undertaken.

Unfortunately the above-mentioned MDGs were not entirely met globally by the year 2015 set for achievement. As a result, the Rio+20 Summit endorsed the formation of Sustainable Development Goals (SDGs).The SDGs were established in order for the countries to continue working towards achieving the development goals (Sach 2012).

2.7.11 Sustainable Development Goals

According to Sachs (2012), the notion of the SDGs emerged quietly, resulting from the ever growing urgency of sustainable development for the whole population. The SDGs embrace the triple bottom line approach to human well-being. The triple bottom line approach combines environmental sustainability, economic development and social inclusion. The objectives will obviously differ nationally. The MDGs approach focused on the richer populations having to support the poor by pledging financial and technological solidarity. On the other hand, the SDGs approach differs in terms of including the whole population, by giving out challenges and goals to meet. The poor and the rich work together for the present and future generations.

SDG 1

The global population must have access to adequate nutrition, safe and sustainable water and sanitation. The world's population will have basic infrastructure, primary health care, roads,

electricity and connectivity to the world's information system by the year 2030 and possibly earlier (Sachs 2012).

SDG 2

Commencing between the years 2015 to 2030, all nations will adopt economic strategies that increasingly build on sustainable best practice technologies, suitable market incentives and individual tasks. The world will work together towards achieving low carbon emission energy systems, sustainable food systems in urban areas, as well as the maintenance of the world's population via voluntary fertility choices of families supported by health services and education.

Nations will adopt a pace of change during these fifteen years, individually and with global cooperation, that will enable humankind to avoid the most dangerous planetary thresholds. The world community will help low-income communities to bear the additional costs that adoption of sustainable systems for energy, agriculture and other sectors might entail (Sachs 2012).

SDG 3

Every country will promote the well-being and competence of all its citizens. The countries should enable their citizens to reach their full potential, regardless of class, gender, ethnic origin, religion or race. Every country will measure the well-being of its citizens with improved strategies and reporting of life satisfaction.

Special consideration will be given will be given to early childhood, the youth and the elderly, addressing the susceptibilities and requirements associated with each age group (Sachs 2012)

SDG 4

According to Sachs (2012), governments at all levels will work together to endorse sustainable development globally. This target includes the commitment to the rule of law, human rights, transparency, participation, inclusion and sound economic institutions. The institutions must support private, public and civil society sectors in a productive and balanced manner. Authority is held in trust to the people, not as a pleasure to the state.

2.8 Economic Impact of Malnutrition

2.8.1 Impact of malnutrition on a country's health system

According to the Food and Nutrition Security Implementation Plan (2014), the inadequacy of social welfare systems contributes highly to malnutrition in South Africa. Even the underlying economic and social problems at national, community and household level reflect malnutrition accompanied by ideological, political and economic structures. Insufficient and unstable funding and poor financial status also contribute to malnutrition, as well as poor institutional arrangements.

The major constraint for improved food and nutrition security system in the country is posed mainly by poorly implemented institutional arrangements and uncoordinated and fragmented strategies and intermediations.
Malnutrition can also be seen as a result of not consuming a diet that is diverse leading to micronutrient deficiencies.

As a means of dealing with malnutrition in the country, the government has tasked the Department of Health (DoH) with certain responsibilities.

- The DoH's responsibility is to facilitate the establishment of identified community champions, information and education material.
- The DoH should advocate for the consumption of diversified diets including indigenous foods by educating the community on diet diversity, screening for dietary diversity and linking to already existing support structures, e.g. agriculture.
- The DoH should also facilitate nutrition supplement availability by providing supplements to undernourished individuals and linking to other support systems.
- The DoH should facilitate the capacity of Early Childhood Development (ECD) practitioners and community development workers on the use of RtHB by monitoring the RtHB for missed immunisation schedules in-case of disease outbreaks.
- The DoH should support the UNICEF by facilitating the capacity building of community development workers in terms of hygiene practices by promoting handwashing, hygiene and food safety (FNSIP 2014).

2.8.2 Impact of malnutrition on a country's economy

A great number of South Africans unfortunately still identify with not having enough income to take care of all their household needs. This happens even after more than a decade that the nation has been a democracy. The average income of a poor South African household is below

a thousand rand a month. This means that a considerable proportion of the country's population is unable to earn and sustain a proper income. Hence, the women caregivers occupying the households are unable to buy enough food to sustain the whole family (Labadarios *et al* 2011).

According to Altman *et al* (2009), the number of food insecure individuals increased on a global scale, from 900 million to one billion during 2007 and 2008, due to rapid food price inflation. Shockingly, food insecure and low-income households are more susceptible to food price increases as they spend a bigger part of their income on food. In the group that was studied the household food expenditure per capita decreased by 7.6%.

It is sometimes assumed that low-income households are generally found in poor municipalities but the converse applies since data compiled showed that serious hunger is prevalent and is found on a similar scope in rural areas and metros.

Work formation seems to be too slow to reach the millions of the world's populations in need. The global economic meltdown has resulted in a worldwide crisis that is food insecurity, (Labadarios *et al* 2011).

According to Labadarios *et a*l (2011), the very high fuel and food prices, accelerating interest rates and high energy tariffs have put severe pressure on South Africans, especially the ones that are already finding it difficult to make ends meet, and are leading the country into unemployment and poverty. After the many years of democracy most communities still regard themselves as not having enough income to meet their household needs. The majority of the population's households still find it difficult to sustain a decent income. The projected regular income of a poor household is less than a thousand rand per month. As a result, women living in these households find it very challenging to buy enough food to feed the whole household.

According to Jacob (2009), household income and asset status is what household food security is dependent on most. The households most likely to suffer food scarcity are the low-income households rather than the wealthy households. Income changes are associated with altering the quality and amount of foods brought and consumed. Households cut down on their food purchases and change intake patterns as a coping mechanism to fight food inflation. Losing the opportunity to earn an income in a household can lead to a food secure household becoming one that is not food secure.

It is women in South Africa who mostly shop for groceries and the element that most concerns these women before a food product is purchased is the cost, or price. Other elements taken into

account include healthiness, nutrients, taste, safety, contents and food hygiene and preparation convenience. Hence, if the price is high, purchasing is less likely to happen. Studies have proven that a healthier lifestyle is more expensive, costing more than 65% more when compared to the normal South African diet. As a result, most South Africans cannot afford the healthy diet (Ronquest-Ross *et al* 2015).

Ronquest-Ross *et al* (2015) also added that specific supermarket price increases, which account for more than half of all retail sales, accompanied by the increase in per capita incomes and urbanisation is doubling the demand for costly food products such as meat products, dairy products, processed and packaged food as well as fruits and vegetables and, as expected, is putting a further strain on the consumer.

2.8.3 Role of the Recession on Malnutrition

According to Bloem *et al* (2010), in developing countries the increased fuel prices and significant inflation that occurred in 2008 caused a reduction in the accessibility of food for a lot of people especially because the urban and rural poor are net purchasers, hence their buying power decreased immensely because of income opportunities that were reduced as a result of the financial down-turn, while food prices increased significantly. Food accessibility reduced, causing the more vulnerable people to rationalise their food consumption, as two thirds of household income was being spent on food. As a result, the population bought foods that were affordable rather than nutritious, causing their dietary patterns to be of poor quality.

The extremely high price of agricultural goods has not meant high returns for the small farmer. The developing smallholders who rely on rainfall for farming and are deprived of fertilizers, improved seed access and readily available advice cannot reap the rewards of their labour. In addition, not only are most smallholders net food buyers but a large share of the non-farmer "bottom billion" are landless rural labourers or the urban poor who rely almost entirely on the market for food (Webb 2010).

Webb (2010) also adds that high commodity prices have negatively affected the food budgets of the poor, while hindering their ability to offer a supply response to the high prices. The UN Secretary General noted in the results in 2008 that the threat of malnutrition and hunger was growing.

According to the Academy of Nutrition and Dietetics (2013) income has affected nutrition security significantly because it is dependent on the local living cost. The living cost provides water, shelter, health-care, education and land as the basic political and social services. Hence, the soaring global food prices have impacted the food-insufficient and low-income countries significantly, through decreased healthcare, household income and social support. The combination of failure in agriculture, financial crises, the country's policy mistakes and increased energy prices have resulted in price shocks that are the reason for the food price upsurge.

In a study by Misselhorn *et al* (2013), it was shown that economic growth driven by the agricultural sector would reduce both inequality and poverty. Economic growth has given birth to welfare gains that stem from the agricultural sector, which are significantly greater in settlements of poor households.

2.9 Conclusion

Gender inequality experienced by women is preventing them from being included in economic, education and capital growth structures, which in turn results in increased population growth and affects their nutritional status.

Women are most likely to make a substantial contribution and achieve their full potential, given that the women experience gender equality, are empowered, enabled, valued by society, valued as caregivers and are healthy throughout their life span (Langer *et al* 2015).

Studies at the moment show very minimal results on socio-demographic data focused on women caregivers in South Africa hence the available data may not be entirely accurate. The need for collecting more data on women's socio-demographics is a high priority. This will enable the country to draw clearer and more reliable cooperation, making way for much needed research interventions and solutions (UNAIDS 2008).

The fortification of wheat flour and maize meal with essential micronutrients such as folate, vitamin B6, riboflavin, niacin and thiamine increased the RNI levels of the former micro nutrients. However, the iron levels were still lower than the RNIs because iron as well as calcium was not included in the fortification process (Steyn *et al* 2007).

Poor populations are directly and swiftly affected by the changes in climate, economics and related shocks in more ways than one. Nevertheless, the accessibility of food is still the main boundary between the sudden shocks and the nutritional well-being of the population. Working towards nutrition improvement could prevent disabilities, protect health, save lives and improve the productivity of the economy (Bloem *et al* 2010).

According to Love *et al* (2008), measureable information to do with the health and illness status of South Africans and their food intake patterns shows that nutrition knowledge has not made much impression on attaining desired behaviour of diversity and primary nutritional status. With the implementation of national FBDGs for South Africans, it is important to make sure that these dietary messages permit customers to receive the desired behavioural change.

Almost twenty years and fifteen years after the World Food Summit (WFS) and the embracing of the Millennium Declaration, respectively, it was stated that there weren't any reasons to celebrate the achievement of any of the goals by the governments and state presidents. Far from attaining the goals set by the WFS, a population of 795 million will continue to suffer from undernourishment between 2014 and 2016. The educational space between women and men exists at all levels. With that said, the state presidents and private sector business delegates have been able to shift the people's responsiveness towards a new concept of Sustainable Development Goals (SDGs) (Castro and de Lara 2015).

In order to decrease malnutrition, cost effective, simple and evidence-based solutions coupled with nutrition sensitive development strategies, need to be accelerated (PMNCH 2012).

CHAPTER 3
METHODOLOGY

3.1 Introduction

This chapter explains how data was collected in order to determine the socio-demographic profile, nutritional status, nutritional risks and food intake among women from a low and middle income community in a township in KwaZulu-Natal (KZN). Data of good quality was collected and put together aided by the use of proper measuring instruments and proper planning research design as critical components in data collection. To meet all the research objectives, certain factors were considered in selecting research methods which included:

- available resources
- characteristics of the population under research (age, gender)
- time frame.

According to Altman *et al* (2009), in understanding household food security it is imperative to investigate the resources of each household, the distribution system of food and the household's accessibility to food together with its challenges. A low income and middle income community is perceived as being slightly diverse in terms of education, nutritional status, nutrition knowledge and income levels. This study intends to ascertain whether this diversity is vast or is just hypothetically being seen as such and thus there is a need to investigate using proper instruments and research material in order to find the differences or similarities if any between the two communities.

3.2 Study area/ Setting

KwaNdengezi is a township in the province of KwaZulu-Natal, the second largest province in South Africa which has a total population of 1045 million people of which the female population makes up 52%, (Statssa 2009). Residing in the township are about 32 088 people (eThekwini Municipality 2012). The area has two sections divided by a road. The north section comprises of semi-detached houses with two bedrooms for a single family. These houses were built by the so-called "apartheid government" for the black communities when they were removed from their original land to townships under the Group Areas Act.

The south section comprises of houses that were built later for the working middle class community consisting of, for example, teachers, nurses and policemen. These houses are now sold to the general public and anyone who can afford them; they are mainly three to four bedroom houses with a proper yard. Both these sections have electricity, running water and proper sanitation.

According to how the community is divided the north section is seen as a low-income community whilst the south section is said to be more well off and thus a middle-income community.

The purpose of this study is to study the two sections in order to determine whether the north section is more nutritionally challenged than the south section and which section is more educated and maybe more food secure despite the high rate of unemployment (36.4%) in this community. Food security exists when every household individual at all times has enough nutritious food for an active, productive and healthy life (Thulile 2014).

3.3 Study Type

The study was descriptive in nature using various measuring instruments to collect relevant data. The data that was collected was of a quantitative nature comparing two socioeconomic groups using different variables with the aim of identifying problems and providing an answer to the research question. The study was conducted in the households of each of the participants. The researcher visited the households to explain the study to each of the caregivers after which the study was conducted. The timeframe for data collection per household was under 45 minutes. Anthropometric measurements were conducted. Participants were not expected to undress during weighing and measuring but were requested to remove shoes and heavy clothing. The data was collected from 260 households, 130 households per section, from women of 18-50 years of age.

3.3.1 Research Design

An empirical study design was used to collect primary data about the two communities residing in the two sections of the township.

3.3.1 Developmental Study Design

Stage 1: Literature Review

This stage involves the scrutiny of scientific literature significant to the study.

Stage 2: Planning the Study

The planning procedure consisted of the following steps:

- Research proposal writing
- Setting up appointments with the relevant stakeholders
- Meeting the councillor heading the community to attain approval to conduct the study in the community.

Stage3: Rolling out the Study

The rolling out of the study was done over a period of three seasons, which were autumn (April 2013), winter (July 2013) and spring (September 2013), in order to get an accurate reflection of the community's food consumption patterns.

Stage 4: Reporting on Results

The report on the results of the study will be discussed in detail in chapter 4.

3.4 Target Population

The households in the north and south of KwaNdengezi Township were randomly selected by using the number of roads listed in the eThekwini municipality map. A sample of 130 households per area was targeted. The north section had 39 roads and the sample number of households required was divided by the number of identified roads resulting in three households per road being targeted. The same procedure was used for the south section where 26 roads were identified resulting in five households per road being targeted.

The caregivers in the participating households were given an information letter and the study was explained to them (Annexure B). The study consent form (Annexure C) was then signed by the participating caregivers in the households as acknowledgement of their voluntary participation. Fifty percent of the information letters were written in isiZulu to accommodate those participants who preferred to be addressed in their home language and to ensure that the study objectives were communicated clearly too every household without any language barrier hindering the communication process. The participants were assured that the study was voluntary and that they could withdraw their participation at any given time. The participants' names and addresses were recorded and can only be accessed by the researcher and the supervisor but may not be used on the questionnaire. A participant number was linked to each participant's profile and used throughout the research process. The information given by respondents was locked in a cupboard in the Food and Nutrition Department and will be stored for five years after which it will be disposed of by shredding.

Upon agreement by the participants, the study was then conducted at a time that suited the researcher and fieldworkers, and the follow-up was conducted on the days following.

3.5 Sampling Strategy

KwaNdengezi was divided into two sections, the north section and south sections. A power calculation using the household numbers as indicated by eThekwini Municipality (2012) was used to determine sample size (Cole 2006).

In 2007 there were 7105 households in this area (eThekwini Municipality 2012) and using a 95% confidence interval, a sample of 257 households was needed to represent the community

and this number was rounded up to 260. Therefore 130 households were randomly selected per area

$$Ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where:

Z=Z value (e. g 1.96 of 95% confidence interval)

p= percentage picking a choice, expressed as a decimal

(0.5 used for sample size needed)

c= confidence interval, expressed as .07 decimal (three units on both sides of the normal).

The sample can be described as women caregivers/ owners of households between the ages of 18 and 50 years. The criteria included targeting only women in the north section and the south section in KwaNdengezi. The criteria excluded men, children younger than 18 years and adults older than 50 years. They also excluded adults residing outside of the KwaNdengezi area and those who were not main caregivers in the households.

3.6 Data Collection

3.6.1 Training of Fieldworkers

The fieldworkers were recruited from amongst the third year students in the Department of Food and Nutrition at the Durban University of Technology. Fieldworkers were also recruited from the local community being studied as part of capacity building and 'giving back' to the community in return for their participation. The fieldworkers were trained how to conduct interviews and complete the 24-Hour Recall questionnaires, Socio-demographic questionnaires and the Food Frequency Questionnaires. The fieldworkers were also trained how to take anthropometric measurements using the correct instruments and in using food samples in order for the participants to be able to estimate portion sizes when interviewed using the 24-Hour Recall questionnaires. English was the medium of instruction during the training sessions; however isiZulu was used during interviews with participants as a means of communication in order for participants to fully understand the questions. Fieldworkers worked in pairs in the participants' households for safety reasons. Reliability and punctuality was highly stressed by the researcher to the fieldworkers on duty. The fieldworkers urged the participants to be honest

at all times during the interviews. The researcher was present during the fieldwork to ensure the study was conducted properly and questions that arose were answered.

Figure: 3.1 Fieldworkers

3.6.2 Methods used to collect data

Different types of questionnaires were used as measuring instruments to collect the necessary data needed for the research. The questionnaires were checked daily by the researcher for completeness and accuracy at the end of fieldwork; if any questions arose they were followed up on or the process was repeated the next day. The gathering of data will be discussed in detail in the following section.

The participants answered three sets of questionnaires including the socio-demographic questionnaire (Annexure D), the 24-Hour Recall questionnaire (Annexure E) and the Food Frequency Questionnaire (Annexure F). The participants were also weighed using a Physician Scale for weight, the Stadio-meter for height and a non-stretchable measuring tape for waist circumference.

3.6.2.1 The Socio-demographic Survey

A valid and reliable socio-demographic questionnaire was used for the study (Napier 2009). In an interview situation the questionnaire was completed to determine the social profile, socio-demographic and poverty levels of households. The questionnaire was compiled in English but isiZulu was also used during the interviews in order for the participants to fully understand the questions. The major points of the survey included education level, employment status, household income, personal information, household assets and the number of household members. The researcher completed the questionnaires in 260 households and all of these were usable in the study. It took approximately 15-20 minutes for each socio-demographic questionnaire to be completed.

3.6.2.2 Dietary Assessment

One of the aims of the study was to determine the food intake, food diversity and food variety of the low income and middle income communities. Three 24-hour recall questionnaires as well as a FFQ were completed per person for this section.

a) 24-hour recall

A structured 24-hour recall questionnaire was used for three consecutive days, two weekdays and one weekend day (Annexure E). This is a dietary assessment questionnaire that is used to determine the food consumed by the respondent 24 hours prior to the interview and to monitor the respondent's actual dietary intake. This was done through face-to-face interviews conducted by the fieldworkers who had been trained in using methods for gathering dietary information and in using food models simultaneously to determine portion sizes and identify certain food items which helped in yielding sufficient reliable data. All the questionnaires were able to be used and it took approximately five to twenty minutes per 24-hour recall questionnaire.

b) Food Frequency Questionnaire

The FFQ was completed to determine the food group diversity score (FGDS) and food variety score (FVS) indicating dietary intake behaviour (Annexure F). The FFQ consisted of a structured listing of individual foods consumed in the community over a period of seven days in the nine food groups recommended by FAO which are: 1) Flesh foods (including meat,

poultry and fish); 2) Eggs; 3) Dairy products; 4) Cereals, roots and tubers; 5) Legumes and nuts; 6) Vitamin A rich fruits and vegetables (including pumpkin, carrots, wild leafy vegetables, spinach, butternut, apricots, peach and mango); 7) Other fruits (including apples, peaches, pears, grapes, plums, sub-tropical fruits and juices); 8) Other vegetables; 9) Oils and fats (including butter, sunflower oil, margarine, lard, salad dressing, potato crisps and coffee creamer) (FAO 2009). The respondents were asked to indicate the food items consumed in the last seven days as listed on the questionnaire. The FFQ was used as an instrument to validate the 24-hour recall. The FFQ used was unquantified as it did not specify serving sizes (Oldewage-Theron and Kruger, 2008).

