FOOD SECURITY AND COPING STRATEGIES OF AN URBAN COMMUNITY IN DURBAN

Dissertation submitted in fulfilment of the requirements for the degree of Masters of Applied Science in Food and Nutrition in the Department of Food and Nutrition: Consumer Science, Faculty of Applied Sciences at the Durban University of Technology

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DECLARATION

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

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ABSTRACT

Introduction: Food and Agriculture Organisation (FAO 2015a) estimated that 220 million people (23.2%) in Sub-Saharan Africa were undernourished. Parallel to hunger, obesity rates have more than doubled globally since 1980; in 2014, 1.9 billion adults in the world were overweight and 600 million were obese (FAO 2015a). Obesity is a serious concern facing the world today and a major contributor to chronic disease such as diabetes and cardiovascular disease, which are often fatal (Bray, Frühbeck, Ryan and Wilding 2016: 1947). In South Africa, overweight and obesity have reached unacceptable numbers as over 60% of South Africans are overweight or obese. Furthermore, in 2015 South Africa was declared the fattest nation in Sub-Saharan Africa, adding another burden to the HIV epidemic (Ng, Fleming, Robinson, Thomson, Graetz, Margono, Mullany, Biryukov, Abbafati and Abera 2014: 777). Unemployment is one of the major factors that drive household food insecurity due to the fact that most people access food commercially. Therefore, income is a significant factor in ensuring that a healthy and nutritious diet is consumed regularly.

The study community was at Umbilo, Durban, KwaZulu-Natal in a government owned estate called Kenneth Gardens. The estate has 286 units and accommodates approximately 1500–1800 residents. It formed part of an extensive network of cluster housing schemes developed by the apartheid government as a protectionist strategy to provide safe and affordable housing for poor and working class whites. Kenneth Gardens is currently managed by KwaZulu-Natal (KZN) Province and offers subsidized housing to residents from diverse background. Residents are low income bracket earners and many rely on state disability and pension grants for survival. Kenneth Gardens faces a wide range of social problems such as alcohol, drug abuse, domestic violence, unemployment and limited access to education (Marks 2013:26).

Aim: The aim of the study was to determine the food security status, coping strategies, food intake and the nutritional status of the Kenneth Gardens community, which is situated in an urban area in KwaZulu-Natal.

Methodology: One hundred and fifty (n=150) randomly selected caregivers participated in the study. The sample size was calculated using a power calculation indicating that 150 participants represent a reliable sample. The sampling procedure was simply random sampling. This study was quantitative and partly qualitative and descriptive in nature therefore, different measuring instruments were used to collect relevant data. The research tools for various variables measurements included; food security questionnaire, anthropometric measurements, a socio-demographic questionnaire, a food frequency questionnaire, and 24-hour recall questionnaires conducted in triplicate. Food security coping strategies were documented through a focus group interview with the Kenneth Gardens community members to determine strategies used to address food scarcity. All participants were weighed and measured to determine body mass index (BMI), classified according to the World Health Organisation (WHO) cut-off points. Data for socio demographic, FFQ, anthropometric measurements, and coping strategies was captured by the researcher on Excel® Spread sheets and analysed by a statistician for descriptive statistics using the Statistical Package for the Social Science (SPSS) version 17.0. Data for the 24-hour recall was captured and analysed by a nutrition professional using the MRC Food Finder® version 3.0 software, based on the South African composition tables.

Results: The study population consisted of 150 households, including women (n=122) and men (n=28). The results revealed that the majority of households (52.7%, n=79) were headed by a mother, and only 40% (n=60) of households were headed by a father. Majority (47.3%, n=71) of the participants had completed matric and 7.3% (n=11) had tertiary education. English, (52%, n=78), was the most spoken home language, followed closely by Zulu, (43.3%, n=65). Thirty six percent (n=54) of the participants were unemployed and 26.7% (n=40) were employed; however over, 50% (n=40) of the employed participants were temporary. Twenty eight percent (n=42) of the participants earned less than R3000.00 per month and 31.3% (n=47) earned between R3000.00 and R6000.00 per month. Pensioners were 17.3% (n=26), who therefore received a government grant that ranges between R1500 and R1520 per month depending on the claimant's age. The average household income was reported as R4429.20. The average number of people in the household was five, which equates to R6.00 per person per day. The results also revealed that 38% (n=57) of the household had a sole contributor to

the household income; other households had two contributors (42.7, n=64) and 11.3% (n=17) had three contributors.