3.6.2.3 Anthropometric Questionnaires

The height, weight and waist circumference of the 130 participants per section were determined during the study by the trained fieldworkers to calculate Body Mass Index (BMI). Precise standard measuring techniques were applied for the anthropometric measurement to be valid, each measure was taken twice and the average of the two measurements was used. The measurements were recorded on an anthropometric data sheet (Annexure G). The measures were then compared and evaluated to reference standards to assess weight status, BMI and the risk of various diseases.

Anthropometric measurements include height, weight and waist circumference.

a) Height

- All the respondents' heights were measured in metres (m) rounded off to the nearest (mm).
- The respondents had to remove hats and shoes prior to being measured.
- The crown of the head was used as a margin in cases where respondents had hairstyles that added height.
- A Stadiometer was used to determine height (Scales 2000).
- The respondent had to stand up straight facing the fieldworker with shoulders and arms relaxed and the heels and buttocks touching the wall.

- The fieldworker had to record the respondent's height twice in the space provided on the anthropometric data collection sheet and the average was calculated.
- The procedure was repeated twice and the two readings were required to be varied by less than 5mm.
- The measurement was taken to the nearest 5mm and then taken to the nearest 0.5cm.
- The same procedure was repeated for all the respondents (WHO 2011; Lee and Nieman 2010).

b) Weight

- Weight was measured in kilograms (kg) and rounded off to the nearest gram (g) using a good quality, calibrated electronic scale (CPPS-physician scale, Scales 2000).
- The scale was placed on a hard, uncarpeted surface.
- The scale was then switched on and the fieldworker had to wait until zero indication and a stable indicator appeared.
- The respondent had to step onto the scale without shoes and bulky clothing such as jackets or jerseys and heavy objects in pockets such as keys were removed before the respondent was weighed.
- The respondent stood up straight facing the fieldworker with feet slightly apart so that weight was equally distributed on both legs until the measurement was recorded; the procedure was done twice and the measurements were recorded in the space provided on the form and the average was calculated to ensure accuracy.
- At the end of the measuring and recording of their weight, the respondent would step down off the scale and the scale would be returned to zero position and the process would be repeated (WHO 2011).

c) Waist Circumference

- Waist circumference of all respondents wearing light clothing was measured by the same fieldworker.
- Measurements were recorded twice on the anthropometric data collection sheet.
- Waist circumference was measured at the midpoint between the lower margin of the last palpable rib and the top of the ilea crest (hip) (WHO 2008).

- The respondent was asked to stand up straight with their feet fairly close together (about 12-15 cm) so that their weight would be equally distributed on both legs.
- The measuring tape was held firmly and its horizontal position was in line with the belly button.
- The tape was held loosely enough to allow the fieldworker to place their finger in between the tape and the respondent's body without squeezing the skin.
- Measurements were recorded to the nearest centimetre and rounded off to the nearest 0.1cm. The procedure was repeated twice for each respondent and the average was calculated.
- The increases in waist circumference indicated changes in risk factors for cardiovascular diseases.
- The measure for the increased risk was ≥88cm in women (WHO 1997and 2008).

3.7 Data Analysis

3.7.1 Study Variables

Various questionnaires were used to measure a variety of variables in the study. The socio-demographic profile was assessed by means of a socio-demographic questionnaire. The dietary intake and food variety and dietary diversity were assessed by means of the 24-Hour Recall questionnaire and a Food Frequency Questionnaire (FFQ) respectively. The anthropometric measurements included weight, height and waist circumference.

3.7.2 Statistical Analysis of Data

3.7.2.1 The Socio-demographic Questionnaire

The socio-demographic questionnaires (Annexure D) were checked and sorted for completeness and accuracy by the researcher. The socio-demographic questionnaires were completed in an interview situation and captured on a Microsoft Excel® spreadsheet by the researcher and analysed on the Statistics Package for Social Sciences (SPSS) software version 22 for descriptive statistics and presented in the form of graphs and tables.

3.7.2.2 Dietary Assessment

The 24-hour Recall questionnaires (Annexure E) were used to determine dietary intake; this was analysed using the Food finder® computer software version 3 to indicate actual nutrient intake and is presented in means and standard deviation in graphs and tables (Langenhoven *et al* 1991). This information was analysed by a nutrition specialist and this programme was developed by the South African Medical Research Council. Nutrient intake was compared to the DRIs. The Top 20 food items consumed and the mean fruit and vegetable intake per group was also calculated. The AMDRs were calculated to indicate the energy contribution from the macronutrients. The Nutrient Adequacy Ratio (NAR) was also calculated and correlated with the Food Group Diversity score.

A valid and reliable adapted FFQ was used to determine the food variety and dietary diversity score and was collected during the interview format. The data gathered was presented on a Microsoft Excel® spreadsheet and analysed using the SPSS software version 22 to present the Food Group Diversity Score (FGDS) and Food Variety Score (FVS). The FFQ was adapted for this specific community to take into consideration the dietary habits of the two groups (one in the low income group and the other one in the middle income group) before the FFQ was implemented; the FFQ will be used as the interview questionnaire. (Oldewage-Theron and Kruger 2008) (Annexure F)

3.7.2.3 Anthropometric Measurements

The anthropometric measurements, height, weight and waist circumference of (n=130) participants per section were captured on an Excel Spreadsheet® to determine and classify the BMI of the participants. The BMI was calculated by dividing the weight in kilograms (kg) by the square of the height in metres (m^2), (kg/m^2). The WHO BMI cut-off points used were underweight at <16.00 -18.49, normal weight at 18.50-24.99, overweight at ≥25.00 and obese ranging from ≥30.00 - ≥40.00 (WHO 2009).

Waist circumference was measured twice and the mean used to determine the waist-to-height ratio (WHO) in order to identify participants at risk of cardiovascular disease and other diseases of lifestyle, and the cut-off points for women were 88cm (Klein., Heymsfield, Kelley, Leibel,

Nonas and Kahn 2007). The height-to-waist ratio (WHtR) was determined and interpreted with a cut-off point of 0.5. A WHtR of >0.5 is a risk indicator of metabolic syndrome (Ashwell and Hsieh 2005).

3.7.2.4 Correlations

Correlations were conducted using the Pearson statistical test. The inferred scatter plots of two variables positioned into coefficient quantitative terms by Pearson's correlation r=0, indicates no association although negative associations are indicated by r= -1 and positive associations are indicated by r= 1 (Gelman 2013). Significance is indicated at $p<0.05$.
Correlations were drawn between variables of the socio- demographic, FFQ and 24-hour- recall questionnaire and BMI to determine if there was a statistical significance between the two populations.

List of all the correlations done amongst each group

- Income and BMI
- Income and frequency of meals
- Income and FVS
- Money spent on food and education level
- Money spent on food and number of people in the household
- Money spent on food and frequency of meals
- Money spent on food and FDGS
- Money spent on food and FVS
- Money spent on food and BMI
- BMI and energy
- BMI and FAT
- BMI and PRO
- BMI and CHO
- BMI and FVS
- BMI and FGDS
- BMI and education level
- BMI and frequency of meals.

Mean comparison between the north and south section variables

- Income
- Money spent on food
- Education level
- Number of people per household
- Frequency of meals
- FGDS
- FVS
- BMI
- Energy.

3.8 Ethical Consideration

The research proposal was submitted and approved in 2012 by the Faculty of Applied Sciences Research Committee (FRC) at the Durban University of Technology (DUT) prior to the commencement of the study. Ethical clearance was granted as part of the approved proposal by the FRC and was approved by the Institutional Research Ethics Committee (IREC) in 2012 with the clearance number IREC050/12.

Permission to conduct the study in the community was requested and granted in writing by the Councillor of KwaNdengezi Township (Annexure A).

In this study it was imperative that the researcher took into full consideration the ethical part of the study. The researcher took into consideration the research ethics as recommended by the Institutional Research Ethics Committee (IREC).

3.9 Chapter Summary

This chapter discussed all the instruments used in this study to determine the socio-demographic profile, nutritional status, nutritional risks and patterns of the low and middle income women in a township area. All the instruments used in the study were suitable for the gathering of data and to answer the research problem. The aim of the study was to find the

differences and similarities between the two communities by looking at the education status, nutritional status and income levels and the results will be discussed in Chapter 4.

CHAPTER 4
FINDINGS AND RESULTS

4.1 Introduction

This chapter focuses on presenting and explaining the findings and results of the data collected and analysed in detail. Findings in the study include the socio-demographic results, food intake, food frequency scores and anthropometric results of the two communities. The sample size was 260 women participants, 130 each per section, between the ages of 18 and 50 years. The findings and results will be interpreted in percentages as well as numbers and the main points will be discussed. The findings and results will be presented comparing both sections, the north section and the south section.

4.2 Socio-demographic results

The information in Table 4.1 indicates that 15.38% (n=20) of the households in the north section had three people living in them, 11.54% (n=15) of the households had 10+ people whilst the other 25.38% (n=33) of the households had between seven to nine people. When compared to the south section, 19.23% (n=25) of the households had five people living in them and 16.92% (n= 22) had six people, whilst the other 20.77% (n=27) housed seven to nine people.

Table 4.1: Family composition for north (n=130) and south (n=130) sections

Variables	**North Section**		**South Section**	
Number of people per household	Percentage %	Number n=130	Percentage %	Number n=130
10+	11.54	15	6.92	9
6	11.54	15	16.92	22
5	13.08	17	19.24	25
4	14.62	19	16.92	22
3	15.38	20	8.46	11
≤2	8.46	11	10.77	14

Other (household with 7- 9 people)	25.38	33	20.77	27

Table 4.2 indicates that 93.80% (n=122) of the residents in the 130 households were permanent residents whilst all 100% (n=130) of the residents in the households in the south section were permanent residents.

In the north section 3.10% (n=4) of the residents reported to have lived in their households for less than a year, whilst 5.40% (n=7) had lived in their households for one to five years and a maximum of 91.50% (n=119) had lived in their households for more than five years, clearly indicating that most residents have been part of this community for a long time. Additionally, in the south section 3.10% (n=4) of the residents reported living in their households for less than a year, whilst 14.60% (n=19) had lived in their households for one to five years while 82.30% of the residents had lived in their households for more than five years.

Table 4.2: Residence duration

Variables	**North Section**		**South Section**	
Permanent residents	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Permanent	93.80	122	100	130
Not permanent	6.20	8	0.00	0
Duration at residence				
<1year	3.10	4	3.10	4
1-5 years	5.40	7	14.60	19
>5years	91.50	119	82.30	107

The majority of the houses in the north section (99.20%, n=129) and all (100%) of the houses in the south section were brick houses.

The households in the north section comprised of 63.08% (n=82) households with four rooms, 33.85% (n=44) with more than four rooms and only 3.07% (n=4) with fewer than two rooms. Of the 130 households 43.8% (n=57) had an outside building or room and 56.20% (n=73) did not, but 79.20% (n=103) of the households in the south section had more than four rooms, whilst 18.50% had three to four rooms and a minimum of 2.30% (n=3) had fewer than two rooms.

Table 4.3: Accommodation

Variable	**North Section**		**South Section**	
Type of house	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Brick house	99.20	129	100	130
Clay house	0.80	1	0.00	0
Rooms per house				
4 rooms	63.08	82	79.20	103
>4 rooms	33.85	44	18.50	24
<2rooms	3.07	4	2.30	3
Total	100.00		100	
Outside building				
With outside building	43.80	57	35.40	46
Without outside building	56.20	73	64.60	84

Almost half 47.69% (n=62) of the households were owned by women whilst 50.00% (n=65) of the participants were living with relatives and 2.31% (n=3) were either renting, living with friends or were homeless, whilst in the south section 80.77% (n=105) of the households were owned by the caregiver, whilst 12.31% (n=16) lived with their relatives, and 6.92% (n=9) rented the households or lived on the employer's property.

Table 4.4: Living Conditions

Variables	**North Section**		**South Section**	
Living conditions	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Owned by caregiver	47.69	62	80.77	105
Living with relatives	50.00	65	12.31	16
Other (renting or in employer's property)	2.31	3	6.92	9

Water facilities in each household in the north section consisted of 91.50% (n=119) of households with taps in the house, whilst 6.20% (n=8) had taps outside the house (in the yard), 0.80% (n=1) used a borehole and 1.50% (n=2) fetched water from elsewhere. In the south section 99.20% (n=129) of the participants in the households used tap water inside the house and 0.80% (n=1) used tap water from outside (in the yard).

In the north section 97.70% (n=127) of the households had a flush toilet system whilst 1.50% (n=2) used a pit latrine and only 0.80% (n=1) did not have a toilet facility.
In the south section, however, 99.20% (n=129) of the households had a flush toilet system and only 0.80% (n=1) did not have a toilet facility.

In the north section waste removal was provided to 98.50% (n=128) of the households and only 1.16% (n=2) of the households was not provided with a similar service, and 99.20% (n=129) of the households in the south section system were provided with waste removal services.

Table 4.5: Sanitation

Variables	**North Section**		**South Section**	
Water facilities per household	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Tap in the house	91.50	119	99.20	129
Tap outside house (yard)	6.20	8	0.80	1
Borehole	0.80	1	0.00	0
Fetch water elsewhere	1.50	2	0.00	0
Total	100.00	130	100.00	130
Toilet facilities per household				
Flush toilet	97.70	127	99.20	129
Pit latrine	1.50	2	0.00	0
None	0.80	1	0.80	1
Total	100	130	100.00	130
Waste removal				
Yes	98.50	128	99.20	129

In the north section 77.70% (n=101) of the households had a tarred road in front of the house, whilst 23.8% (n=31) had a gravel road and 76.20% (n=99) did not have a gravel road outside the house whereas in the south section 98.50% (n=128) of the households had a tarred road in front of the house and 96.20% (n=125) did not have a gravel road in front of the house whilst 3.10% (n=4) had a gravel road and 0.80% (n=1) had both.

Table 4.6: Type of road surface

Variables	**North Section**		**South Section**	
Tarred road	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Yes	77.70	101	98.50	128
Gravel road				
Yes	23.80	31	3.10	4
No	76.20	99	96.20	125
Both (gravel and tar road)	0	0	0.80	1
Total	100.00		100.00	

Most households 63.10% (n=82) in the north section had tiled floors whilst 16.20% (n=21) had cement floors and 15.4% (n=20) had carpets with 5.40% (n=7) having a mix of two of the three floor surfaces. In the south section the residents indicated that 86.20% (n=113) of the households had tiled floors, 6.20% (n=8) had cement floors whilst 4.60% (n=6) were carpeted and 2.3% (n=3) had other types of floors but 26.20% (n=34) of the floors in the households were either both carpeted and cemented or cemented and tiled.

Table 4.7: Flooring in the house

Variables	**North Section**		**South Section**	
Material floors are made of	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Cement	16.20	21	6.20	8
Tiles	63.10	82	86.20	113
Carpet	15.40	20	4.60	6
Other (includes two of each)	5.40	7	2.30	3
Total	100.00		100.00	

Figure 4.1 indicates the number of households that were affected by pest infestations which might have affected the respondents' nutritional status in terms of infections and diseases and physically affected them where assets such as furniture and food could be damaged. Figure 4.1 indicates that both the north and south sections were significantly affected by geckos, with the north section at 79.23% (n=103) and the south section at 56.92% (n=74), followed by ants, with the north section at 53.85% (n=70) and the south section at 56.92% (n=74). The north section participants were also affected by mice at 43.08% (n=56) which was much higher than the south section households at 11.54% (n=15).

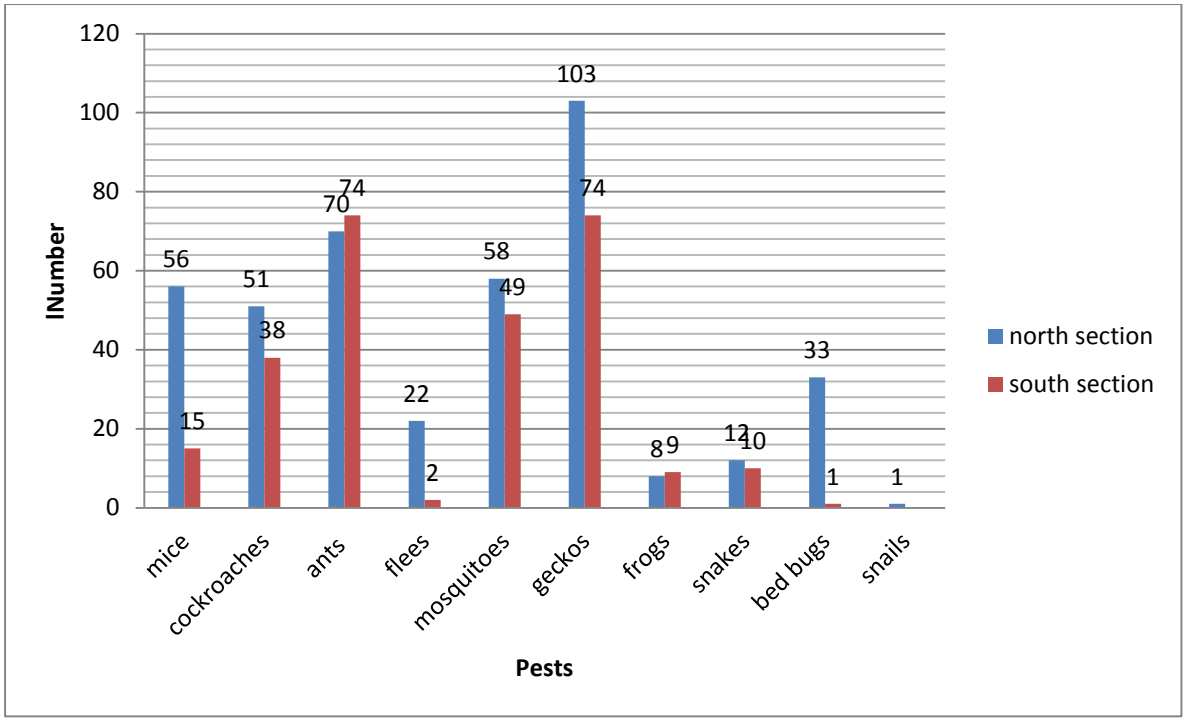

Figure 4.1: Pests infestation in the north and south sections indicated by the number of households

In respect of the employment rate in the north section households, 21.50% (n=28) of the participants were employed but the majority of 78.50% (n=102) were unemployed, which was a slightly lower rate when compared to the south section where 36.90% (n=48) of the participants were employed and the majority 63.10% (n=82) were unemployed.

Work status and income

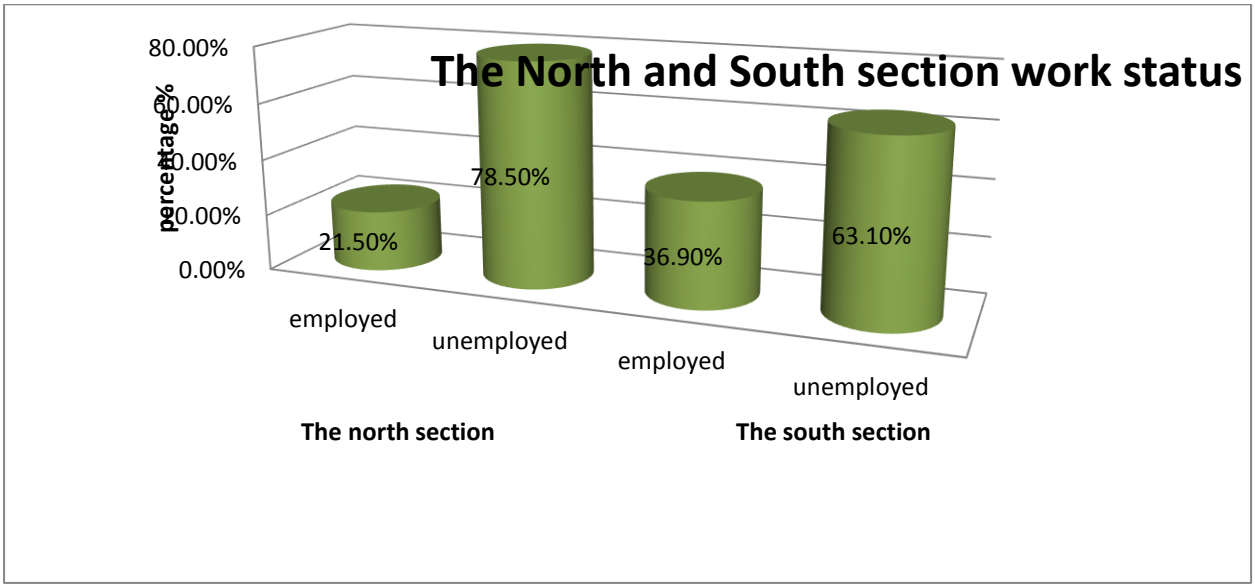

Figure 4.2: The employment rate in the north and south sections

The information in Table 4.8 indicates a clear breakdown of the participants' current employment status. The participants' current employment status is that out of the 49.23% (n=64) of the unemployed participants in the north section, 17.69 (n=23) were students, whilst 10.00% (n=13) had retired, 1.54% (n=2) were housewives and 0.78% (n=1) were unspecified. The current employment status in the south section at the time of the study was as follows: 29.20% (n=38) of the participants were housewives, 21.50% (n=28) were unemployed participants, 10.00% (n=13) were students whilst 1.50% (n=2) were retired and 4.60% (n=6) were unspecified except for the 33.08% (n=43) employed participants.

Table 4.8: Current work status breakdown for the north and south sections

Variable	**North Section**		South Section	
Current work status	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Unemployed	49.23	64	21.50	28
Students	17.69	23	1.50	2
Retired	10.00	13	29.20	38
Housewives	1.54	2	10.0	13
Unspecified	0.78	1	4.60	6
Not stipulated	20.00	26	33.08	43
Total	100.00		100.00	

The number of participants who were seeking employment in the north section was 37.61% (n=41) but 62.39% (n=68) were not, whilst in the south section 49.43% (n=43) of the unemployed participants were seeking employment but 50.57% (n=44) were not.

A large number 62.36% (n=58) of the participants in the north section had not been employed for more than three years, 21.51% (n=20) had not been employed for one to three years whilst 7.53% (n=7) had not been employed for six to twelve months and 8.60% (n=8) had been unemployed for less than six months. For the south section the duration of unemployment was 6.35% (n=4) for the participants who were unemployed for less than six months, 11.11% (n=7) for the unemployed between six to twelve months whilst 14.29% (n=9) had been unemployed for one to three years and 68.25% (n=43) of the participants had been unemployed for more than three years.

Table 4.9: Employment status

Variables	**North Section**		**South Section**	
Seeking employment	Percentage %	Number (n=109)	Percentage %	Number (n=87)
Yes	37.61	41	49.43	43
No	62.39	68	50.57	44
Total	100.00		100.00	
Unemployment duration		(n=93)		(n=63)
<6 months	8.60	8	6.35	4
6-12 months	7.53	7	11.11	7
1-3 years	21.51	20	14.29	9
>3 years	62.36	58	68.25	43
Total	100.00		100.00	

Of the employed participants in the north section households, 43.75% (n=14) had permanent employment, 25.00% (n=8) had temporary positions while 15.63% (n=5) had fixed term contracts and the remaining 15.63% (n=5) were self-employed, freelancing or worked on a per demand basis. On the other hand, 72.34% (n=34) of the employed south section participants had permanent employment at the time of the interview, 19.15% (n=9) had temporary positions whilst 6.38% (n=3) were either self-employed or worked on a per demand basis and 2.13% (n=1) was unspecified.

Amongst the employed participants in the north section only 8.53% (n=11) had part-time employment whilst 91.47% (n=118) did not have any part-time employment over and above the full-time employment whilst in the south section only 11.54% (n=15) of the employed participants had part-time employment and 88.46% (n=115) did not.

Table 4.10: Current job status

Variables	**North Section**		**South Section**	
Current job	Percentage %	Number (n=32)	Percentage %	Number (n=47)
Permanent	43.75	14	72.34	34
Temporary	25.00	8	19.15	9
Fixed term contract	15.625	5	0.00	0
Other (freelancing/ work on demand)	15.625	5	6.38	3
Unspecified	0.00	0	2.13	1
Total	100.00		100.00	
Part-time employment		(n=129)		(n=130)
Yes	8.53	11	11.54	15
No	91.47	118	88.46	115
Total	100.00		100.00	

The participants' total income per month in the north section was at R1000 to R2000 for 62.31% (n=81) of the participants, R3000 to R4000 for 25.38% (n=33) and less than R6000 for 7.69% (n=5) of the participants whilst 7.69% (n=10) had a total income of more than R6000 per month. The south section participants' showed a total income per month of R1000 to R2000 for 18.46% (n=24) of the households, R3000 to R4000 for 15.38% (n=20), and less than R6000 for 4.61% (n=6) whilst 47.69% (n=62) of the participants had a total income of more than R6000 (Refer to Table 4.11).

Table 4.11: Household income

Variables	**North Section**		**South Section**	
Total income per month	Percentage %	Number (n=130)	Percentage %	Number (n=130)

Table 4.11: *(continued)* Household income

R1000-R2000	62.31	81	18.46	24
R3000-R4000	25.38	33	15.38	20
<R6000	3.85	5	4.61	6
>R6000	7.69	10	47.69	62
Don't know	0.77	1	13.85	18
Total	100.00		100.00	

Food security is indicated in Table 4.12 where 36.92% (n=48) of the north section participants indicated that they often did not have enough money to buy food, 20.77% (n=27) sometimes did not have enough money to buy food, whilst 20.77% (n=27) seldom had enough money to buy food. However, a small percentage of 21.54% (n=28) never experienced a shortage of money to buy food. However, 0.77% (n=1) of the south section participants indicated that they always did not have enough money to buy food, 3.85% (n=5) often, 8.46% (n=11) sometimes whilst 9.23% (n=12) replied that it seldom happened and the majority 77.69% (n=101) never had such an experience.

The number of people that contributed to the household income in the north section including the participant was at 3.08% (n=4) for one contributor, 49.23% (n=64) for two, 29.23% (n=38) for three, 6.92% (n=9) for four, whilst 10.00% had five and only 1.54% (n=2) had six contributors. However, in the south section, the number of people that contributed to the household income together with the participants was 3.08% (n=4) for one contributor, 47.69% (n=62) for two, 26.92% (n=35) for three, 14.62% (n=19) for four whilst 6.92% (n=9) had five and only 0.77% (n=1) had six contributors.

A maximum of 92.31% (n=120) of the participants in the north section spent more than R500 per month on food, 5.38% (n=7) spent between R250-300 on food whilst 1.54% (n=2) spent from R200-250 on food and 0.77% (n=1) spent R50-100 on food per month but in the south section the number of participants that spent more than R500 per month was 93.08% (n=121) whilst 3.08% (n=4) spent between R250-300 per month and 0.77% (n=1) spent between R200-250 per month with 3.08% (n=4) not knowing.

Table 4.12: Not enough money for food and contributors to income

Variables	**North Section**		**South Section**	
Not enough money for food	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Always	0.00	0	0.77	1
Often	36.92	48	3.85	5
Sometimes	20.77	27	8.46	11
Seldom	20.77	27	9.23	12
Never	21.54	28	77.69	101
Total	100.00		100.00	
Contributors to h/h income				
1	3.08	4	3.08	4
2	49.23	64	47.69	62
3	29.23	38	26.92	35
4	6.92	9	14.62	19
5	10.00	13	6.92	9
6	1.54	2	0.77	1
Total	100.00		100.00	
Money spent on food per month	Percentage%	Number (n=130)	Percentage %	Number (n=130)
>R500	92.31	120	93.08	121
R250-300	5.38	7	3.08	4
R200-250	1.54	2	0.77	1
R50-100	0.77	1	0.00	0
Unspecified	0.00	0	3.08	4
Total	100.00		100.00	

In the north section 6.15% (n=8) of the participants often bought food once a week whilst 83.85% (n=109) bought food once a month and 10.00% (n=13) brought food at random periods such as twice a month (every fort-night when they received wages), whereas 2.31% (n=3) of the participants in the south section bought food once a week and 80.00% (n=104) bought food once a month and only 17.69% (n=23) bought food either twice a month or at random times.

In the north section 90.77% (n=118) of the participants admitted to purchasing food in a supermarket, whilst 8.46% (n=11) purchased from a wholesaler and 0.77% (n=1) bought food at a tuckshop. A large number of 94.62% (n=123) of the south section participants bought food

from a supermarket whilst 4.61% (n=6) brought food at a wholesaler and only 0.77% (n=1) bought from both.

Table 4.13: Place and frequency of food purchases

Variables	**North Section**		**South Section**	
Frequency of buying food	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Once a week	6.15	8	2.31	3
Once a month	83.85	109	80.00.	104
Other (every for night)	10.00	13	17.69	23
Total	100.00		100.00	
Where food is purchased		(n=130**)**		(n=130)
Supermarket	90.77	118	94.62	123
Wholesaler	8.46	11	4.61	6
Tuckshop	0.77	1	0.77	1
Total	100.00		100.00	

Taxis were used as a form of transport by 85.4% (n=111) of the north section participants whilst 13.8% used a bus and 0.77% (n=1) used their own vehicle; of all the participants 16.69% (n=21) used either a bus and own vehicle or taxi and own vehicle when compared with 55.4% of the south section participants who used a taxi as a means to get around whilst 0.77% (n=1) used a bus and 43.8% (n=57) used their own vehicle (Refer to Table 4.14).

Table 4.14: Transport

Variables	**North Section**		**South Section**	
Transport used on a daily basis	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Taxi	85.38	111	55.38	72
Bus	13.85	18	0.77	1
Own vehicle	0.77	1	43.85	57
Total	100.00		100.00	

Education and language

A maximum of 43.85% (n=57) of the participants in the north section had completed matric with 21.54% (n=28) having obtained grade 10, 17.69% (n=23) had a primary education, 2.31% (n=3) did not have any education whilst 3.08% (n=4) had graduated with a degree or diploma and 10.77% (n=14) had completed college/FET. In the south section 29.23% (n=38) were graduates, 11.54% (n=15) had completed a college/FET education, 26.15% (n=34) had matriculated, 19.23% (n=25) had completed grade 10 whilst 10.00% (n=13) had a primary education and 3.85% (n=5) did not have any education (Refer to Table 4.15).

In the north section 97.69% (n=127) of the participants spoke isiZulu whilst 2.31% (n=3) spoke other languages such as isiXhosa and English but in the south section 96.92% (n=126) of the participants spoke isiZulu and 3.08% (n=4) spoke isiXhosa.

Table 4.15: Education status of participants in the north and south section households

Variables	**Percentage %**	**Number (n=130)**	**Percentage %**	**Number (n=130)**
Highest Education level	North Section		South Section	
Graduated	3.08	4	29.23	38
College /FET	10.77	14	11.54	15
Matriculated	43.85	57	26.15	34
Grade 10	21.54	28	19.23	25
Primary education	17.69	23	10.00	13
None	2.31	3	3.85	5
Not answered	0.77	1	0.00	0
Total	100.00		100.00	
Variables	North Section		South Section	
Language mostly spoken	Percentage %	Number (n=130)	Percentage%	Number (n=130)
IsiZulu	97.69	127	96.92	126
Other languages (IsiXhosa and English)	2.31	3	3.08	4
Total	100.00		100.00	

In 32.31% (n=42) of the households in the north section all the children had birth certificates whilst in 67.69% (n=88) of the households either all the children did not have birth certificates or some children in the household did not have birth certificates. In the south section 83.08%

(n=108) of the households had children with birth certificates and in 16.92% (n=22) of the households either some of the children did not have birth certificates or none of the children had birth certificates.

In 82.31% (n=107) of the households in the north section children had not completed the immunisation programme and in 17.69% (n=23) of the households the children had completed immunisation as compared to the south section participants where 83.08% (n=108) of the participants' children had completed immunisation and 16.92% (n=22) of the children were still on the programme or there were no children in the households.

Table 4.16: Birth certificates and immunisation status

Variables	**North Section**		**South Section**	
Children with birth certificates	Percentage %	Number (n=130)	Percentage %	Number (n=130)
All	32.31	42	83.08	108
Not all and none	67.69	88	16.92	22
Total	100.00		100.00	
Children completed immunisation				
Completed	17.69	23	83.08	108
Still on programme and not immunised	82.31	107	16.92	22
Total	100.00		100	

In the north section 26.92% (n=35) of the participants' households had three children attending school whilst 17.69% (n=23) had no children attending school and only 2.31% (n=3) of the households had all the children attending school, with 53.08% (n=69) of the participants, reporting that not all the children attended school, which was slightly similar to the south section findings where the highest percentage was 27.69% (n=36) for households with three children attending school, 10.00% (n=13) of households with all children attending school whilst 14.61% (n=19) households had no children attending school and the other 47.69% (n=62) was made up of households that did not have children attending school (either they had completed school, were too young to start school or had dropped out).

A maximum of 51.38% (n=56) of the participants' children in the north section walked to school, 20.18% (n=22) used a bus, 21.10% (n=23) used a taxi whilst 3.67% (n=4) got a lift and 3.67% (n=4) used other means such as both a bus and a taxi. In the south section 69.29% (n=79) of the children walked to school, 18.42% (n=21) used a bus whilst 7.89% (n=9) got a lift and 2.63% (n=3) used a taxi with 1.75% (n=2) using two of the above (Refer to Table 4.17).

Table 4.17: School attendance

Variables	**North Section**		**South Section**	
Children attending school	Percentage %	Number (n=130)	Percentage %	Number (n=130)
All	2.31	3	10.00	13
Three	26.92	35	27.69	36
None	17.69	23	14.61	19
Not all	53.08	69	47.69	62
Total	100.00		100.00	130
How children get to school		(n=109)		(n=114)
Walked	51.38	56	69.29	79
Bus	20.18	22	2.63	3
Taxi	21.10	23	18.42	21
Lift	3.67	4	7.89	9
Other (both bus and taxi)	3.67	4	1.75	2
Total	100.00		100.00	

Food preparation, purchasing and feeding responsibilities in the household

In the north section, in 53.85% (n=70) of the households the mother was responsible for preparing food in the household, in 31.54% (n=41) of the households the food was prepared by a sibling, in 6.92% (n=9) of the households the food was prepared by the grandmother whilst in 0.77% (n=1) of the households the food was prepared by the aunt and in 0.77% (n=1) of the households the food was prepared by a cousin, while in 6.15% (n=8) of the households the food was prepared by both a sibling and grandmother. In 57.69% (n=75) of the households in the south section food was prepared by the mother, in 27.69% (n=36) of the households the food was prepared by a sibling, in 3.08% (n=4) of the households the food was prepared by the father whilst in 1.54% (n=2) of the households food was prepared by the aunt and in 0.77% (n=1) of the households the food was prepared by a cousin and in 9.23% (n=12) of the

households the food was prepared by either one of the siblings and the mother or the grandmother and the aunt.

In the north section, 61.54% (n=80) of the participants said the mother decided on the type of food that was bought in the household, in 21.54% (n=28) of the households it was the sibling, in 6.15% (n=8) of the households it was the grandmother, and in 4.61% (n=6) of the households it was either a sibling and their mother, or the mother and the grandmother whilst in 3.08% (n=4) of the households food purchasing was decided by the father and in another 3.08% (n=4) of the households food purchasing was decided by the aunt.
The decision maker on the type of food purchased in the households in the south section was the mother at 69.23% (n=90), in 10.00% (n=13) of the households it was the father, in 8.46% (n=11) of the households it was a sibling whilst in 1.54% (n=2) of the households the grandmother made the purchasing decision and in another 1.54% (n=2) of the households it was the aunt, in 0.77% (n=1) of the households it was a cousin and in 8.46% of the households it was either the mother and a sibling, or the mother and the aunt.

In the north section 48.08% (n=56) of the participants' children were fed by the mother, 27.69% (n=36) were fed by their sibling, 5.38% (n=7) were fed by the grandmother whilst 3.08% (n=4) were fed by the aunt and 10.00% (n=13) by two of the above with 10.77% (n=14) missing in the study as they fed themselves. In the South section 58.46% (n=76) of the children were fed by their mothers, 25.38% (n=33) were fed by their sibling, 3.85% (n=5) were fed by the aunt whilst 1.54% (n=2) were fed by the father and another 1.54% (n=2) were fed by a cousin with 8.46% (n=11) being fed by either their mother and a sibling or by the grandmother and the aunt (Refer to Table 4.18).

Table 4.18: Preparation and type of food

Variables	**North Section**		**South Section**	
Responsible person for food preparation	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Mother	53.85	70	57.69	75
Sibling	31.54	41	27.69	36

Table 4.18: *(continued)* Preparation and type of food

Grandmother	6.92	9	3.08	4
Aunt	0.77	1	1.54	2
Cousin	0.77	1	0.77	1
Other (sibling and grandmother)	6.15	8	9.23	12
Total	100.00		100.00	
Food purchasing decision				
Mother	61.54	80	69.23	90
Father	3.08	4	10.00	13
Grandmother	6.15	8	8.46	11
Aunt	3.08	4	1.54	2
Sibling	21.54	28	1.54	2
Other (mother and sibling/ mother and aunt)	4.61	6	0.77	1
Unspecified	0.00	0	8.46	11
Total	100.00		100.00	
Responsible for feeding children in the household		(n=130)		(n=130)
Mother	48.08	56	58.46	76
Sibling	27.69	36	25.38	33
Grandmother	5.38	7	1.54	2
Aunt	3.08	4	3.85	5
Other (by two of the above)	10.00	13	1.54	2
Missing (self-fed)	10.77	14	8.46	11
Total	100.00		100.00	

The majority (43.08%, n=56) of the households in the north section were headed by the mother, 26.92% (n=35) by the father, 16.92% (n=22) by the grandmother, 9.23% (n=12) by a sibling, 0.77% (n=1) by the grandfather, and 0.77% (n=1) by the aunt whilst another 0.77% (n=1) was headed by the uncle and 1.54% (n=2) by two of the above. In the south section, 53.08% (n=69) of the households were headed by the father, 37.69% (n=49) by the mother, 3.85% (n=5) by a sibling whilst 3.08% (n=4) were headed by the grandmother, 1.54% (n=2) by the aunt with 0.77% (n=1) headed by both the mother and the father.

In 59.23% (n=77) of the households in the north section the mothers decided on how much was spent on food, in 16.92% (n=22) of the households the decision was made by siblings, in

7.69% (n=10) of the households the decision was made by the fathers whilst in 7.69% (n=10) of the households the grandmothers made the decision, in 2.31% (n=3) of the households the aunts made the decision and in 0.77% (n=1) of the households the grandfather made the decision and in another 0.77% (n=1) household the uncle made the decision, while in 4.61% (n=6) of the households it was either the mother and father or the grandmother and mother who made the decisions.

In the south section, in 49.23% (n=64) of the households the participants said the mother decided on the amount of money spent on food, in 25.38% (n=33) of the households it was the father, in 8.46% (n=11) of the households it was the sibling whilst in 1.54% (n=2) of the households it was the aunt and in 0.77% (n=1) one of the households the decision was made by the grandmother and in 14.61% (n=19)of the households the decision was made by either the mother and father or the mother and the grandmother (Refer to Table 4.19).