Urban South Africans tend to purchase food as opposed to growing their own food. A lack of purchasing power results in food insecurity that eventually leads to malnutrition. The majority (56.6%, n=85) of the participants indicated a shortage of money to buy food and this inevitably leads and drive utilisation of coping strategies with high severity rate during periods of food scarcity. Bulk food was purchased once a month by the majority (68%, n=102) of the participants. The most commonly used coping strategy during periods of food scarcity was "Rely on less expensive and preferred food" with the mean score of 4.56 (±SD 2.772). The second used coping strategy was "Reduce the number of meals eaten in a day" with a mean score of 3.85 (±8.163), followed by "Contribute to a food stokvel in order to ensure food over a scarce period" (3.31, ±7.505) and "Restrict consumption by adults in order for small children to eat" (2.24, ±5.333). Utilisation of these food coping indicate a degree of food insecurity.

The Body Mass Index (BMI) classification indicated that women had a higher (31.46 ±8.474) BMI than men (26.00±5.445). A total of 26.2% (n =32) women were overweight and 51.7% were obese category I, II and III. The mean BMI for the whole group was (30.44±8.261) which clearly demonstrated obesity. Nonetheless, men were not overweight; however 25% (n=7) were obese category I. Collectively, underweight was prevalent in women (3.3%, n=4) and men (3.6%, n= 1).

The Food Variety Score was medium (31.91, ±10.573), which indicated a consumption of 30-60 individual foods from four to five food groups during the seven day period; however the top 20 foods consumed from the 24-hour recall revealed that the diet was energy dense and the most consumed foods were primarily from the carbohydrate and fat group and a low consumption of fruits and vegetables was reported; hence the nutrient analysis showed a deficient intake of several nutrients, such as: calcium, vitamin A, zinc, vitamin D, vitamin E, vitamin K, zinc, magnesium, phosphorus, selenium and thiamine by both men and women. According to the WHO dietary factor goals, the acceptable macronutrient distribution ranges (AMDRs) and fruit and vegetable intake based on the 24-hour recalls, fat and protein intake exceeded the recommended 15-30 percent goal. Fruit and vegetable intake was very low in comparison to the minimum recommended intake of >400g.

Carbohydrates intake for women were within the recommended 55-75 percent; however, men aged 19-50 years (50.70%) and >50 years (53.74%) did not meet the recommended intake.

Conclusion: The results of this study reveal that the nutrition status of this community was compromised. The top 20 food intake indicated inadequate eating patterns and that diets comprised of energy dense foods, such as carbohydrates and fats, which could directly be responsible for the high obesity levels of >50% in women and >25% in men. Furthermore, there was low income and a high unemployment rate that proliferates the prevalence of food insecurity, hence the coping strategies reported. Malnutrition exists in communities as a result of food and nutrition insecurity which is affected by a significant number of factors that need to be considered and addressed. Nutrition interventions and nutrition education on a balanced diet, healthier methods of preparing food, and physical activity are required to ensure and improve health status, quality of life and better and sustainable coping strategies for our communities.