Table 4.19: Head of household and decision maker in the household

Variables	North Section		South Section	
Head of household	Percentage %	Number (n=130)	Percentage %	Number (n=130)
Mother	43.08	56	37.69	49
Father	26.92	35	53.08	69
Grandmother	16.92	22	3.08	4
Grandfather	0.77	1	0.00	0
Aunt	0.77	1	1.54	2
Sibling	9.23	12	3.85	5
Other (two of the above)	1.54	2	0.77	1
Uncle	0.77	1	0.00	0
Total	100.00		100.00	
Who decides how much is spent on food		(n=130)		(n=130)
Mother	59.23	77	49.23	64
Father	7.69	10	25.38	33
Grandmother	7.69	10	0.77	1
Sibling	16.92	22	8.46	11
Grandfather	0.77	1	0.00	0
Aunt	2.31	3	1.54	2
Uncle	0.77	1	0.00	0

Other (either mother and father or mother and grandmother)	4.61	6	14.61	19
Total	100.00		100.00	

In the north section 49.23% (n=64) of the participants had three meals per day, 25.38% (n=33) had two meals per day whilst 20.77% (n=27) had more than three meals per day and 4.61% (n=6) had two meals per day, with a much larger percentage in the south section with 62.31% (n=81) of the participants having three meals per day, 30.77% (n=40) had two meals per day whilst 4.61% (n=6) had more than three meals per day and 2.31% (n=3) had one meal per day.

A maximum of 83.85% (n=109) of the participants/caregivers in the north section had their meals at home whilst 13.08% (n=17) ate at work and 3.07% (n=4) ate at school while in the south section the majority 86.92% (n=113) of the participants/caregivers ate meals at home, 11.54% (n=15) ate at work whilst 0.77% (n=1) ate meals at school and 0.77% (n=1) ate at home and at a friend's house.

It was also indicated that 80.77% (n=105) of the participants' children in households in the north section ate most of their meals at home and only 19.23% (n=25) ate at a friend's place and in the south section 91.54% (n=119) of the participant's children ate most of their meals at home whilst 1.54% (n=2) ate at a friend's house and 0.77% (n=1) ate at school (Refer to Table 4.20).

Table 4.20: Meal status

Variables	**North Section**		**South Section**	
Meals per day	Percentage %	Number (n=130)	Percentage %	Number (n=130)
>Three	20.77	27	4.61%	6
Three	49.23	64	62.31	81
Two	25.38	33	30.77	40
One	4.61	6	2.31	3
Total	100.00		100.00	
Where caregiver eat meals		(n=130)		(n=130)
Home	83.85	109	86.92	113
Work	13.08	17	11.54	15
School	3.07	4	0.77	1

Table 4.20: *(continued)* Meal status

Unspecified	0.00	0	0.77	1
Total	100.00		100.00	
Where children eat meals		(n=130)		(n=130)
Home	80.77	105	91.54	119
School	19.23	25	1.54	2
Other (at home and school)	0.00	0	0.77	1
Missing	0.00	0	6.15	8
Total	100.00		100.00	

Household assets, fuel and cooking utensils used

Table 4.21 indicates the number of households with the above mentioned assets. Participants in the south section had more electrical assets compared to the participants in the north section, even though the difference was not large. The participants in the south section all had refrigerators (n=130) where in the north section it was slightly fewer (n=124) participants that had them.

A similar trend was evident in respect of non-electrical assets but interestingly the participants in the north section had more telephones (n=130) than in the south section (n=128). On the other hand, although the participants in the north section had fewer gas stoves (n=28) than the south section (n=57), the participants in the north section had more paraffin stoves (n=45) than the south section (n=23) which meant that participants in the north section depended on sources of energy other than electricity or they did so to save electricity as it was more expensive and the north section was seen as a low-income community.

Fewer participants in the north section had lounge suites (n=116) compared to participants in the south section (n=125) and also fewer (n=44) participants in the north section had dining room suites compared to the south section where more participants (n=49) owned them which was due to the fact that the houses in the north section were smaller with fewer rooms and the participants would not have had space for more assets.

Another interesting point is that more participants (n=67) in the south section owned cars whereas in the north section fewer participants (n=28) owned them, which meant that the north section participants depended more on other means of transport e.g. taxis, buses etc.

Table 4.21: Household assets of the north and south sections

Variables	North Section Number (n=130)	South Section Number (n=130)
Electrical assets		
Electrical stove	94	122
Microwave	101	113
Hot plate	51	42
Radio	114	115
Television	126	129
Refrigerator	124	130
Freezer	47	66
Electrical iron	122	128
Electrical kettle	121	126
Non- electrical assets		
Gas stove	28	57
Telephone	130	128
Paraffin stove	45	23
Mattress bed	129	130
Mattress only	52	57
Lounge suite	116	125
Dining room suite	44	49
Car	28	67
Bicycle/ Motorbike	8	9

Table 4.22 indicates that most participants in the north 94.62% (n=123) and south 96.15% (n=125) sections used electricity as a source of fuel and in the north section 98.46% (n=128) of the participants and 100.00% (n=130) of the participants in the south section said they used stainless steel pots for cooking.

Table 4.22: Type of fuel and pots used in both the north and south sections

Variables	North Section	South Section

Fuel used for food preparation	Number (n=130)	Percentage %	Number (n=130)	Percentage %
Wood fire	2	1.54	2	1.54
Paraffin	5	3.85	2	1.54
Electricity	123	94.62	125	96.15
Gas	0	0.00	1	0.77
Total		100.00		100.00
Type of cooking utensils used	(n=130)		(n=130)	
Cast iron	0	0.00	0	0.00
Aluminium	1	0.77		
Stainless steel	128	98.46	130	100.00
Clay	1	0.77	0	0.00
Total		100.00		100.00

When the means for the north and south section variables were compared there was an extremely significant difference in terms of Income, Education level, Fat and Protein variables, all at p= 0.000, whilst the other variables were insignificant.

Table 4.23: Mean comparison of the north and south sections on selected variables

Variables	**Mean**		**Significance (*p* value)**
	North	**South**	
Income	1869.62	4198.46	0.000**
Money spent on food	482.31	486.92	0.581
Education level	3.53	4.19	0.000**
Number of people per h/h	5.86	5.48	0.243
Frequency of meals	2.86	2.69	0.044*
FGDS	8.58	8.53	0.559
FVS	34.45	32.95	0.131
BMI	32.04	33.66	0.170
Energy	6116.32	6834.34	0.010*
FAT	42.84	52.83	0.000**

Protein	53.43	65.21	0.000**
Carbohydrates	201.91	207.14	0.590

Significance at $*p< 0.05$; $**p<0.01$

4.3 Dietary Assessment

4.3.1 Dietary Intake, Nutrient Analysis and Top 20 Food Items

As indicated in Table 4.24 the mean of the three 24-hour recall nutrient analyses indicated a deficient intake for certain nutrients by women in both the north and south sections.

Women in both the north and south sections did not meet the Estimated Energy Requirements (EER=10093kJ/day) with a mean (±SD) energy of 6116.32kJ±2591.630 and 6844.15kJ±1800.390 respectively but the protein Recommended Daily Allowance (RDA=46g/day) was higher than the RDA at 52.43g±25.150 and 65.08g±21.420 respectively for the two sections. Both the energy and protein intake had a statistical significant difference of p=0.010 and p=0.000 respectively between the participants of the two sections.
The carbohydrate Estimated Average Requirement (EAR=100g/day) for the women in both sections was more than double the EAR with a mean (±SD) of 201.91g±92.870 and 207.46g±59.800 and was not statistically different.

Both the north and south section women did not meet the Adequate Intake (AI=25g/day) of dietary fibre even though the south section intake was slightly higher with a mean (±SD) 13.88g±7.380 and 14.72g±6.080 as well as for calcium at 245.26mg ±182.510 and 305.76mg±165.610 respectively. The statistical difference for fibre was not significant whilst it was significant for calcium (p=0.004).
The north section women did not meet the EAR with regard to iron at 7.20mg±4.940 whilst the south section women met the DRI above the requirements at a mean (±SD) 8.75mg±3.640. The statistical difference for iron was significant at p=0.002.

The magnesium intake for the north section women was triple the EAR with a mean (±SD) of 797.44g±85.050 whilst the south section women did not meet the DRI for magnesium at

215.88g ±68.120 and both sections were above the DRI requirement for phosphorus at 719.83mg ±324.690 and 841.17mg ±254.920 respectively.

The women in the north section did not meet the DRI for most of the macro- and micro-nutrients with a mean (±SD) for zinc (6.65mg±3.120), selenium (33.77mg±31.090), iodine (34.51µg±28.500), vitamin A (313.52µg±646.550), thiamine (0.80mg±0.410, riboflavin (0.77mg±0.690), vitamin B6 (0.90mg±0.580), folate (180.36µg±109.900), pantothenate (4.47mg±2.550), biotin (20.68mcg±12.040), vitamin C (22.54mg±17.130), vitamin D (2.78mcg±3.020), vitamin E (6.88mg±3.830) and vitamin K (51.78mcg±148.700) except for the following macro- and micro-nutrients that met the DRI and were even over the recommendation, with a mean (±SD) for niacin of (13.26mg±7.400) and for vitamin B12 it was (2.66mcg±2.910).

The women in the south section on the other hand met the DRI for some of the macro- and micro-nutrients with a mean (±SD) for zinc (8.00mg±2.910), thiamine (0.94mg±0.380), riboflavin (0.99mg±0.640), niacin (17.64mg±7.130), vitamin B6 (1.15mg±0.520), vitamin B12 (3.87mcg±3.200), pantothenate (5.92mg±3.010) but the following macro- and micro-nutrients did not meet the DRIs: selenium (35.67mcg±21.600), iodine (36.22mcg±20.160), vitamin A (498.49mcg±696.630), folate (199.17mcg±113.830), biotin (29.23mcg±25.530), vitamin C (40.43mg±31.440), vitamin D (3.68mcg±2.800), vitamin E (8.62mg±3.560) and vitamin K (86.20mcg±147.670).
All the micronutrients mentioned above had a significant statistical difference as presented in table 4.24, except for sodium, selenium, iodine and folate.

Table 4.24: Dietary Intake Nutrient Analysis between the women of the north and south sections

	North Section (n=130)		South Section (n=130)		DRIs	Statistical significance between the two groups (*p*-value)
Nutrients p/day	Women Mean ±SD	% Women <100% of DRIs	Women Mean ±SD	% Women <100% of DRIs		

Table 4.24: *(continued)* Dietary Intake Nutrient Analysis between the women of the north and south sections

Energy (kJ)	6116.32±2591.630	60.60	6844.15±1800.390	67.81	10093EER	0.010

Total protein (g)	53.43 ± 25.510	116.16	65.08±21.420	141.48	46RDA	0.000
Total Fat (g)	41.54±23.510		52.98±20.440			0.000
Carbohydrates (g)	201.91±92.870	201.91	207.46±59.800	207.46	100EAR	0.590
Total Dietary Fibre (g)	13.88±7.380	55.50	14.72±6.080	58.89	25AI	0.350
Calcium (mg)	245.26±182.510	24.53	305.76±165.0610	30.58	1000AI	0.004
Iron (mg)	7.20±4.940	88.93	8.75±3.640	108.04	8.1EAR	0.002
Magnesium (mg)	797.44±85.050	75.94	215.88±68.120	83.03	255-265EAR	0.054
Phosphorus (mg)	719.83±324.690	124.11	841.17±254.920	145.03	580EAR	0.001
Zinc (mg)	6.65±3.120	97.77	8.00±2.910	117.64	6.8EAR	0.000
Selenium (mcg)	33.77±31.090	75.05	35.67±21.600	79.28	45EAR	0.594
Iodine (mcg)	34.51±28.500	36.33	36.22±20.160	38.12	95EAR	0.620
Vitamin A (RE) (mcg)	313.52±646.550	62.70	498.49±696.630	99.70	500EAR	0.030
Thiamine (mg)	0.80±0.410	89.37	0.94±0.380	104.81	0.9EAR	0.006
Riboflavin (mg)	0.77±0.690	85.44	0.99±0.650	109.72	0.9EAR	0.010
Niacin (mg)	13.26±7.400	120.58	17.64±7.130	160.34	11EAR	0.000
Vitamin B6 (mg)	0.90±0.580	82.05	1.15±0.520	104.67	1.1EAR	0.000
Folate (mcg)	180.36±109.900	56.36	199.17±113.830	62.24	320EAR	0.206
Vitamin B12 (mcg)	2.66±2.910	133.18	3.87±3.200	193.30	2 EAR	0.002
Pantothenate (mg)	4.47±2.550	89.37	5.92±3.010	118.34	5 AI	0.000
Biotin (mcg)	20.68±12.040	68.93	29.23±25.530	97.4	30 AI	0.001
Vitamin C (mg)	22.54±17.130	37.56	40.34±31.440	67.23%	60 EAR	0.000

Table 4.24: *(continued)* Dietary Intake Nutrient Analysis between the women of the north and south sections

Vitamin D (µg)	2.78±3.020	55.68	3.68±2.800	73.59	5 AI	0.009
Vitamin E (mg)	6.88±3.830	57.29	8.62±3.560	71.80	12 EAR	0.000
Vitamin K (µg)	51.78±148.700	57.53	86.20±147.670	95.78	90 AI	0.067

EAR - Estimated Average Requirements
EER - Estimated Energy Requirements
AI - Adequate Intake
***p*-value** <0.05 - is seen as statistically significant

4.3.2 24-Hour Recall

Top 20 Foods Intake

The Top 20 foods intake is represented by the total intake by each group over the three days, the mean intake, frequency (the number of times the food was consumed by the group) as well as the per capita intake (the average amount each person would have consumed if the whole group had some). The Top 20 foods consumed will be interpreted per age group in order to clearly show the food pattern for the younger population apart from the older population.

Table 4.25 indicates that the women aged 19-30 years in the north section consumed a high per frequency amount of carbohydrates as sugar (22.21g), maize (276.06g), rice (204.86g), bread (156.01g) and potato chips (188.33g) appearing at numbers one, two, three, four and twelve respectively. This group also consumed chicken as the first protein at number six; however, the mean intake over three days is 3735.00g which is larger than the average protein portion, with a frequency intake of 169.77g per day and a capita intake of 64.41g per day, followed by beef at number 11 (186.29g per frequency intake) and egg at number 13 (104.37g per frequency intake) and polony, sausage and salami at numbers 15, 16 and 18. Vegetable curry is the first consumed vegetable food at number 14 consumed only eight times at 426.67g per portion followed by cabbage stew at number 20 consumed over four times (656.67g). The community also consumed unhealthy options, in the form of carbonated cold drink at number 10 with a mean intake of 3806.67g over three days followed by French fries at number 12 (1695.00g).

Table 4.25: The mean Top 20 food items over 3 days measured by 24-Hour Recalls for women aged 19-30 years in the north section ranked by frequency (n= 58)

No.	Food Item	Total Intake (g)	Mean Intake (g) over 3 days	Frequency consumed per day	Per frequency intake /day (g)	Per capita intake per day (g)
1	Sugar	3065	1021.67	46	22.21	17.61
2	Maize meal, cooked	33 955	11318.33	41	276.06	195.15
3	Bread/ rolls	18 820	6273.33	41	153.01	108.15
4	Rice, cooked	22 125	7375.00	36	204.86	127.14
5	Tea, brewed	18 650	6216.67	25	248.67	107.19
6	Chicken curry	11 205	3735.00	22	169.77	64.41
7	Margarine	937.50	312.50	21	14.88	5.37
8	Milk	5225	1741.66	17	102.45	30.03
9	Cold drink, squash, diluted	11 850	3950.00	15	263.33	68.10
10	Cold drink, carbonated	11 420	3806.67	13	292.82	65.64
11	Beef curry	5030	1676.67	9	186.29	28.89
12	Potato chips, French fries	5085	1695.00	9	188.33	29.22
13	Fried egg	2505	835.00	8	104.37	14.37
14	Vegetable curry	1280	426.67	8	53.33	7.35
15	Polony	514	171.33	6	28.55	2.94
16	Sausage	1425	475.00	5	95.00	8.19
17	Breakfast cereal	1150	383.33	5	76.67	6.60
18	Salami	1175	391.67	5	78.33	6.75
19	Sugar beans	1710	570.00	4	142.50	9.81
20	Cabbage stew	1970	656.67	4	164.17	11.31

Table 4.26 indicates the Top twenty food items consumed by women aged between 31-50 in the north section, where they consumed a high amount of carbohydrates as sugar (1270.33g), maize meal (15296.67g), bread (5956.67g) and rice (9481.67g) appearing at number one, two, three and four respectively on the top twenty with sugar as the most frequently consumed food (74); even so, the sugar intake per capita was 17.64g per day. Chicken appears at number six as the first protein consumed by the group even though it was consumed only 25 times with a mean intake over the three days of 3933.67g which is above the average protein portion, with an intake of 157.35g per frequency per day and 54.63g per capita intake per day. Vegetable

curry (273.33g) appears at number 12 as the first vegetable food consumed followed by squash/ butternut (173.33g) and tomato and onion (370.00g) at numbers 18 and 20 respectively.

Table 4.26: Mean Top 20 food items consumed over 3 days measured by 24- Hour Recalls, for women aged 31-50 years in the north section ranked by frequency (n=72).

No.	Food item	Total intake (g)	Mean intake (g) over 3 days	Frequency consumed per day	Per frequency intake/ day (g)	Per capita intake per day (g)
1	Sugar	3811	1270.33	74	17.17	17.64
2	Maize meal - cooked	45890	15296.67	59	259.26	212.45
3	Bread/ rolls	17870	5956.67	44	135.38	82.73
4	Rice, white cooked	28445	9481.67	41	231.26	131.69
5	Tea, brewed	30430	10143.33	37	274.14	140.88
6	Chicken curry	11801	3933.67	25	157.35	54.63
7	Margarine	796.5	265.50	24	11.06	3.69
8	Milk	5342.5	1780.83	22	80.95	24.73
9	Cold drink, squash	13440	4480.00	18	248.89	62.22
10	Cold drink, carbonated	12100	4033.33	9	448.15	56.02
11	Sugar beans	3537.5	1179.17	9	131.02	16.38
12	Vegetable curry	820	273.33	8	34.17	3.80
13	Soup powder	885	295.00	8	36.87	4.10
14	Lemon juice	804	268.00	7	38.28	3.72
15	Peanut butter	485	161.67	7	23.09	2.25
16	Fried egg	1825	608.33	7	86.90	8.45
17	Beef curry	3015	1005.00	6	167.50	13.96
18	Butternut, boiled	520	173.33	5	34.67	2.41
19	Oats	3610	1203.33	5	240.67	16.71
20	Tomato and onion stew	1110	370.00	5	74.00	5.14

Table 4.27 indicates that in the south section women aged 19-30 years mostly consumed foods high in carbohydrates as sugar (643.50g) and bread (2780.00g) at number 1 and 2 respectively; rice (4728.33g) and maize (4680.00g) contributed a high amount of carbohydrates but were less consumed at numbers 6 and 9. Apple appears as the first fruit food consumed in this group with a mean intake over three days of (510.00g) consumed three times at number 15, with a frequency intake of 170.00g per day and a per capita intake of 15.00g per day. Chicken was

the first and main protein source at number 8 consumed 14 times (3020.00g). Milk is at number three on the top twenty foods as the calcium source was consumed 23 times (1303.33g), with a frequency of 56.67g per day and a capita intake of 38.88g per day. Tomato and onion was the first vegetable food excluding potato at number 20 consumed three times (520.00g). The unhealthy options consumed by this group included carbonated cold drink at number 10 with a mean intake over three days of 3990.00g, followed by a savoury snack at number 13 (181.67g) and French fries at number 16 (533.33g).