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LIST OF ABBREVIATIONS

AFSUN	-African Food Security Urban Network
AIDS	-Acquired Immunodeficiency Syndrome
AIs	-Adequate Intakes
AMDR	-Acceptable Macronutrient Distribution Range
BMI	-Body Mass Index
BP	-Blood Pressure
CANSA	-Cancer Association of South African
CCHIP	-Community Childhood Hunger Identification project
CO_2	-Carbon Dioxide
cm	-centimetre
CS	-Coping strategies
CSI	-Coping Strategy Index
CVD	-Cardiovascular Diseases
DBP	-Diastolic Blood Pressure
DBSA	-Development Bank Southern Africa
DDS	-Dietary Diversity Score
DOA	-Department of Agriculture
DOJCD	-Department of Justice and Constitutional Development
DOSD	-Department of Social Development
DRI	-Dietary Reference Intake
DUT	-Durban University of Technology
EARs	-Estimated Average Requirements
EC	-Eastern Cape

FANTA	-Food and Nutrition Technical Assistance
FAO	-Food and Agriculture Organisation
FFQ	-Food Frequency Questionnaire
FGDS	-Food Group Diversity Score
FRC	-Faculty of Applied Sciences Research Committee
FS	-Food Security
FVS	-Food Variety Score
GDP	-Gross Domestic Product
GIS	-Geographic Information Systems
HDSS	-Health and Demographic Surveillance System
HH	-House Hold
HIV	-Human Immunodeficiency Syndrome
HRD	-Human Resources Development
HRD	-Human Resources Development Strategy
HUD	Housing and Urban Development
IFSNP	-Integrated Food Security and Nutrition Programme
IFSS	-Integrated Food Security Strategy
IGDP	-Integrated Growth and Development Plan
INP	-Integrated Nutrition Programme
IRDP	-Integrated Rural Development Programme
IREC	-Institutional Research Ethics Committee
KAB	-Knowledge Attitude and Behaviour
Kj	-Kilojoule
kg	-kilograms

Km	-Kilometre
KZN	-KwaZulu-Natal
LSM	-Living Standard Measure
m	-metres
m^2	-metre squared
MBP	-Mean Blood Pressure
Mcg	-microgram
MDG	-Millennium Development Goal
mg	-Milligrams
MOU	-Memorandum of Understanding
MUAC	-Mid-upper-arm circumference
n	-number
NAR	-Nutrient Adequacy Ratio
NCDs	-Non Communicable Diseases
NDP	-National Development Plan
NFCS	-National Food Consumption Survey
NGO	-Non-Government Organisation
NICUS	-Nutrition Information Centre of the University of Stellenbosch
NPO	-Non-Profit Organisation
ORS	-Oral Rehydration Solution
PE	-Physical education
PEM	-Protein Energy Malnutrition
QSR'S	-Quick service Restaurants
R&D	-Research and Development

RD	-Rural Development
RDAs	-Recommended Dietary Allowances
RDP	-Reconstruction and Development Programme
SA	-South Africa
SAFBDG	-South African Food Based Dietary Guidelines
SAMRC	-South African Medical Research Council
SANHANES	-South African National Health and Nutrition Examination Survey
SASSA	- South African Social Security Agency
SBP	-Systolic Blood Pressure
SD	-Socio Demographic
SD	-Standard Deviation
SDGs	-Sustainable Development Goals
SPSS	-Statistical Package for Social Sciences
SSA	-Sub-Saharan Africa
STATSSA	-Statistic South Africa
U.S	-United States
U.S.A	-United States of America
UKZN	-University of KwaZulu-Natal
UL	-Tolerable Upper Intake Level
UN	-United Nations
UNAIDS	-United Nations Programme on HIV/AIDS
UNDP	-United Nations Development Programme
UNFPA	-United Nations Population Fund
UNICEF	-United Nations Children's Fund

UNPD	-United Nations Population Division
WB	-World Bank
WFR	-Weighed Food Records
WFS	-World Food Summit
WHO	-World Health Organisation

LIST OF SYMBOLS

>	Greater than
≥	Greater than and Equal to
<	Less than
≤	Less than and Equal to
%	Percent
±	Plus or Minus
=	Equals To
♀	Women
♂	Men
µg	Microgram
*	Estimated Energy Requirement
≈	Al

CHAPTER 1 – INTRODUCTION AND CONTEXT OF THE STUDY

1.1 INTRODUCTION

As a developing country, South Africa has come a long way since the 1994 first democratic elections. Despite the many challenges throughout the years, tremendous progress is evident in terms of meeting many developmental objectives. This includes, but is not limited to, building democracy institutions, maintaining macro-economic stability, reducing non-income poverty and inequality through increasing access to basic services, reducing crime and improving health levels (Development Bank Southern Africa (DBSA) 2011; Labadarios, Mchiza, Steyn, Gericke, Mauder, Davis, Parker 2011: 891).

Previous studies (Altman, Hart, Jacobs 2009:345; Labadarios *et al*. 2011: 891; Pereira, Cuneo, Twine 2014: 339) have confirmed that many South Africans are still food insecure, and are still plagued by poverty and unemployment despite the economic and political advances that have been made. The nature and form of economic growth still remains one of the biggest challenges in addition to the challenges of job creation, poverty and crime Unemployment and the varying rate of income inequality is the basis on which poverty, hunger and food insecurity thrives amongst many households (DBSA 2011).

Even though South Africa is regarded as a food secure nation, the vast majority of South Africans remain food insecure at a local level, especially in rural regions (Labadarios *et al*. 2011: 891; Pereira *et al*. 2014: 339). There are many complex challenges facing food security globally and locally. Pereira *et al*. (2014: 341) stated that recent studies have indicated that an alternate approach that incorporates all the different stressors to food security needs to be considered. The first Millennium Development Goal to 'decrease hunger by half by the year 2015' has proven to be a challenge (FAO 2014). Sub-Saharan Africa still remains the continent with the highest rate of food insecurity and undernourished people in the world despite numerous efforts to reduce the numbers. The Food and Agriculture Organisation (FAO 2015a) estimated that 795 million people were chronically undernourished. The modest progress and prevalence is in Sub-Saharan Africa where the ratio estimates indicate that one in four people are undernourished.

1.1.1 Background to the problem

Food Insecurity is a global phenomenon, has been regarded as crisis since the World Food Conference held in 1974 when large-scale shortages of food and imminent starvation was considered imminent (FAO 2006). Food security still remains a global challenge and a concern as many people are still affected. According to the FAO (2014) the prevalence of undernourished people living in Sub-Saharan Africa and food insecurity is evidently more prevalent in developing countries as opposed to developed countries (Labadarios *et al*. 2011: 891; Pereira *et al*. 2014: 339; Steyn and Temple 2008: 164).

According to Labadarios *et al.* (2011: 891); DBSA (2008) and FAO (2006) food security rests on three pillars of strength: food availability, food accessibility and food usage or utilisation. The FAO (2016) defines food security as being evident when everyone has sufficient food for an active and healthy lifestyle. It is essential that food is nutritious and safe for consumption. People need to have sufficient amounts, and a wide variety of food available on a constant basis, both at a national and local level, within local markets and fields (food availability), in order to secure appropriate and nutritious food adequate resources are required (food access). Furthermore, knowledge on the basic nutrition and care, as well as adequate water and sanitation are fundamental in the appropriate use of food. When food security is in crisis, it is important to determine the factors impacting on each pillar and find solutions (FAO 2006).

Food insecurity has a direct impact on malnutrition, with the main cause of malnutrition being inadequate dietary intake and illness (UNICEF 1998). Labadarios, Steyn, Maunder, MacIntryre, Gericke, Swart, Huskisson, Dannhauser, Vorster and Nesmvuni (2005: 259) reported that the majority of children affected by malnutrition come from the rural regions of Sub-Saharan Africa, where stunting and underweight are common nutrition disorders. Food insecurity, inadequate diets and malnutrition directly affect each other and form a vicious cycle of infection. Stunting and problems associated with being underweight in South Africa remain common nutrition disorders together with proliferation incidence of obesity seen in the past few years (Labadarios *et al.* 2005: 253; Ng *et al*. 2014: 777).The National Food Consumption Survey review (2011) reported that for every five children, one is either stunted or underweight. According to DBSA (2008) stunting, disability, poor brain development and children's capacity to learn can arise as a result of the micronutrient deficiencies in children. Furthermore, micronutrients deficiency can also result into death, particularly if there is a Vitamin A