Table 4.27: The mean Top 20 food items consumed over 3days measured by 24-Hour Recalls for women aged 19-30 years in the south section (n= 34)

No.	Food Item	Total Intake (g)	Mean Intake (g) over 3 days	Frequency consumed per day	Per frequency intake/ day (g)	Per capita intake (g) per day
1	Sugar	1927.5	642.50	34	18.89	18.90
2	Bread/ rolls, brown	8340	2780.00	30	92.67	81.76
3	Milk	3910	1303.33	23	56.67	38.33
4	Tea, brewed	16555	5518.33	22	250.83	162.30
5	Margarine	797.5	265.83	18	14.77	7.82
6	Rice, cooked	14185	4728.33	18	262.68	139.07
7	Cold drink, squash	10470	3490.00	14	249.28	102.65
8	Chicken curry	9060	3020.00	14	215.71	88.82
9	Maize meal, cooked	14040	4680.00	13	360.00	137.65
10	Cold drink, carbonated	11970	3990.00	12	332.50	117.35
11	Polony	525	175.00	7	25.00	5.15
12	Fried egg	1530	510.00	6	85.00	15.00
13	Snack, savoury	545	181.67	4	45.42	5.34
14	Beef curry	3030	1010.00	4	252.50	29.71
15	Apple, average size	1530	510.00	3	170.00	15.00
16	Potato chips, French fries	1600	533.33	3	177.78	15.69
17	Salami, beef, pork	790	263.33	3	87.78	7.75
18	Coffee, brewed	2500	833.33	3	277.78	24.51
19	Salad, beetroot	290	96.67	3	32.22	2.84
20	Tomato and onion	1560	520.00	3	173.33	15.29

Table 4.28 indicates the Top 20 foods consumed by the south section women aged 31-50 years. The most consumed foods as the source of carbohydrate in this group were maize (23886.67g),

rice (12371.67g) and bread (5256.67g) consumed 68, 64 and 57 times respectively. Chicken curry was still the most frequently consumed food as a protein source consumed 43 times with a mean intake of (7430.00g) over three days which was much higher than the average protein portion, having a frequency of 172.79 per day and a capita intake of 77.40g per day. Milk was one of the most frequently consumed foods as a source of calcium at number 2 (4978.67g), with a frequency of 63.83 per day and a capita intake of 51.86g per day and cheese appears at number 18 (132.67g).

Squash/ butternut appears as the first vegetable consumed 18 times (890.83g) and apple appears as the first fruit food consumed by the group at 17 times (2300.00g) and tomato and onion appears at number 20 (1406.67g).

Table 4.28: The mean intake of Top 20 food items consumed over 3 days measured by 24-Hour Recall for women aged 31-50 years in the south section (n= 96)

No.	Food Item	Total Intake (g)	Mean Intake (g) over 3 days	Frequency consumed a day	Per frequency intake/ day (g)	Per capita intake (g) per day
1	Sugar	4830	1610.00	109	14.77	16.77
2	Milk	14936	4978.67	78	63.83	51.86
3	Tea, brewed	58160	19386.67	76	255.09	201.94
4	Maize meal, cooked	71660	23886.67	68	351.27	248.82
5	Bread/ rolls	15770	5256.67	64	82.13	54.76
6	Rice, cooked	37115	12371.67	57	217.05	128.87
7	Chicken curry/ stew	22290	7430.00	43	172.79	77.40
8	Margarine	1480	493.33	38	12.98	5.14
9	Cold drink. squash	28310	9436.67	34	277.55	98.30
10	Cold drink, carbonated	17715	5905.00	22	268.41	61.51
11	Beef curry/ stew	11560	3853.33	19	202.81	40.14
12	Squash/ Butternut	2672.5	890.83	18	49.49	9.28
13	Apple, average size	6900	2300.00	17	135.29	23.96
14	Amadumbe, taro	590	196.67	13	15.13	2.05
15	Egg, fried in oil	3190	1063.33	13	81.79	11.08
16	Sausage, beef or pork	2515	838.33	10	83.83	8.73

Table 4.28: *(continued)* The mean intake of Top 20 food items consumed over 3 days measured by 24-Hour Recall for women aged 31-50 years in the south section (n= 96)

17	Dumpling, steamed bread	3530	1176.67	10	117.67	12.26
18	Cheese	398	132.67	10	13.27	1.38
19	Beans, sugar, dried	4775	1591.67	9	176.85	16.58
20	Tomato and onion	4220	1406.67	9	156.29	14.65

Table 4.29 shows the results of the energy distribution of the macronutrients from the average of the three 24-Hr Recalls in accordance with the World Health Organisation's (WHO) dietary factor goals, excluding fruit and vegetable intake. The results show that the respondents had a balanced diet in terms of macronutrient intake; however, the respondents' diet lacked in variety and nutrient intake as a result of insufficient fruit and vegetable intake. Carbohydrates appeared as the main source of food consumption whilst fruit and vegetable intakes were very low. Only the south section group showed a fruit intake of one type of fruit which was still very low in the top 20 food items whilst the other groups only had vegetable curry and tomato and onion as vegetable foods.

The total fat intake was above the recommended intake of fat by the World Health Organisation for all four of the groups. Carbohydrates contributed above 55% of the daily needs in all the groups which is on par with the WHO recommended goal of 55-75%. The protein contribution to the total intake of energy was above 15% which is almost 100% of the WHO goal at 10-15% for all the groups, while the south section women aged 31-50 indicated a higher percentage than other groups at 16.46% than the other groups.

Table 4.29: Macronutrient distribution ranges as determined from 24-Hour Recalls (WHO 2003).

Dietary factor (food nutrient)	Mean ± SD	Mean % Energy contribution	AMDR goal
North section women 19-30 (n=58)			
Total Fat %	49.79±25.45	27.63	15-30
Protein %	59.78±26.19	15.24	10-15
Carbohydrate %	210.11±88.37	57.12	55-75
North section women 31-50 (n=72)			
Total Fat %	34.89±19.60	22.76	15-30

Table 4.29: *(continued)* Macronutrient distribution ranges as determined from 24-Hour Recalls (WHO 2003).

Protein %	48.33±23.22	14.48	10-15
Carbohydrate %	195.30±96.45	62.68	55-75
South section women 19-30 (n=34)			
Total Fat %	57.23±20.09	29.88	15-30
Protein %	64.90±24.25	15.57	10-15
Carbohydrate %	213.96±6.97	54.55	55-75
South section women 31-50 (n=96)			
Total Fat %	51.27±51.27	28.12	15-30
Protein %	65.33±65.33	16.46	10-15
Carbohydrate %	204.72±204.72	55.40	55-75

The fruit and vegetable intake contribution was much lower than the recommended WHO intake of >400g for all four groups.

Table 4.30: Fruit and vegetable range as determined by the 24-Hour recalls (WHO 2003)

Nutrient factor (food nutrient)	Mean ±SD (g/day)	Per capita intake per day	WHO Recommended Intake (g/day)
Fruit and vegetable			
North section 19-30 (n=58)	76.63	75.63	>400
North section 31-50 (n=72)	65.25	65.25	>400
South section 19-30 (n=34)	98.09	98.09	>400
South section 31-50 (n=96)	140.34	140.33	>400

4.3.3 Food Variety Score, Dietary Diversity and Nutrient Adequacy

Reported in the food variety score are the nine nutritious food groups counting the individual foods as indicated in Table 4.31 within the seven-day period, a total number of 66 different individual food items was consumed. The total range of individual food items consumed by the participants during the seven day period was between 0-66.

The highest number of individual food items consumed by the majority of the participants was between 31-40 individual food items (50.00%, n=65). The mean food variety scores (FVS)

(±SD) for all food items consumed by the participants from the four groups during the seven day period was 34.44 (±8.419), indicating a medium food variety score.

The food groups showing most variety were the fruit (n=15) and vegetable (n=12) groups respectively. Fifteen different fruits were consumed by one participant only; a large number of participants (26.15%, n=34) consumed four different fruits within the seven day period. A total of twelve different vegetables were consumed by two participants only; the majority of participants consumed six different vegetables (17.69%, n=23) within the same period. Interestingly all the participants had consumed vegetables, only two participants had not consumed fruit and seven participants had not consumed vitamin A rich foods within the seven day period as indicated in Table 4.6.

Ten different meat foods were consumed by one participant only with the majority (26.15%, n=34) of the participants consuming five different fleshy foods within the seven day period followed by (19.23%, n=25) consuming six different fleshy foods.

The most frequently consumed food group was the egg group by (86.15%, n=112) participants with (13.84%, n=18) participants not consuming any eggs at all.

Ten different starchy foods were consumed by three participants, with the majority consuming seven different starchy foods (26.92%, n=35) and the least number of participants consuming only four different starchy foods (5.38%, n=7) within the seven day period.

The legume group was the least consumed with (13.08%. n=17) of the participants not consuming any legumes and the majority (41.54%, n=54) consuming only one legume in the group.

The majority of participants (34.61%, n=45)consumed four different fat groups followed closely by (32.31%, n=42) of the participants consuming three different fat groups and only one participant had not consumed any fat or oils within the seven day period.
Lastly, nine participants had not consumed any dairy foods within the seven day period and the majority had only consumed two different dairy foods (27.69%, n=36).

Table 4.31: Household food access as measured by food variety scores within the food groups consumed by women over a period of seven days (n=130) in the north section

Flesh Group (n=10)	Eggs Group (n=1)	Dairy Group (n=6)	Cereals Group (n=10)	Legume Group (n=5)	Vitamin A Group (n=8)	Fruit Group (n=15)	Vegetable Group (n=12)	Fats Group (n=6)	Total FG Individual food (n=60)
0=0	0=18	0=9	0=0	0=17	0=7	0=2	0=0	0=1	0=10=0
1=2	1=112	1=30	1=0	1=54	1=19	1=4	1=2	1=1	11-20=6
2=9		2=36	2=0	2=37	2=35	2=18	2=2	2=14	21-30=35
3=12		3=26	3=0	3=16	3=25	3=15	3=7	3=42	31-40=65
4=25		4=14	4=7	4=4	4=21	4=34	4=9	4=45	41-50=18
5=34		5=13	5=19	5=2	5=14	5=20	5=19	5=21	51-60=6
6=25		6=2	6=32		6=7	6=16	6=23	6=6	
7=17			7=35		7=1	7=9	7=19		
8=5			8=25		8=1	8=3	8=13		
9=0			9=9			9=5	9=19		
10=1			10=3			11=1	10=8		
						12=1	11=7		
						15=1	12=2		

Low =0-3 food groups or <30 individual foods
Medium = 4-5 food groups or 30-60 individual foods
High = 6-9 food groups > 60 individual foods

A summary of the food group variety for the women in the north and south section is presented in Table 4.32 and in the north section community a mean of ±SD of 34.44 ±8.419 was consumed, indicating a medium food variety score (medium variety= 30-60 individual foods).The vegetable group reported the highest individual mean FVS ±SD of 6.80 ±2.382 followed by cereal, flesh products, fruits, fats and oils, vitamin A rich groups, dairy, legumes and eggs with 6.70 ±1.384, 4.96 ± 1.644, 4.68 ±2.347, 3.69 ±1.044, 3.05 ±1.546, 2.59 ±1.351, 1.79 ±0.939, 1.00 ±0.000 respectively.

In the south section community a mean ±SD of 33.81 ±10.670 was consumed indicating a medium food variety score (medium=30-60).

The vegetable group reported the highest individual mean FVS ±SD 6.79±2.194, followed by cereals, flesh foods, fruit, fats and oils, vitamin A rich foods, dairy, legumes and nuts and eggs

at 6.58±1.488, 4.72 ±1.556, 4.24 ±2.002, 3.48 ±1.023, 2.94 ±1.208, 2.27 ±1.110, 1.79 ±0.909 and 1.00 ±0.00 respectively.

Table 4.32: Summary of Food Variety Scores within the Food Groups of women in the north section (n=130)

Food Group	Mean		±SD		Range of scores	
	North	South	north	South	North	South
Cereals, roots and tubers	6.70	6.58	1.384	1.488	4-10	1-10
Other vegetables	6.80	6.79	2.382	2.194	1-12	1-12
Vitamin A rich fruit & vegetables	3.05	2.94	1.546	1.208	1-8	1-5
Flesh foods meat, poultry, fish	4.96	4.72	1.644	1.556	1-10	1-9
Fats and oils	3.69	3.48	1.044	1.023	1-6	1-6
Dairy	2.59	2.27	1.351	1.110	1-6	1-6
Other fruit	4.68	4.24	2.347	2.002	1-15	1-12
Legumes and nuts	1.79	1.79	0.939	0.909	1-5	1-5
Eggs	1.00	1.00	0.00	0.000	1	1
Total food items	34.44	33.81	8.419	10.670	11-60	15-51

Low = 0-3 food groups or <30 individual foods
Medium = 4-5 food groups or 30- 60 individual foods
High = 6-9 food groups >60 individual foods

In Table 4.33 the food group diversity for women in both sections is summarized as the majority of the participants (100%, n=130) could be classified as having a good dietary diversity score, consuming food from 7-9 different food groups altogether.

Table 4.33: Summary of Food Group Diversity of women (n=130) in both the north and south section

Number of food groups consumed (n=9)	Frequency		Percentage	
	North	South	North	South
1-6	0	0	0.0	0.0
7	7	10	5.38	7.69
8	40	41	30.77	3.54
9	83	79	63.85	60.77
Total	130	130	100%	100%

Low = 0-3 food groups or <30 individual foods
Medium = 4-5 food groups or 30- 60 individual foods
High = 6-9 food groups >60 individual foods

Tabulated in Table 4.34 are the nine nutritious food groups with a count of the individual foods consumed within the groups. A total of 66 different individual items foods was consumed by the participants within the seven day period. The total range of individual food items consumed by the participants was between 6 and 66.

The highest number of individual food items consumed by the majority of the participants was between 31- 40 individual food items (43.08%, n=56). The mean food variety score (FVS) (±SD) for all foods consumed by the food groups during the seven day period was 33.81 ±10.67, indicating a medium food variety score.

The food groups with the most variety were the vegetables (9.23%, n=12), fruits (7.69%, n=10) and cereals (7.69%, n=10). Twelve different vegetables were consumed by one participant alone, while the majority of the participants (18.46%, n=24) consumed seven different vegetables within the seven-day period. Twelve different fruits were consumed by one participant whilst the majority of the participants (23.08%, n=30) consumed four different fruits and one participant consumed ten different starchy foods with the majority of the participants (24.62%, n=32) consuming seven different starchy foods followed closely by (23.08%, n=30) of the participants consuming six different starchy foods within the seven day period.
The majority of the participants (32.31%, n=42) had consumed four different vitamin A rich foods and only two participants had not consumed any vitamin A rich foods within the seven day period.

All the participants in the south section had consumed fleshy foods but the majority of the participants (24.62%, n=32) had consumed four different fleshy foods, which was the same as (24.62%, n=32) of the participants who had consumed five different fleshy foods in the seven day period.
A maximum number of participants (82.31%, n=107) had consumed the egg group and a minimum of (17.69%, n=23) participants had not consumed the egg group.

Four different fats were consumed by the majority of the participant's (40.0%, n= 52) and only one participant had consumed all six different fats.

The majority of the participants (29.23%, n=38) had only consumed one dairy food item with eleven participants who had not consumed any dairy food item within the last seven days and a maximum number (40.77%, n=53) of participants had only consumed one type of legume with (15.38%, n=20) of the participants not consuming any legumes and only one participant consuming all five different legume foods.

Table 4.34: Household food access as measured by food variety within the food groups consumed over the period of seven days by women in the south section (n=130)

Flesh Group (n=9)	Eggs Group (n=1)	Dairy Group (n=5)	Cereal Group (n=10)	Legume Group (n=5)	Vit A Group (n=5)	Fruit Group (n=10)	Vegetables Group (n=12)	Fats Group (n=6)	Total FG individual group (n=60)
0=0	0=23	0=11	0=0	0=20	0=2	0=4	0=0	0=1	0-14=0
1=1	1=107	1=38	1=1	1=53	1=20	1=10	1=1	1=6	15-21=6
2=8		2=31	3=2	2=32	2=28	2=16	2=2	2=14	22-30=43
3=19		3=32	4=6	3=21	3=29	3=18	3=8	3=40	31-40=56
4=32		4=17	5=21	4=3	4=42	4=30	4=10	4=52	41-50=24
5=32		6=1	6=30	5=1	5=9	5=25	5=16	5=16	51-60=1
6=23			7=32			6=8	6=17	6=1	
7=9			8=28			7=13	7=24		
8=4			9=9			8=3	8=20		
9=2			10=1			9=2	9=22		
						12=1	10=5		
							11=4		
							12=1		

Low = 0-3 food groups or <30 individual foods
Medium = 4-5 food groups or 30- 60 individual foods
High = 6-9 food groups >60 individual foods

Nutrient Adequacy

In Figures 4.3 to 4.6 the Nutrient Adequacy Ratio (NAR) values demonstrates the connection between the dietary diversity score and nutrient adequacy ratios for energy, protein and other

selected vitamins and minerals. The following figures reveal an increase in NARs of some nutrients as the dietary diversity scores increases.

Figure 4.3 shows that there is an increase in NARs from food group 7 to 8 which then stagnates and slightly decreases for all women in the north section for each of the nutrients from food group 8 to 9.

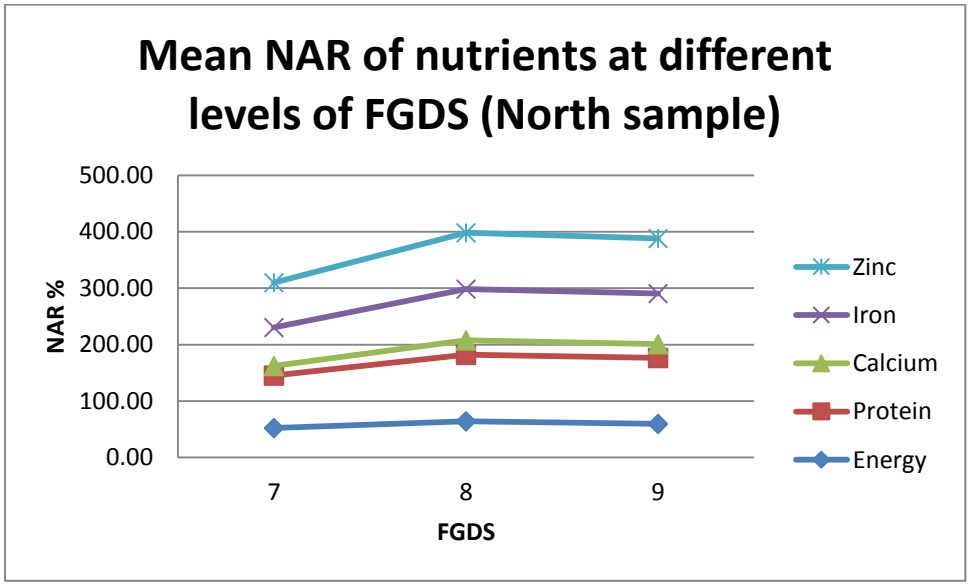

Figure 4.3: NAR% for energy and nutrients (north section sample n=130)

Figure 4.4 shows that there was a dramatic increase in the NARs for some of the nutrients from food group 7 to 8 showing a further increase also from food group 8 to 9, such as vitamin A, riboflavin as well as vitamin B, except for folate that increased drastically from food group 7 to 8 and slightly decreased from food group 8 to 9, however none of it reached 100% of the DRIs.

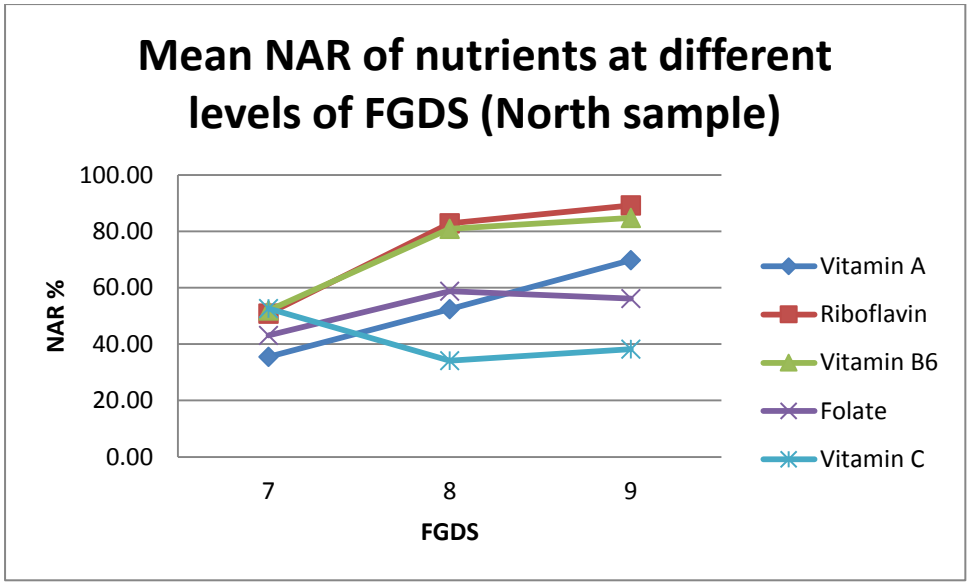

Figure 4.4: NAR% of nutrients (north section sample n=130)

Figure 4.5 demonstrates a slight but steady increase in the NARs from food group 7 to 9 for most of the nutrients such as energy, protein, calcium, iron and zinc from food group 7 to 8 and a slight decrease from FDGS 8 to 9.

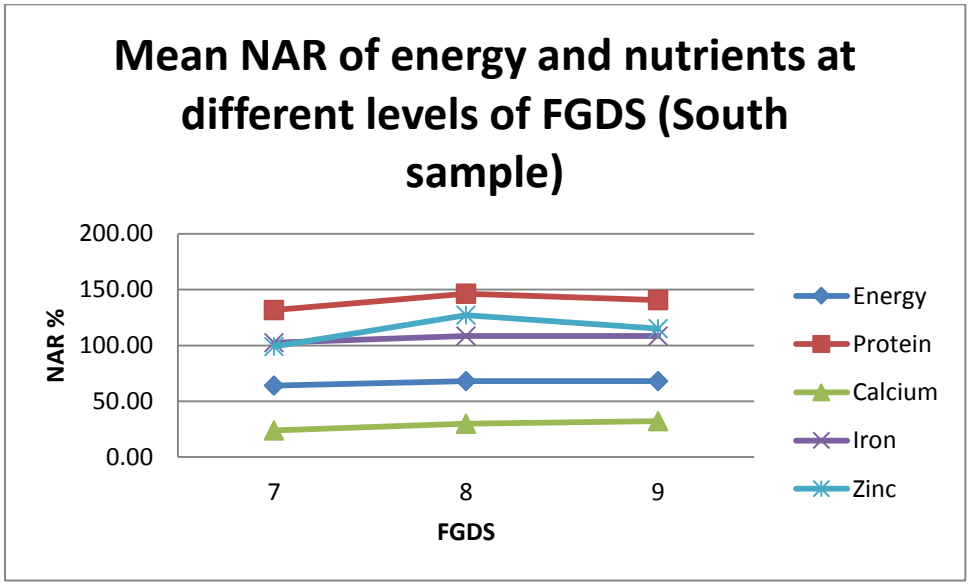

Figure 4.5: NAR% for energy and nutrients (south section sample n=130)

Figure 4.6 illustrates that there is no real pattern or increase of the NARs as the FGDS scores increase, riboflavin and vitamin B6 is above 10% of the DRIs.

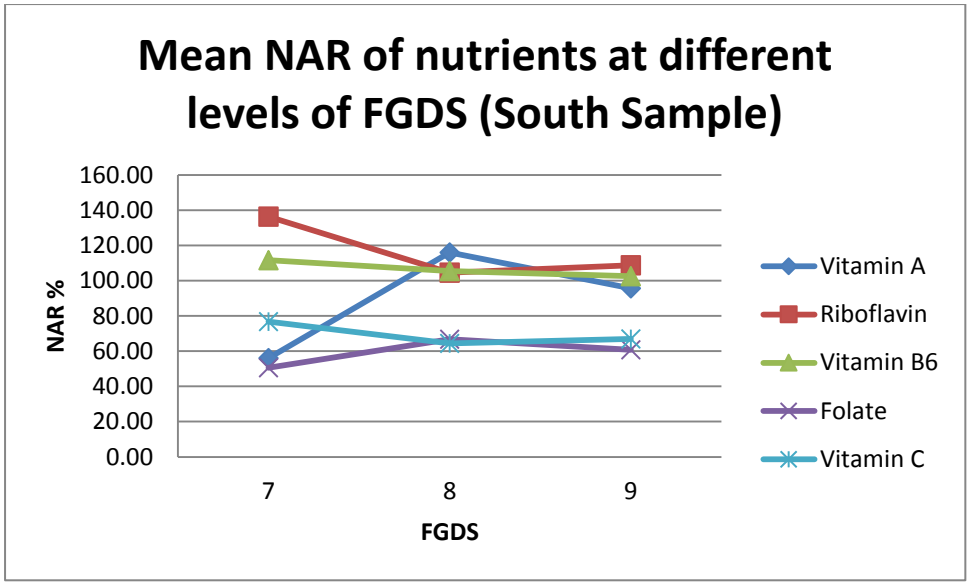

Figure 4.6: NAR% for nutrients (south section sample n=130)

4.4 Anthropometric Indicators

4.4.1 Anthropometric results

Table 4.35 describes the mean age, weight, height and BMI of the women in both the north and south sections separately. The north section women's mean age was 34.6 years with a SD of ±11.316, weight (79.06kg±20.353, height (1.58m±0.097) and BMI (32.19±9.994). The south section women's mean age was 39.17 years with a ±SD of ±10.891, weight (84.45kg±21.790), height (1.59m±0.088) and BMI (33.64±8.469). The mean BMI indicates that the majority of both the north and south section women were above the normal BMI classification, as the BMI was 32.19 and 33.64 respectively (obese 1, 30-34.99, obese 11, 35.00-39.99 and obese 111, ≥40 of the BMI principal cut off points). The mean waist circumference for the north section was 97.53cm±18.799 whilst the mean waist circumference for the south section was 101.26cm±18.229. There was no significant difference between the north and south section women for BMI with a *p*-value of 0.209 and there was no significant difference between the north and south section women for waist circumference with a *p*-value of 0.106. However, there was a significant difference between the north and south section women for WHtR with a *p*-value of 0.000.

Table 4.35: Means, Standard Deviations (±SD) and nutritional significance differences between age, weight, height and BMI north (n=130) and south (n=130)

	Variable	Mean Age in years	Mean Weight(kg)	Mean Height(m)	Mean BMI	Mean Waist Circumference (cm)
North section	±SD	±11.316	±20.353	±0.097	±9.994	±18.799
	Women (n=130)	34.60	79.06	1.58	32.19	97.53
South section	±SD	±10.891	±21.790	±0.088	±8.469	±18.229
	Women (n=130)	39.17	84.45	1.59	33.64	101.26
p-values *p*<0.05			0.000		0.209	0.106

Table 4.36 indicates the results of the BMI for the women in both the north and south sections. In the north section 1.54% women were underweight and 2.31% of the women in the south section were underweight, and 21.54% and 9.23% respectively were within normal range classification. Most women in both the north and south sections fell into the obese I classification at 26.15% for the north section women and 24.61% for the south section women respectively (30.00-34.99), whilst 15.38% women in the north section and 16.92% in the south section fell into the class II range for obesity (35.00-39.99) and 14.62% of the women in the north section as well 22.30% in the south section were in even more danger, being classified in the class III range of obesity (≥40). There was no statistical significance between the women in the north and south sections (*p*=0.209).

Table 4.36: BMI classification table for the north (n=30) and south (n=130) section women

Parameter	Classification	% of North section women (n=130)	% of South section women (n=130)
Body Mass Index-BMI	Underweight (<18.50)	1.54%	2.31%
	Normal weight (18.50-24.99)	21.54%	13.07%

Table 4.36: *(continued)* BMI classification table for the north (n=30) and south (n=130) section women

	Overweight (≥25.00-29.99)	20.77%	20.77%
	Obese 1 (30.00-34.99)	26.15%	24.61%
	Obese 11 (35.00-39.99)	15.38%	16.92%
	Obese 111 (≥40)	14.62%	22.32%
	Total	100.00%	100.00%

Figure 4.7 shows that the majority of the women in both the north and south sections were above the cut-off points for waist circumference (≥88cm), being at 71.53% in the north section and at 78.46% in the south section while 28.46% of the women in the north section were within the normal value (<88cm) as were 21.54% of the women in the south section; there was, however, no statistical significance between the two groups at p=0.106. These findings correspond with the results in table 4.19 that showed a maximum prevalence of obesity amongst most of the women, putting them at risk of cardiovascular diseases.

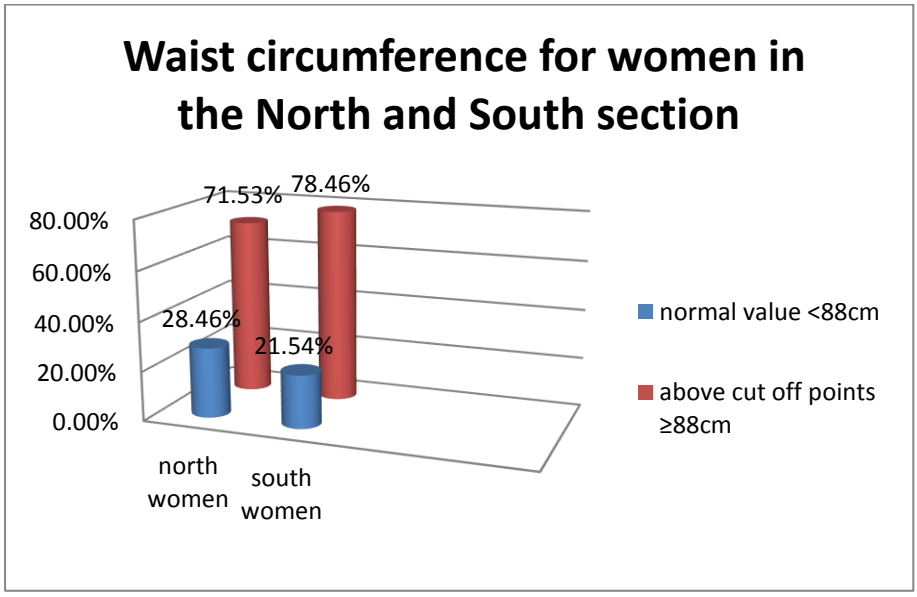

Figure 4.7: Cut-off points for waist circumference for women

Figure 4.8 shows the waist-to-height ratio (WHtR) of the women in total. The chart indicates that the majority of the participants were at risk of developing metabolic syndrome as 69.23% of the participants had a WHtR >0.5 putting them at risk of metabolic syndrome.

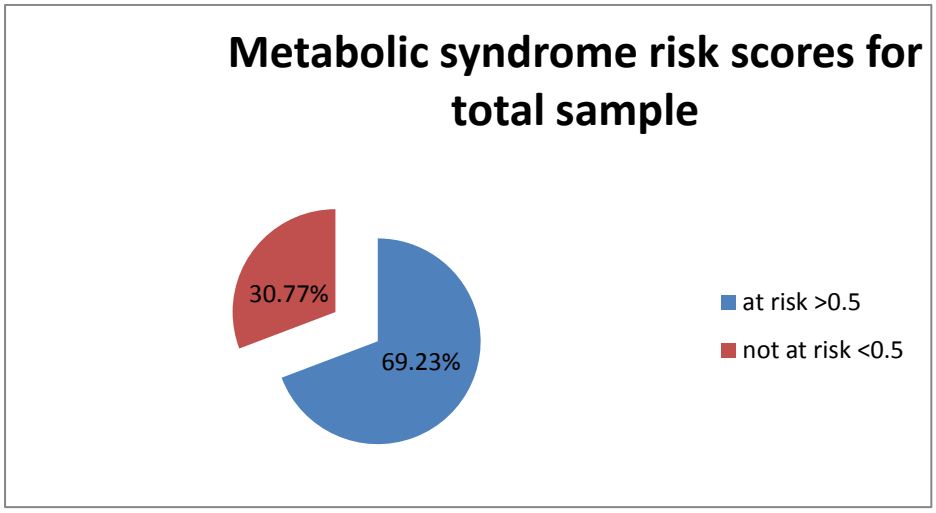

Figure 4.8: Metabolic syndrome risk scores as measured by waist-to-height ratio (WHtR)

Figure 4.9 shows the results for both sections in detail for ease of comparison. More women in the south section at 93.08% were at risk of metabolic syndrome whereas in the north section only 45.38% of the women were at risk, exceeding >0.5 WHtR. On the other hand, the results showed that more women in the north section at 54.62% were at a higher risk of metabolic syndrome than in the south section with 6.92% being below the WHtR. There was a significant statistical difference of p=0.000 between the mean of 0.50 and 0.64 for the north and south sections respectively.

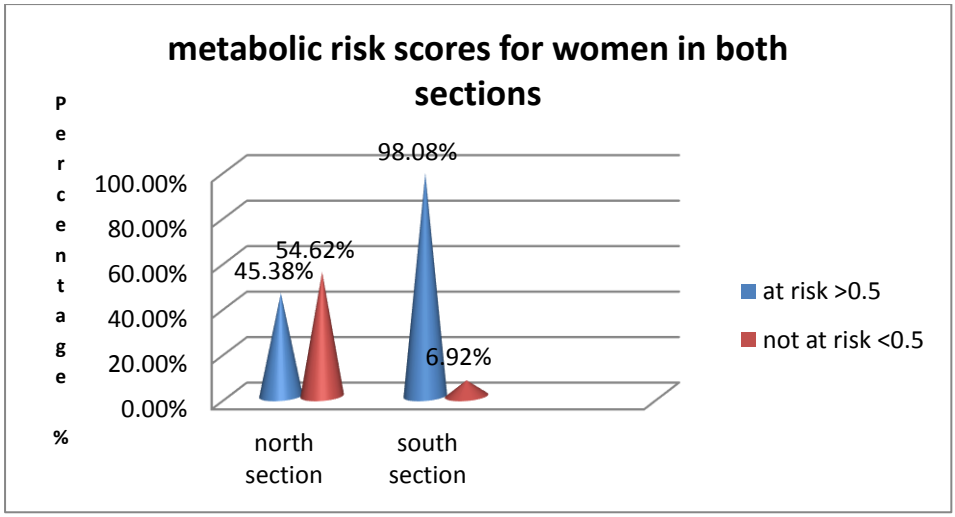

Figure 4.9: Metabolic risk scores for women in both sections based on the WHtR

4.5 Correlations

The *p*-value is the probability of attaining a test statistic at least as extreme as the one that was really observed, supposing that the null hypothesis is true. However, the rejection of the null hypothesis happens when the *p*-value is less than 0.05 or 0.01. When the null hypothesis is rejected, the result is said to be statistically significant (Gelman 2013).

In the north section the relationship between income and FVS (p=0.002), between money spent on food and number of people in the household (p=0.027), and between BMI and education (p=0.004) was found to be significant. In the south section the relationship between money spent on food and food frequency of meals (p=0.052) was found to be significant. The other variables were insignificant and there was no relationship between the variables.

Table 4.37: Relationship between income and BMI, between income and frequency of meals, between income and FGDS, between income and FVS, between money spent on food and education, between people in households and other variables (Spearman's rho correlations).

Variable	**Significance (*r*- value)**		**Relationship (*p* value)**	
	North	**South**	**North**	**South**
Income and BMI	0.008	-0.027	0.933	0.763

Table 4.37: *(continued)* Relationship between income and BMI, between income and frequency of meals, between income and FGDS, between income and FVS, between money spent on food and education, between people in households and other variables (Spearman's rho correlations).

Income and frequency of meals	0.138	-0.056	0.120	0.530
Income and FGDS	0.131	0.155	0.139	0.079
Income and FVS	0.272	0.145	0.002*	0.099
Money spent on food and education level	0.194	0.131	0.027*	0.136
Money spent on food and no. of people in h/h	0.033	0.124	0.710	0.160
Money spent on food and frequency of meals	0.076	0.171	0.391	0.052
Money spent on food and FDGS	0.101	-0.008	0.252	0.926
Money spent on food and FVS	0.156	-0.068	0.076	0.444
Money spent on food and BMI	0.111	-0.041	0.221	0.643
BMI and energy	0.116	-0.008	0.198	0.927
BMI and FAT	0.115	-0.022	0.205	0.802
BMI to PRO	0.137	-0.022	0.129	0.805
BMI and CHO	0.087	0.065	0.336	0.460
BMI and FVS	0.055	-0.001	0.547	0.994
BMI and FGDS	0.020	-0.015	0.822	0.867
BMI and education level	0.256	-0.028	0.004*	0.754
BMI and frequency of meals	0.084	-0.042	0.356	0.631

*****Correlation is significant at the 0.05 level (2- tailed)

**Correlation is significant at the 0.01 level (2- tailed)

4.6 Discussion

The amount of data gathered and analysed in this research clarifies the significant questions and findings about the nutritional risk, dietary intake patterns and living conditions of the two communities in KwaNdengezi Township, in KwaZulu-Natal. The findings confirm that poorer communities have limited food choices but at the same time, the fact that a population is well educated with a better income does not ensure that it makes better food choices.

Table 4.38: Comparison Results

Test/ Tools	**Variable Tested**	**Results**	
		North section	South section
Microsoft Excel spreadsheet ®, analysed using the SPSS version 22	Socio-demographic profile	Total income above R6000 in 7.69% of households Employed participants: 21.5% Unemployed at 78.5%	Total income above R6000 in 47.69% of households. Employed participants: 36.9%. Unemployed at 63.1% more electrical assets than the north section.
Food Finder (MRC 199) mean, minimum, maximum and standard deviation compared to DRIs	Dietary Intake over 24hours x 3 days	The magnesium intake was triple the EAR with mean ±SD (797.44g±88.050). Dietary fibre was lower than the south section at 13.88g±7.380. Iron intake did not meet the EAR at 7.20±4.90.	The magnesium DRI was not met (215.88g±68.120). Dietary fibre was higher than the north section at 14.72g±6.080. The iron intake was above the recommended DRI at 8.75mg±3.640.
Food Finder Software (MRC 1991) mean, minimum, maximum and standard deviation compared to DRIs T- test for significance between groups.	Dietary Intake over 24 hours x 3 days	No statistical significance for fibre. Calcium was statistically significant at p=0.004.	Iron was statistically significant at p=0.002.

Table 4.38: *(continued)* Comparison Results

Descriptive Statistics, SPSS version 22, t-test for significance between groups	Food Variety over 7 days (FFQ)	Highest range of individual food item consumption 31-40. Medium food variety 30-60 individual foods. Vegetable group reported the highest individual mean FVS±SD (6.80±2.382).	Medium food variety score 30-60 individual foods. Vegetable group reported the highest individual mean FVS±SD (6.79±2.194).
	Food Group Diversity	Good dietary diversity score 7-9.	Good dietary diversity score 7-9.
	Fruit and Vegetable intake ≥400/day	Fruit and vegetable contribution was much lower than the recommended intake of ≥400g/day.	Fruit and vegetable contribution was much lower than the recommended intake of ≥400g/day.
AnthroPlus (WHO)	Weight, Height and Age		
		North	South
	BMI classification Underweight Normal weight Obese I Obese II Obese III	Mean age 34.6years Weight (79.06kg±20.353) Height (1.58m±0.097) Above the normal BMI classification (32.19±9.994) Mean waist circumference (97.53cm±18.799) No statistical significance BMI p<0.209 1.54% 21.54% 26.15% 15.38% 14.62%	Mean age 39.17yrs Weight (84.45kg±21.790) Height (1.59m±0.088) Above the normal BMI classification (33.64±8.469) Mean waist circumference (101.26cm±18.229) No statistical significance BMI p<0.106 2.31% 9.23% 24.61% 16.92% 22.30%

The 2011 Census that was conducted in South Africa for all people within its borders recorded that the number of people without education had decreased tremendously from 19% to 8.7%

from 2001 to 2011. The percentage of those people that had completed secondary education and beyond, improved from 23.4% to 40.5% from 1996 to 2011 respectively. However, the current 2016 Census concluded that 2 269 421million people in South Africa had no schooling whilst 11 886 912 million completed secondary education. According to Oldewage-Theron *et al* (2014) in a study conducted in the Vaal region of South Africa amongst 722 women, 77.3%, of the women had completed primary schooling, 20.5% had completed secondary schooling and only 1.5% were uneducated.