deficiency. Van Stuijvenberg, Nel, Schoeman, Lombard, du Plessis and Dhansay (2015: 842) indicated that 20% of preschool children in Calvinia West, Cape Town were stunted and had micronutrient deficiency. The prevalence of stunting differed from one province to another. The last annual South African report from the United Nations Children's Fund (UNICEF (2014) stated that one out of every five children was stunted. It further highlighted factors such as; poor household access to food, inadequate maternal and child care, poor access to healthcare, unhealthy environment with limited access to clean water and safe water disposal that contribute substantially to poor food intake and illness. In addition lack of resources and extensiveness of poverty further contribute to malnutrition (UNICEF 2012).

Some of the most crucial factors contributing to the state of malnutrition include; urbanisation, a shift in dietary patterns, lack of or a decrease in physical activity due to environmental and societal deviations associated with economic developments, policy challenges regarding the agriculture sector and departments of health, including policies that affects the environment, food processing, distribution as well as transport, over and above urban planning, marketing and education. In order to comprehend and combat food insecurity in the world it is paramount that every factor is explored and considered Averett, Stacey, Wang 2014: 26; WHO 2014b; WHO 2015c).

Escalation in poor human health is being observed throughout the world. Triple burden malnutrition is a new developmental concern affecting millions. According to WHO (2014a) there was approximately 800 million chronically undernourished people in 2014 globally. It is estimated that 500 million are obese and 2 billion suffer from micronutrient deficiency.The World Health Organisation (WHO) (2014) reported that malnutrition is the most serious health problem and is a major contributor to child deaths. It is estimated to contribute to more than one third of child deaths. One of the causes is a lack of access to nutritious food and inadequate dietary intake which not only affects children but also the elderly. The volatility of food prices worsens the conditions. The other factor that affects children's nutrition status is disease particularly diarrhoea, measles, pneumonia and malaria (Barasi 2003: 266-296; Langley-Evans 2015: 7). The prevalence of obesity all over the world is very high and affects millions of people. In 2008 there were approximately 1.4 billion adults from 20 years and above who were over the adequate healthy weight of whom an estimated 200 million were men and 400 million were women. By 2012 40 million children less than five years were overweight and obese (WHO 2015b; Ng *et al*. 2014: 767).

According to WHO (2016) overweight and obesity are defined as "abnormal or excessive fat accumulation that may impair health"'. Results from several studies conducted amongst school children in South Africa all indicated excessive weight among school children. In a study conducted by Tathiah, Moodley, Mubaiwa, Denny and Taylor (2013: 718) in KwaZulu-Natal among primary schools children, 9% of female learners were overweight and 3.8% were obese. In a similar study 11.1% of learners in grade one were overweight and obese in the North West Province (Piernaar and Kruger 2014: 109). A combined dominance of both under-and over-nutrition was evident. Economic and nutritional transition was mentioned as one of the triggers of overweight and obesity among school children. Ng *et al*. (2014: 766) also confirmed prevalence of overweight and obesity in developing countries among children, the findings indicate that 23.8% and 22.6% of boys and girls were overweight and obese in 2013 respectively.

Obesity is the major contributor to chronic diseases including diabetes and cardiovascular disease. More deaths worldwide are caused by obesity rather than under-nutrition. WHO (2014b) estimated that obesity affects approximately 30% more children in developed countries and is known to have contributed to 3.4% of the world's population deaths every year. It further reported that the increase has reached epidemic levels developing countries including South Africa but mostly in urban areas. In recent years a substantial increase of overweight and obesity amongst the South African population across all gender and racial groups has been observed (Averett *et al.* 2014: 23);Bray *et al*. (2016: 1947) indicated that obesity is quite expensive to manage and the cost with increase in BMI. This needs urgent attention, as it may be difficult for households with limited income to manage. Households with the lowest income experience hunger to a greater extent, spend less money on food, and have a lower standard of education. This correlation is prevalent throughout Sub-Saharan Africa (Dorosty *et al.* 2008: 1-10; Sharafkhani, Dastgiri, Rasool, Ghavamzader. 2011: 31-34; Pereira *et al.* 2014: 339; Averett *et al*. 2014: 23).

There is a direct association between people's nutritional status and food intake and the latter is dependent on income and food security. These variables cannot be seen in isolation but have to be studied simultaneously (Dewbre 2010: 22-23). Achieving food security goals includes achieving and maintaining food availability, stability, accessibility and utilisation of food even when confronted with a variety of unfavourable natural (floods, hurricanes and earthquakes), economic, social and political situations (DBSA 2008; FAO 2006; Steyn and Temple 2008:

166-168). While the focus is on increasing food security, prevalence levels and patterns of malnutrition remain questionable as food security is hard to pinpoint. Access to food and water is essential to human well-being and development. Every person should live a life that guarantees good health and well-being; nobody in the world should go hungry and there is nothing more difficult (Altman *et al*. 2009: 345).

1.1.2 Food security: The global perspective

The global battle against food insecurity and hunger continues as the number of people affected remains unacceptable. Out of the 805 million hungry people in the world, 98% live in developing countries. Tremendous efforts in fighting hunger have been made and there has been major progress. In the past decade the number of undernourished people dropped by approximately 60% and 58% globally and in developing countries respectively. This translates into a reduction of more than 100 million (FAO 2015a).

Commitments made by the international community are clearly evident; however the struggle is far from over and more efforts and international assistance are required. Approximately 220 million people living in Africa experience hunger (FAO 2015a). However, Asia is the most affected area in the world and accounts for more than two thirds of the world's hungry population. Progress in hunger reduction was slow (FAO 2015a).

The UN (2014) believed prior to the year 2015 targets set at the WFS to reduce underfed people by fifty percent, was still within reach; however the last 2015 report reveals that the goal was almost met, though some of the set targets were achieved prior to 2015. It was estimated that 63 developing countries reached the MDG hunger target and the WFS goal was reached by 25 countries. Latin America and the Caribbean as a whole showed tremendous progress in reducing hunger and reached both the MDG and WFS goals (UN 2014).

The challenge facing world leaders is making sure that every human being has access to food, and that food insecurity levels are reduced (Sharafkhani *et al.* 2011: 31-34; Steyn and Temple 2008: 166-168). Gleadow (2010: 31-33) suggested to double the production of food with half the resources by 2050 in order to provide food security for 8.5 billion people in the world, however climate changes pose threat in maximising production. Grant (2015: 87) reiterate the significance of modifying inputs into outcome including resources, in food systems in order to achieve food and nutrition security. Food insecure people were estimated at 849 million in

2006 and by 2007 this had escalated to 982 million Globally this rate increased steeply during the global economic crisis (Sharafkhani *et al.* 2011: 31). The cost of living has substantially increased and poverty scales have escalated, particularly in developing countries and rural regions where poverty appears to be worse.

Food security is impossible to achieve without considering global warming and its impact on the environment. Global warming has an enormous influence on food prices, Therefore it should be put into perspective when combatting food insecurity. It is without doubt that food prices are the major influence in the onset of food insecurity. Food prices do not only increase the number of hungry people, but also trigger political instability in developing countries in the extent that people are forced to migrate to richer nations (Cothron 2009: 54-56,79; Pereira *et al.* 2014: 340).

Development concerns regarding food insecurity are around social protection, sources of income, access to land and water, retail markets and education. Access to food is influenced by all these factors and focus should be based around these development concerns in order to understand how they affect household food access. With this knowledge it would be possible to develop and design appropriate and effective food security policies that are multi-level, and that incorporate a diversity of factors, such as the fast growing retail sector (Pereira *et al.* 2014: 339).