The findings in this study correspond with the earlier findings. More participants in the KwaNdengezi Township were educated or had some form of basic education. Interestingly, 44.2% more participants in the north section had matriculated. Both these sections are literate enough to understand nutrition education and be equipped with skills that can better their socio-economic status.

The Academy of Nutrition and Dietetics (2013) put together a position paper in support of programmes, systems, policies and practices, used by countries whilst working with emerging populations to succeed in attaining nutrition security and self-sufficiency, and at the same time being economically and environmentally sustainable. The paper stated that, for populations to have nutrition security there needed to be an accessible variety of nutritious foods, education, proper sanitation, skills and resources for populations to live healthily and have a holistic approach when caring for diseases. The Academy reported that 13% of people globally relied on sources of water that were not improved whilst 11% lacked potable water for drinking and proper sanitation facilities were insufficient for the population at 42%, placing people's lives at risk because of health concerns. Nevertheless, this did not correspond with the findings in this study as 91.5% of the households in the north section had proper water facilities as well as 99.2% of the households in the south section having a tap both inside the house and outside. The Census (2011) conducted in the South African population corresponds, as it reported in its findings that households with water pipes inside the house had increased from 32.3% to 46.3% from 2002 to 2011. Sanitation status is not a problem in both these communities rather people need to be taught proper ways they can use to have proper sanitation bring positive results in their lifestyle such as household hygiene, washing of hands and drinking clean water.

It was also found that people living in urban areas with formal housing and improved education normally had better quality diets. However, better socio-economic standing did not mean that

those people had a nutritional intake of better quality instead it may also result in dietary intake patterns of poor quality (Academy of Nutrition and Dietetics 2013).

The current study also found that, the south section participants were more affluent and better educated and had more electrical assets than the participants in the north section and 47.69% of the participants' total income was above R6000 (refer to Table: 4.11) whilst only 7.69% of the participants in the north section had such a high income. A better income status does not ensure that a community will make better informed food purchases but rather may go the opposite and purchase foods that are harmful to their well- being such as high- fat, high- sugar and high- salt food choices, only because they can afford them.

Hawkes (2006), when putting together a paper on the mechanisms of globalisation and integration of the global marketplace affecting the specific patterns of diet amongst the middle income countries, stated that dietary shifts take place when change in consumer incomes, desires and behaviours converge with macro-structural forces. Food consumption patterns are also influenced by the development of policies designed to incorporate trade and promote marketing of a global food market on agriculture in the economic sphere. Middle income communities tend to lean more to diets high in fat, sugar and sodium, as they purchase more fast foods than cook at home.

The prevalence of diet-related diseases, poor quality diets and obesity tend to be found among high income countries between groups of lower socioeconomic status (SES). However, this is now also becoming a trend in middle income countries. The research found that as the gross national product increases in developing nations, the obesity burden moves towards a population of lower SES. The link between obesity and poor diet emerges in this socioeconomic context (Hawkes 2006). The more stable the economic status for a community, is the most likely the people are to indulge in the name of being "finally economically free".

The Statssa (2012) survey on the labour force in South Africa indicated that unemployment had increased by 3.7%, which was a higher percentage when compared to the employment rate that had increased by 2.3% in the year 2011. The current study found the north section had 21.5% employed participants and 78.5% were unemployed whilst the south section had 36.9% employed participants and 63.1% who were unemployed.

The south section had a better socio-demographic profile on average than the north section.

4.6.1 Nutrient Intake

In a study conducted by Imamura *et al* (2015) on people from 187 nations (88.7% of the population) using data from 325 surveys, it was found that a major cause of disability and mortality globally was poor quality diet intake. Usually the international food programmes put the focus on micronutrient deficiency and food security. However, due to NCDs the diet related burdens were more than those caused as a result of under-nutrition in many parts of world.

What is important in designing, informing and implementing strategies to decrease diet related diseases worldwide, is a better understanding of dietary changes and patterns.
Only small samples have been used in previous research on diet internationally, hence not enough data and knowledge of dietary patterns is available which puts restraints on the making of dietary policies and dietary priorities (Imamura *et al* 2015).

According to Labadarios *et al* (2011), in a study on South Africans aged 16 years and above, nutrient adequacy is reflected mainly by a diet that has enough variety. This is due to the fact that a single food cannot contain all the required nutrients, therefore there is a need for a diet that includes a variety of foods to meet all the required nutrients. Diet groups that mainly focus on a singular or similar type of food are closely linked with food insecurity and contribute greatly to vitamin and mineral deficiencies resulting in decreased dietary diversity, disease and the occurrence of sicknesses (dietary diversity being used as a food security measurement at a household or individual level).

Kennedy, Fanou, Seghieni, and Brouwer (2011) revised the measuring guidelines for dietary diversity and added that dietary diversity measures food intake qualitatively so that the accessibility of the variety of food is reflected clearly.

In this study the same can be said as both the north and south section women did not meet the Estimated Energy Requirements (EER) with a mean (±SD) energy (6116.32kJ ±2591.630) and (6844.15kJ ±1800.390) but the protein Recommended Daily Allowance (RDA) was found to be higher than the RDA with the mean (±SD) of (52.43g ±25.150) and (65.08g ±21.420) respectively.
The Carbohydrate Estimated Adequate Requirement (EAR) for the women in both sections was more than double the EAR with a mean (±SD) of (201.91g ±92.870) and (207.46g ±59.800).

Kennedy, Ballard and Dop (2009) found in a study in Mali that the diet of an urban sample of women was high in starchy staples, mainly refined white rice, refined wheat flour and millet, providing nearly 50% of the total energy in the diet. Fat in the form of edible vegetable oil provided a substantial proportion of the total dietary energy at 32%.
Most women consumed grains and grain products, vitamin C-rich vegetables, and vitamin A-rich deep yellow/orange/red vegetables (using the 1g minimum intake criteria). The majority of women also consumed foods from the nuts and seeds group, beef, pork, veal, lamb, goat or game meat and all other vegetables food groups. No women consumed soybeans or soy products, cheese, organ meat, chicken or other fowl or insects, and few women consumed any fruit. The food groups most affected by the 15g minimum intake criteria were vitamin A-rich deep yellow/orange/red vegetables and nuts and seeds. The large whole fish/dried fish/shellfish/other seafood, small fish eaten whole with bones and vitamin A-rich dark green leafy vegetables food groups were also influenced by the 15g minimum intake (Kennedy *et al* 2009).

In this study for both sections but with a slight difference, the food groups that were mostly consumed by participants were fruit and vegetables. A maximum number of participants consumed four different fruits and between six to seven vegetables within a seven day period. Seven different starchy foods were consumed by the majority of the participants. Most participants consumed four to five different meat foods, four different fats and oils and frequently consumed the egg group. However, the participants in the north section consumed the least foods in the legume group whilst in the south section the majority of the participants consumed one type of legume. Also, it was only in the south section that the majority of the participants consumed one type of dairy.

A study conducted by Hatloy (1998) in Koutiala town (south-eastern Mali) on 77 children aged 13-58 months, stated that the nutrients that are vital in meeting the requirements of nutrition can only be obtained from a diet made up of a variety of foods. Most foods assist in the prevention of fatal diseases like cancer and encourage long life. More varied diets are mostly the healthier ones. A varied diet is said to be one that promotes good health levels. Health levels are most affected by vitamin and mineral deficiencies at 36% than are affected by deficiencies of caloric foods at 12%, highlighting the crucial need for addressing food quality in agricultural systems. In this study the diet for both the populations was found to be higher in calorie food intake than in macronutrient food intake. As much as the study was conducted on children it

echoes the result that the food the caregivers prepare impact on the whole families' nutritional status.

In the current study the NAR percentages for energy for the north section increased from food group 8-9 by 12.83%, and from protein by 40.39%, whilst in the south section the energy percentage from food group 7-9 increased by 4.08% and from protein by 9.05%. This indicated that the energy percentage increased when other nutrients were introduced in the diet.

When conducting a survey on vitamin intakes for 18-64 year old adults in north and south Ireland, O'Brien, Kiely, Harrington, Robson and Flyn (2001) found that the micronutrient intake was lower than the required average. For example, vitamin A intake was below the average requirement (AR) in 16.6% of the women, the riboflavin intake was below the average requirement (AR) in 20.6% of the women whilst the folate intake was below the average requirement (AR) in 11.2% (18-35years) and 6.6% (36-50years) of the women, respectively. The vitamin D intake was also found to be quite low in many people in the population, hence many people were dependent on direct exposure to sunlight in order to receive enough amounts of vitamin D. In this study the micronutrient intake was insufficient for both sections, since the mean intake for fruit and vegetables, where most micronutrients are found, was below the WHO recommended intake of >400g/ day, at <100g/day. However, certain micronutrients were compensated for by fortified staples such as maize and flour (see Chapter 2). Such staples were fortified with vitamin A, riboflavin, niacin, thiamine, iron, zinc, folic acid and vitamin B6. Hence, the indicated increase in the NARs (refer to Figure 4.3 to 4.6).

As the food group indicators became more disaggregated dietary diversity scores increased. Mean dietary diversity scores ranged from 5.1 to 7.1 for the 1g indicators and from 4.3 to 5.6 for the 15 g indicators. The median scores ranged from 5-7 food groups for the 1 g indicators and 4-5 food groups for 15g indicators (Kennedy *et al* 2009).
Kennedy *et al* (2009) also found that median intakes of riboflavin, niacin, vitamin B12, folate and vitamin A were below the estimated average requirements (EARs) and calcium intake was below the adequate intake (AI). Median intakes were above the EAR for vitamin B6, vitamin C and zinc and equal to the EAR for thiamine. The estimated probability of adequate intake was < 0.20 for vitamin B12 and folate, and ranged from 0.27 to 0.31 for riboflavin, calcium and niacin, and was 0.50 or above for iron, vitamin A, vitamin B6, thiamine, zinc and vitamin

C. The sample average mean probability adequacy (MPA) for the 11 micronutrients was 0.47. Women (46%) had an MPA above 0.5 and 25 percent had above 0.6.

The starchy staple food group provided the majority of thiamine, vitamin B6, iron and zinc in the diet due to the large quantities of grains consumed. Considerable amounts of other vitamins and minerals were provided by different food groups. Legumes and nuts provided a large percent of niacin and folate intake, dairy contributed to B12 and calcium intake, all other flesh foods contributed primarily to B12 intake, vitamin C rich vegetables contributed to a large percentage of the intake of folate and vitamin C and dark green leafy vegetables to the highest percentage intake of vitamin A (Kennedy *et al* 2009).

In the current study a similar trend was observed as both the sections only met the DRIs for a few micronutrients rather than for most of them but the south section scores were above the north section scores.

The micronutrients intake in the north section from food group 7-8 such as calcium consumption increased by 10.99%, iron by 23.44% and zinc by 30.73% whilst in the south section calcium increased by 8,12%, iron by 6.09% and zinc by 28.11%. It must be noted that these micronutrients were not consistent as the percentages decreased from food group 8-9.

The south section had a better nutrient intake profile on average than the north section.

4.6.2 Anthropometric Data - BMI

The WHO (2009), on its global database on BMI, revealed that the BMI may not be the same when compared with the degree of fitness for all people partly because people do not have the same body proportions. The increased BMI is associated with certain ongoing health risks which causes the interpretation of the grading for the BMI to be different for certain populations, as they differ.

According to the SANHANES-1 Media Release (Shisana *et al* 2013) study on all South Africans of all ages occupying households, it reported that participants in the study conducted, recalled a history of high blood pressure at 30.9%, and high blood sugar at 20.7% in the family and some recalled a stroke history at 8.9% and heart diseases at 7.6%. As expected the respondents that recalled such a history in their families also followed the same pattern as 16.5% had high blood pressure, 5.0% had diabetes, 4.2% had high blood cholesterol with 2.2% having heart diseases and 1.8% stroke.

The obesity and overweight prevalence was much higher in women at 24.8% and 39.2%. The women had a waist circumference that put them in danger of metabolic problems at 68.2%. Obese and overweight female populations in South Africa had increased in 2012 from 2003 from 27% to 39.2% respectively (Shisana *et al* 2013).

The findings from this study indicated the same concerns. The south section women were more at risk of metabolic diseases at 98.08% than the north section at 45.38% even though the south section is seen as better informed than the north section population. Overall 69.23% of the women in the whole sample (n=260) were at risk of metabolic syndrome. Most women in both the north and south sections, at 71.53% and 78.46% respectively, were above the cut-off point (≥88cm) for waist circumference.

In a study conducted by Popkin, Horton, Kim, Mahal and Shuigao (2001) in China and India, that covered 25 Indian states, sampling 83 000 women (15-49 years) and adults living in eight provinces of China (20-45 years), a population representing 2.4 billion of the people, the findings showed that China's structural shift in diet was more hasty than India's. The Chinese diet was becoming more similar to the American high fat diet in terms of the macronutrient composition of energy from fat, carbohydrate and protein. Nearly 33% and 25.4% of energy comes from fat in the diet in urban and rural areas, respectively. However, the Indian macronutrient structural shift was found to be much lower. Nevertheless, millions of people in the Indian population consume a diet high in fat.

The WHO (2015) stated that the global population's diet now included a food intake of high fats, free sugars, salt/sodium and energy, but, however, having the least or no fruit and vegetable, grains and dietary fibre.
The WHO (2016) also adds that about 22% of the global population have an excessive macronutrient intake. Developing populations had increased their accessibility to caloric intake by 16% in 2010. In this study most women in both sections were obese with 22.30% and 14.12% in the south section and north section respectively being within the class III obesity range (≥40).

The reduction of total fat intake by 30% of total energy intake assists the adult population by preventing unnecessary weight gain. Also, the reduction of saturated fat intake by 10% of total energy intake would assist adults by lowering the risk of NCDs (WHO 2015). In this study,

this can be encouraged and recommended for the women in both sections, as the majority fall between the class I and class III of the obesity classification range.

The south section was more at risk of diet-related diseases that lead to NCDs on average than the north section.

4.7 Conclusion

In this chapter the results and findings were outlined according to the objectives to identify socio-demographic profile, food variety, food group diversity and the nutritional risk of the two communities, as well as to compare the results of the two communities.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The main aim of the study was to compare the food consumption patterns and nutritional risks of women caregivers in a low-income community and a middle-income community in a township called KwaNdengezi in KwaZulu-Natal. This was achieved by measuring the current

socio-demographic, nutrition and food intake profile between the north community that reside in two-roomed housing and is poorer and less educated against the south community that is more affluent and better educated and lives in formal housing with a yard. The north community is perceived as the low-income community whilst the south community is perceived as the middle-income community. The two communities are separated by a tarred main road.

Low income communities are normally the most affected by poverty, food insecurity and malnutrition, while middle income communities show improved levels of lifestyle but are also affected by the same factors that affect the low income community leading to instability because of food price hikes, climate change and urbanisation amongst others.

The household's livelihoods are secure when access to resources, household ownership and income are secure, ensuring that the identification of livelihood influences the essentials of life.

5.2 Limitations to the study

- Households were initially randomly selected for the study as in some of them, the participants were not available because of work commitments, and as a result the next household had to be used if it had a suitable candidate for the study.
- Most households in the south section owned dogs, making it difficult for the fieldworkers to enter the premises especially if there were no people outside to welcome the fieldworkers.
- Research studies are not popular with this community and as a result some participants were not happy sharing personal information such as income received by the household and meals consumed, probably being somewhat ashamed of their food choices.
- Some households had males as the main caregivers, and hence had to be excluded from the study even if the household had been initially randomly selected because the study was targeting only women caregivers.

5.3 Main Findings

Many research studies have concluded that South Africa is food secure at national level but studies of households show a different pattern, with many households experiencing poverty, with members being both undernourished and overnourished and as a result they can be

described as food insecure. The unemployment rate is currently very high, with many individuals having lost their most recent jobs and many unable to obtain jobs; hence many people are sitting at home without work and not being able to further their studies, affecting the educational level of the community. Price hikes are also a point of concern as households with their main caregivers unemployed cannot make proper food choices, resulting in individuals buying cheaper items in bulk in order to sustain their families longer. Bulk buying will normally include products containing starch (bread, rice, porridge etc.), meat, poultry and fats, and will exclude fruits and vegetables as they are expensive and can only be purchased in smaller quantities.

The country's government has committed to paying social grants as a means of dealing with the issue of unemployment and poverty, with the intended outcome that social grants will assist households to survive and mortalities due to malnutrition will be avoided. These social grants are divided between the elderly pension grants, disability grants, foster grants and children's grants. Unemployed people and those living in informal settlements are eligible to receive formal free housing in the form of RDP houses from the government and a reduced rate of payment for basic services, and services such as healthcare treatment are free.

Certain studies also show that the country's population appears to be converting to the more westernised diet that is high in fat, salt, refined sugar and calories and includes food loosely termed as "junk food". Such a diet has adverse effects that lead to overweight and obesity which then results in all kinds of non-communicable diseases such as, among others, stroke, coronary heart disease, type 2 diabetes, and increased levels of blood pressure. The factors associated with this tendency to embrace a more western diet include urbanisation and migration from rural areas, recently attained wealth, inadequate nutrition knowledge and raised social standards.

The survey findings indicated in this study concur with what other studies have found, that most households are now headed by women. However, women in the north section had a somewhat limited lifestyle compared to the south section women who enjoyed an improved lifestyle.

The socio-demographic profile of the south section participants was found to be of a higher status when compared to that of the north section. The south section households had a better sanitation status and fewer pest infestations that may lead to infections and diseases. The

unemployment rate was lower than that of the north section. Very few participants in the south section complained about not having enough money to purchase food for their families. Most of the south section participants spent over R500 per month on food purchases when compared to the north section, even though the margin was close.
Livelihoods in the south section were found to be of a higher standard than those in the north section. The study also showed that education levels in the south section were higher, as more participants in this section than in the north section had graduated.

Interestingly, when it came to food consumption patterns, both the north and south sections showed a similar trend in terms of the individual foods consumed by participants. The food variety scores indicated a medium food variety score for both sections, resulting in a good variety score. However, neither the north or south sections met the Estimated Energy Requirements for energy but the protein RDA was higher for both the sections. It must be noted, however, that the south section's protein RDA was still higher when compared to the north section. This corresponds with the results tabled in Chapter 4, that the meat and poultry food consumption of participants was higher in the south section than in the north section.

Both the sections had a very high kilojoule intake, doubling the DRIs for carbohydrate. Out of the top twenty foods consumed, sugar, maize, bread and rice headed the list.
The results of the energy distribution of macronutrients from the average of the 24-hr recalls when compared to the WHO dietary factor goals showed that the participants' diets were well balanced for macronutrient intake for both sections while the diets for both sections lacked in micronutrient intake.

The results in this study thus indicate that most women caregivers in both the north and south sections were overweight and falling below the obesity level as far as the participants' BMI was concerned. However, the majority of the women caregivers in the south section fell above the obesity classification, showing that the women caregivers for the south section are at an even higher risk of obesity related illnesses (NCDs). Results also showed that the majority of the south section women caregivers' waist circumferences were above the waist circumference cut-off point (≥88cm), placing most of the participants at risk of diseases such as cardiovascular disease. When the weight-for-height ratio was measured for the whole sample most of the women caregivers were at risk of developing metabolic syndrome.

The correlations drawn in this study between the north and south sections showed a significant difference in variables such as income and education level. The correlations also showed a significant difference in variables such as protein and fat intake. The correlations drawn simply mean that the north section can still be regarded as a low- income community whilst the south section is a middle income community. However, the margin is very narrow as other many variables showed no significance at all.

5.4 Conclusion

This study has established that the status of the low-income and middle-income households is slightly similar in terms of food choices and consumption patterns observed; but on the other hand it is slightly different as the middle income community was well educated, and their employment status was higher than the low-income north community but the food consumption patterns and risks were very similar. Both the communities were at risk of obesity related diseases but they also showed minimal micronutrient intake which will later develop into micronutrient deficiency.