1.1.3 Food security: The African perspective

The African continent has been poverty-stricken for a number of decades and progress towards relief has been relatively slow despite the global effort to reduce the number of affected people. Sub-Saharan Africa remains the worst affected and has the highest food insecure population with 214.1 million people undernourished between 2012 and 2014. The prevalence of hunger in the northern part of Africa remains low. Significant progress in relieving hunger is evident here and only 5% of the people are affected, or undernourished. The report further stipulates that 40% of the population in Sub-Saharan Africa still lives in extreme poverty (UN 2015c).

Poverty is undoubtedly the underlying factor and major catalyst for food insecurity in Africa. African people have to rely on retail markets to access food as a large proportion have no land to farm, and those households that have access to land often lack the resources to invest in

productive assets and agricultural technologies for sufficient agricultural production (Pereira *et al*. 2014: 339; FAO 2010a). Poor African communities depend on agricultural production to survive and climate changes generate vulnerability among these groups (Pereira *et al.* 2014: 339). As a result of climate change, Sub-Saharan Africa has damaged land to such an extent that the impact affects crop production and can no longer be cultivated. Climate sensitive disasters are likely to emerge, such as rift valley fever that affects stock, and a lack of or too much water, which can destroy infrastructure. Disasters such as these shift priorities instantly, where resources are diverted to deal with the emergency instead of being used for development. Furthermore, African agriculture lacks adequate policies. Countries have weak institutions, and regulatory frameworks are poor, all of which undermines research and development (R&D) in the sector. In the 26 countries found in Sub-Saharan Africa only a limited number have proper policy support that is provisioned with regulatory frameworks and functioning institutions; the rest are either absent or are too frail to support agricultural development (FAO 2014).
Dependency on agriculture makes African communities not only more vulnerable to exposure to events of extreme nature but also to adverse effects of climate change. A decline in agricultural production in most rural African communities from big field production to small home gardens is due to a lack of support from the government in terms of policy changes. Long-term investment in agriculture is significant in strengthening food security in the future by increasing competition among farmers, reducing prices and making food more affordable to the poor (FAO 2010a; Godfray *et al.* 2010: 812-818; Altman *et al.* 2009: 345; Collier and Dercon 2014: 93).

Decline in African agriculture therefore forces people to rely on income and purchase food through local supermarkets (Pereira *et al*. 2014: 339). The World Bank (WB) (2006) stated that the consumption of food in any household is affiliated to income; people buy what is affordable despite the nutritional value. A large proportion of that income is spent on staple foods. Food is extremely expensive as there is insufficient domestic production therefore food needs to be imported. It is estimated that 30 billion dollars is spent annually on imported foods in Africa. This dependency on international markets for food reduces the financial resources for infrastructure and socio-economic amenities. The impact on income fluctuations due to price instability reduces the nutritional status of adults and children's consumption of essential nutrients during early days of life and subsequent permanent reduction of future earning capacity and perpetuated status of poverty (FAO 2014b; Pereira *et al.* 2014: 339; Labadarios *et al.* 2011: 895; Collier and Dercon 2014: 93).

Lack of access to food is not the only cause of nutrition inadequacy. Poor health conditions and diseases including HIV/AIDS also play a role. Millions of people are affected by HIV/AIDS globally with Sub-Saharan Africa mostly affected. Numerous efforts have been invested to decrease the HIV epidemic in Africa, and some countries have shown good progress with the number of infections decreasing. Sub-Saharan Africa had 1.5 million new infections in 2013, in addition to the already existing 24.7 million HIV positive people. This is partly due to the lack of comprehensive knowledge about HIV/AIDS. Non communicable diseases including HIV/AIDS other compromise the health of individuals and affect food security in various ways. The health of people in Africa is already compromised by poverty and malnutrition and HIV fuels the situation to spiral out of control. There is an increase in the nutrition needs of people living with HIV due to reduced food intake and the malabsorption of nutrients. This poor nutrition results in weight loss, muscle wasting, weakness and nutrient deficiency. HIV also increases vulnerability to infection, which is a big concern as it speeds up the progression of AIDS and further inhibits the impaired immune system to fight infections. Even though the UNAIDS (2015) reported a decrease in infection and deaths in the latest report, HIV/AIDS still contributes to poor health and impacts on the productivity of millions of people in the world (Pereira *et al.* 2014: 341; UNAIDS 2014).