5.5 Recommendations

5.5.1 Recommendation 1: Drafting of policy

- The policies being made by government and other stakeholders should be adapted to and focus more on households headed by women caregivers as findings have confirmed that most households are headed by women.
- The heads of states and government entities should implement projects that support and sustain women at household level, ensuring that whatever systems are put in place are beneficial to them and the families they nurture, and address issues of food security and food intake that cover all the necessary issues of malnutrition at household level.
- The policy makers need to draft legislation and implement ways to increase the income status of women to a similar level as men so as to ensure that they can meet the daily challenges of price hikes and the needs of their families.

5.5.2 Recommendation 2: Nutrition Knowledge

- It is clear that most people in the country have minimal knowledge about food consumption patterns, food intake and implications of certain diets; hence more nutrition education geared towards educating the most vulnerable and poverty stricken communities should be introduced.

- ❖ Nutrition education should be conveyed using layman's terminology and even translated to mother tongue so that the whole population will be able to understand it and be able to implement the knowledge received in their daily lives.
- ❖ The population needs to be taught proper ways of preparing, cooking and serving food, keeping in mind food safety at household level.
- ❖ The promotion of micronutrient consumption should be endorsed and the foods that provide these, such as fruit and vegetables should be sold at a rate such that households can afford them because one of the main reasons populations don't consume fruit and vegetables is the expensive price.

5.5.3 Recommendation 3: Interventions by the agricultural sector

- ❖ Studies have indicated that if the country could use home- grown products instead of importing them, the state of food security would improve greatly.
- ❖ The country has great potential to improve its agricultural status by supporting the farmers at grass roots level, as they are closely linked to the communities.
- ❖ Women farmers also need recognition and assistance in order to grow their standing as farmers, improve entities and have a say in all agricultural activities undertaken by the sector.
- ❖ Household fruit and vegetable gardens must continue to be promoted, for individuals to be able to get produce for free without spending money on transport and buying produce at a higher price in a supermarket; this will then ensure a balanced diet all round without people feeling the pinch.
- ❖ Household farming should also be endorsed; farming anything from chickens and ducks to goats and cows would make a difference to the state of household food security.

5.5.4 Recommendations for future interventions

- ❖ More research studies need to be undertaken that target women at household level, to get a clearer and better understanding of the country's community.
- ❖ The government should devise and implement projects and ways to empower women so that they are not dependent on their husbands or male partners and are empowered to take care of their families and be more independent.
- ❖ Nutrition education should be instilled at community level by targeting caregivers and children, as they are the most vulnerable.

- ❖ The risk factors for food insecurity such as malnutrition and poverty must be dealt with holistically.

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ANNEXURE A

767 Nkonjane Rd
KwaNdengezi
3607
2012

The Councillor
KwaNdengezi
3607
Dear Councillor

Permission to conduct a research study in KwaNdengezi Township

I hereby wish to acquire permission to conduct a research study on the community of KwaNdengezi under the topic Food Consumption Patterns and Nutritional Risks of women in Low and Middle Income Communities in KwaNdengezi, KwaZulu-Natal.

The study will be conducted in both the north and south part of KwaNdengezi Township amongst the community within these areas. The sample will be randomly selected within the two communities and participation will be voluntarily. The participants will also give permission before participating in the study.

The aim of the study is to determine the indicators between the north community that is more affluent and live in formal housing and the south that reside in informal housing and is a poorer community. The two communities are separated by a tarred road

The survey will be conducted using a socio- demographic questionnaire, food frequency questionnaire and 24-hour- recall questionnaire; all participants will be weighed and measured.

The research will be presented in the form of a publication and in other accredited journals and presented in conferences. The results from this study will provide an insight into the households in the KwaNdengezi area who are overweight/ underweight and how a programme can be devised to help them reduce health risks. The achievement of an MTech: Consumer Science: Food and Nutrition qualification.

Permission to conduct the study in this community will be greatly appreciated.

Yours Sincerely
Mrs Sithembile Gumede (MTech: Food and Nutrition)
20202394

Annexure B

LETTER OF INFORMATION

Dear Ward 12 resident

Thank you for allowing me to explain to you my research study for your consideration

Title of the Research Study:
Food Consumption Patterns and Nutritional Risks of the Low and Middle Income Communities in KwaNdengezi.

Principal Investigator/s/researcher:
S.T. Gumede, MTech: Food and Nutrition

Co-Investigator/s/supervisor/s:
Dr. C. Napier, D-Tech

What is the purpose of the Study?
The purpose of this study is to look at the two sections in order to determine if the North section is poorer and is less educated and is more nutritionally challenged than the South section in KwaNdengezi Township which is more educated and maybe food secure, with the high number of unemployment (36.4%) in this community. Food security is defined as populations having more than enough food to provide for and live healthy (eThekwini Municipality 2012; Laing 2011:1).

What will it involve?

- The counsellor of the community has been approached to get permission from the local Government for the study to be undertaken.
- I will need you to sign a consent form to show that you agree to participate in the study after which I would have explained all the procedures to you.
- If you agree you to participate, you will then be asked to complete 3 questionnaires in an interview situation it that will take 45min.
- The questionnaires will include:
- A Socio- demographic questionnaire
- Three 24-hour food recall questionnaires. (will be answered on three different days)
- A Food Frequency Questionnaire to determine the food variety and dietary diversity.
- We will also weigh, measure your height and waist circumference, you will not be asked to remove your clothing except for shoes and jersey.
- Participation is voluntary and you can withdraw at any time with no penalty**.**
- If you participate, your name will remain anonymous and only numbers will be used.

Risks or Discomforts to the Participant: No clothing will be removed except for shoes and jerseys. The weighing and measuring will take place privately.

Benefits to the community: the results of the study will be shared with the councilor and interventions will be taken when the study is completed as and when the councilor allows. The participants are free to ask any nutrition related questions and will be referred to health facility if any problems are found.

Remuneration: It will be clearly communicated with participants that there will be no financial gain for participating in this study.

Costs of the Study: you will not be expected to pay anything towards the study.

Research-related Injury: the study is structured and will be conducted in a manner that will not cause injuries but the supervisor and the Ethics committee can be contacted for queries.

Persons to Contact in the Event of Any Problems or Queries:

Supervisor: Dr. C. Napier on 031 373 2326 or carinn@dut.ac.za

The researcher: S.T. Gumede on 072 551 3562

.

Research Ethics administrator on 031 373 2900.

Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za.

Annexure C

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC)

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, _S.T. Gumede_____ (name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, __S.T. Gumede_____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____Sthembile Gumede_____		_____
Full Name of Researcher	**Date**	**Signature**

_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**

_____	_____	_____
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

Please note the following:

Research details must be provided in a clear, simple and culturally appropriate manner and prospective participants should be helped to arrive at an informed decision by use of appropriate language (grade 10 level - use Flesch Reading Ease Scores on Microsoft Word), selecting of a non-threatening environment for interaction and the availability of peer counseling (Department of Health, 2004)

If the potential participant is unable to read/illiterate, then a right thumb print is required and an impartial witness, who is literate and knows the participant e.g. parent, sibling, friend, pastor, etc. should verify in writing, duly signed that informed verbal consent was obtained (Department of Health, 2004).

If anyone makes a mistake completing this document e.g. wrong date or spelling mistake a new document has to be completed. The incomplete original document has to be kept in the participant file and not thrown away and copies thereof must be issued to the participant.

References:

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ANNEXURE D

DURBAN UNIVERSITY of TECHNOLOGY
Food and Nutrition Consumer Sciences

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

This questionnaire covers certain aspects of your life, including work and personal details, health and illness, lifestyle and social life that is relevant to health. The answers to these questions will be kept strictly confidential and the information will not be identifiable from any reports or publications.

1. GENERAL INFORMATION

Subject number:..... Date: .....

Fieldworker name: .....

Please answer all questions by marking the correct answer with **X**, except where otherwise indicated.

Where do you live?

.....

2. PERSONAL INFORMATION

2.1 Your role in the family

Mother	Grandmother	Father	Grandfather	Other, specify.....

2.2 When were you born? Year: Month: Day:

2.3 How old are you? _____ years

2.4 Gender:

Male	Female

3. ACCOMMODATION AND FAMILY COMPOSITION

3.1 Do you live in?

Town/City	Farm	Squatter camp	Rural village	Hostel	Township	Other, specify.....

3.2 Do other people live in your house?

Yes
No

3.3 How many people are living in your house?

1	2	3	4	5	6	7	8	9	10	10+

3.4. Please **complete** the table below on all members of the household

Name of household member	Age (yrs)	Gender M / F	Family relationship	Level of schooling	Does this person eat and sleep in this house at least 4 days a week?

3.5 Are all members' permanent residents in this house?

Yes	No

3.6 If yes, how long have you been staying permanent in this house?

< 1 year	1-5 years	>5 years

3.7 Has any children in your household died in the past?

Yes	No

Reason: .....

3.8 In what type of house are you staying?

Brick	Clay	Grass	Wood	Zinc/shack

3.9 How many rooms does your house have?

< 2 rooms	3-4 rooms	> 4 rooms

3.10 Are there other houses/shacks within the same yard of the main house?

Yes	No

3.11 How are you currently living?

Homeless	
Living with relatives	
Living with friends	
Hostel accommodation	
Squatter home	
Rented house/flat	
Own house/flat	
Employees Properties	
Other, specify.....	

3.12 Do you have the following facilities at home?

3.12.1 Water

Tap in the house	
Tap outside the house (in yard)	
Borehole	
Spring / river / dam water	
Fetch water from elsewhere	

3.12.2 Toilet facilities

None	
Pit latrine	
Flush / sewage	
Bucket system	
Other, specify.....	

3.12.3	Waste removal	Yes	No	
3.12.4	Tarred road in front of house		Yes	No
3.12.5	Gravel road in front of house		Yes	No

3.13 To what extent do you have problems with the state of your house (e.g. too small, repairs, damp, etc.)?

.....

.....

3.14 Do you have problems with the following?

Mice/ Rats	
Cockroaches	
Ants	
Flees	
Mosquitoes	
Geckos	
Frogs	
Snakes	
Bed Bugs	

3.15. What is the floor inside your house made of?

Cement	
Tiles	
Carpet	
Dirt	
Sand/mud	
Dung	
Other, please state	

4. WORK STATUS AND INCOME

4.1. Are you currently employed?

Yes	No

If YES, go to Question 4.5.

4.2. If NO, how would you describe your current status (tick one box only)?

Unemployed	Retired	Housewife	Student	Other, specify.....

4.3. Are you actively looking for paid employment at the moment?

Yes	No

4.4. How long have you been unemployed?

< 6 months	6-12 months	1-3 years	> 3 years

4.5. If YES (question 4.1) is your current job a:

Permanent position	Temporary position	Fixed term contract	Other, specify.....

4.6. Are you doing part time jobs on weekends and school vacations?

Yes	No

4.7 What is the exact title of your current job?
(Including self-employed)

4.8. What is the total income in the household per month?

< R500	R501-R1000	R1001-R1500	R1501-R2000	R2001-R2500	R2501-R3000
R3001-R3500	R3501-R4000	R4501-R5000	R5501-R6000	>R6001	

4.9. Please specify the monthly income in the household (if willing).....

4.10. How often does it happen that you do not have enough money to buy food?
for you and your family?

Always	Often	Sometimes	Seldom	Never

4.11. How many people e.g. partner, relatives & others (including yourself) contributed to your household income from any source, (including wages/salary from paid employment, money from second or odd jobs income from savings investments, pension, rent or property, benefits and or maintenance etc.) in the last 12 months?

People	0	1	2	3	4	5	6	7	8	9

4.12. How often do you buy food?

Every day	Once a week	Once a month	Other, specify.....

4.13. Where do you buy food?

Tuck shop	Street vendor	Wholesalers	Supermarket	Other, specify.....

4.14. What type of transport do you use to get around?

Taxi	
Bus	
Train	
Own vehicle	
Other Specify	

4.15. How much money is spent on food PER MONTH? (Tick only one box)

R 0 – R 50	R 51 – R 100	R 101 – R 150	R 151 – R 200	R 201 – R 250	R 251 – R 300	> R 500	I do not know

5 EDUCATION AND LANGUAGE

5.1. What is your highest education level?

None	Primary School	Standard 8	Standard 10	College/FET	Other post school

5.2 What language is spoken mostly in the house?

Zulu	Xhosa	English	Afrikaans	Other, specify.....

5.3 How many children (in the household) have birth certificates?

None	1	2	3	4	5	6	7	8	All

5.4 How many children have completed their immunisation schedule?

None	1	2	3	4	5	6	7	8	All

5.5 Number of children attending school

None	1	2	3	4	5	6	7	8	All

5.6 How do the children get to school?

Walk	Bus	Taxi	Lift	Other, specify.....

Tick one block for every question:	Father	Mother	Sibling	Grandma	Grandpa	Aunt	Uncle	Cousin	Friend	Other
5.7 Who is mainly responsible for food preparation in the house?										
5.8 Who decides on what type of food is bought for the household?										
5.9 Who is mainly responsible for feeding/serving the child?										
5.10 Who is the head of this household?										
5.11 Who decides how much is spent on food?										

5.12 How many meals do you eat per day?

0	1	2	3	> 3

5.13 Where do you eat most of your meals?

Home	Friends	Work	School	Other, specify.....

5.14 Where do your children eat most of their meals?

Home	Friends	School	Other, specify.....

6. ASSETS

6.1 Does your home have the following items and how many?

	Yes	No	Quantity
Electrical stove			
Gas stove			
Telephone / Cell phone			
Primus or paraffin stove			
Microwave			
Hot plate			
Radio			
Television			
Refrigerator			
Freezer			
Bed with mattress			
Mattress only			
Lounge suite			
Dining room suite			
Electrical iron			
Electrical, kettle			
Car			
Bicycle / Motorbike			

6.2 What type of fuel do you usually use for food preparation?

Wood fire	Paraffin	Electricity	Gas	Coal/Charcoal	Other, specify.....

6.3 What type/s of material are your pots made off (tick all relevant options)?

Cast iron	Aluminium	Stainless steel	Clay	Other, specify.....

Thank you very much for your co-operation. We appreciate the time.

ANNEXURE E

24 – HOUR RECALL

Subject date of birth : _____ Age: _____ Gender: Male/Female

Interviewer: _____

Name: _____ Date: _____ / _____ /

Address: _____

Tick what the day was yesterday:

Monday	Tuesday	Wednesday	Thursday	Friday

Would you describe the food that you ate yesterday as typical of your habitual food intake?

Yes	1	No	2

If not, why? _____

I want to find out about everything you ate or drank yesterday, including food you pick from the veld. Please tell me everything you ate from the time you woke up to the time you went to sleep. I will also ask you where you ate the food and how much you ate.

Time (approximately)	Place (Home, school, etc)	Description of food and preparation method.	Amount	Amount in g (office use Only)	Code (office use only)
From waking up to going to work, or starting day's activities					

During the morning at work or at home					

Time (approximately	Place (Home, school, etc)	Description of food and Preparation method.	Amount	Amount in g (office use Only)	Code (office use only)
Middle of the day (Lunch time)					
During the afternoon					
At night (dinner time)					

Time (approximately	Place (Home, school, etc)	Description of food and preparation method.	Amount	Amount in g (office use Only)	Code (office use only)
After dinner, before going to sleep					
* Do you take any vitamins (tablets or syrup)		Yes	1	No	2
Give the brand name and dose of the vitamin/tonic:					

ANNEXURE F

DURBAN UNIVERSITY of TECHNOLOGY

FOOD AND NUTRITION CONSUMER SCIENCES

FFQ LIST OF FOODS AND FOOD GROUPS DIVERSITY

PLEASE INDICATE THE FOOD YOU ATE DURING THE PAST SEVEN (7) DAYS BY AN (X)

GROUP 1: Flesh Foods (Meat, Poultry, Fish) Diversity	Y	N
Meat (Chicken)		
Meat (Beef)		
Meat (Mutton)		
Meat (Lamb)		
Meat (Pork)		
Meat (Goat)		
Dried Meat (Biltong)		
All Mince		
All Tribe/Offals/Runners and Heads		
Fish (fresh / whole)		
Tinned Fish (Pilchards/Tuna)		
Processed Meats (Viennas / Polony, Russians, Boerewors Sausage)		
Seafood (Prawns, Mussel's, Calamari, Crab, Shrimp, Crayfish)		
GROUP 2: Eggs Diversity	**Y**	**N**
Eggs		
GROUP 3: Dairy Products Diversity	**Y**	**N**
All Milk		
Evaporated milk (Unsweetened)		
Condensed milk		
Maas/ Inkomasi		
All Cheese		
Custard		
Ice Cream		
GROUP 4: Cereals, Roots and Tubers Diversity	**Y**	**N**
All Rice		
Maize (Pap, Mealie Rice, Mealie Meal, Samp, Porridge, Corn on the cob, Popcorn, Sweet Corn)		
Macaroni/Pasta/Spaghetti		
All Bread (White/ Brown/ Whole Wheat)		
Dumpling/Steamed Bread/Fat Koek		
Scones/Biscuits		
Mageu		

Breakfast Cereals (Corn Flakes, Oats, Weet Bix, Matabela)		
All Tubers/Roots (Amadumbe, Sweet Potato)	Y	N
Potatoes		
GROUP 5: Legumes and Nuts	**Y**	**N**
All Beans Dried		
Dried Peas		
Lentils		
Peanuts and Nuts		
Soya		
GROUP 6: Vitamin A Rich Fruits and Vegetables Diversity	**Y**	**N**
Pumpkin		
Carrots		
Wild Leafy Vegetables Fresh and Dried		
Spinach		
Butternut		
Apricots (Appelkoos)		
Peach (yellow cling)		
Mango		
GROUP 7: Other Fruits (and juices) Diversity	**Y**	**N**
Deciduous Fruits		
Apple		
Peaches		
Pear		
Grapes (black/green)		
Plum		
Sub – Tropical Fruit	**Y**	**N**
Lemon		
Orange		
Naartjie		
Banana		
Pineapple		
Avocado		
Kiwi fruit		
Watermelon		
Guava		
Paw- Paw		
Juices	**Y**	**N**
Juice (100% pure juice e.g. Ceres/Liquifruit)		
GROUP 8: Other Vegetables Diversity	**Y**	**N**
Onions		
Cabbage		
Beetroot		

Tomatoes	Y	N
Green beans (fresh)		
Peas (fresh)		
Cauliflower		
Chili (red/green)		
Lettuce		
Green\ Yellow\ Red Pepper		
Frozen Vegetables (Mixed)		
Ginger & Garlic (Fresh)		
GROUP 9: Oils and Fats Diversity	**Y**	**N**
Butter		
Sunflower oil		
Margarine		
Lard		
Salad dressing/oil		
Potato Crisps		
Coffee Creamer (Cremora, Ellis Brown)		

ANNEXURE G

DURBAN UNIVERSITY of TECHNOLOGY

FOOD AND NUTRITION CONSUMER SCIENCES

Anthropometric Measurements

Section A:

1. Number/Name of the caregiver.....

2. Community:.....

3. Date of birth	Year	Month	Day
4. Gender	Male	Female	

Section B:

1. Body weight (kg)	1. Body weight (kg)	2. Height/Length (cm)	2. Height/Length (cm)
kg	kg	cm	cm

3. Waist circumference	3. Waist Circumference	4. Blood pressure	4. Blood pressure
cm	cm	/	/

31 August 2017

To whom it may concern

Re: Dissertation prepared by Ms Sthembile Gumede

This letter serves to confirm that as requested I have recently edited and proofread the dissertation:

Food consumption patterns and nutritional risks of women in low and middle income communities in Kwandengezi, Kwazulu-Natal

as researched and prepared by Ms Sthembile Gumede.

I am a qualified editor and proof reader and to the best of my knowledge this work is now free of spelling and linguistic/ grammatical errors and reads well. However, any errors that still remain are the result of the author not implementing final editorial corrections as indicated in the track changes version correctly.

Michael Vermeer

Writer, Editor, Proofreader

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