Short term solutions to hunger requires re-enforcement of the capacity in World Food Programme (WFP) with assistance from other emergency response programmes. Long-term strategies are to be place on wider context in order achieve food security through long-term investment in agriculture. This can assist in reducing unpredictable food prices and the state of malnutrition in the world (FAO 2011a).

1.1.4 Food security from a South African perspective

Food security has always been the core of the South African government's agenda and it was declared a priority in national strategies and programmes (Hendriks 2014: 3). Food security was amongst the key role players in policies and strategies that have helped shape the new South Africa; nevertheless Hendriks (2014: 1) states that the food security issue has been perceived and opened to various interpretation by different governments over the years.

The need for policy development was reiterated by the national policy for food and nutrition security in South Africa. In 2002 the South African Cabinet introduced the national Integrated

Food Security Strategy (IFSS) to manage and coordinate food security programmes. These programmes face numerous challenges that need a multidimensional approach. Several factors such as globalisation, climate change, trading agreements, food storage and distribution pose a threat or challenge to food security. The government believes that by developing a food security policy, it will assist, define and measure food security, provide a framework for different strategies and programmes, and create a podium to understand international obligation towards limitations and parameters (Department of Social Development (DOSD) 2013: 3; Department of Agriculture (DOA) 2011: 1-4).

South Africa is among the 49 Sub-Saharan countries plagued by hunger, poverty and HIV/ AIDS. Studies conducted in South African have demonstrated that there is a threat to the national food security and there are many gaps at the local and household level, even though there is sufficient food nationally. The decrease in areas of production in the commercial sector escalates the circumstances. According to the South African Government statistic report (2011) the level of poverty vary slightly across in different provinces. Limpopo has the highest occurrence of hunger and poverty at approximately 63.8%, the Eastern Cape was the second most affected area with 60.8%, followed by KwaZulu-Natal with 56.6%. The South African national general household survey (2014) indicated that 11.4% of households were still vulnerable to hunger. The major challenge in South Africa regarding food security is the lack of formalised structures to evaluate the food security impact on government programmes. Hendriks (2014: 3); Labadarios *et al*. (2011: 891) and Pereira *et al*. 2014: 339) elaborated that due to policy dysfunction in South Africa and a lack of coordination exacerbates the food insecurity problem.

The South African Bill of Rights stipulates that every person should have access to food and clean water. Issues of unemployment, urbanisation, globalisation, hunger, poverty and HIV and AIDS make it extremely difficult for South Africans to achieve food security. The weak and unpredictable world economy drives food, fuel and input prices to increase, resulting in a significant amount of people places pressure on the rand, which at a disadvantage. This is particularly problematic for the poorest households who depend on purchased foods to meet their daily nutrient requirements. Unfortunately purchased foods are usually more expensive and can be unhealthy (Nawrotzki, Robson, Hunter, Twine, Norlund 2014: 283; Labadarios *et al*. 2011: 891; Pereira *et al*. 2014: 354).

It is estimated that approximately 30-50% of the population has insufficient food and consumes an unbalanced diet (Hendriks 2014: 4). As of today, South African still has no specific and acceptable measure for food security and no regularised ways to monitor progress or lack thereof. For a middle income country with high levels of poverty and food insecurity this should be an urgent concern. In order to achieve food security strict policy monitoring and proper reporting framework needs to be developed. Hendriks (2014: 4) believes there are a number of factors that need to be considered, such as source of income, access to land, developments in urban and rural communities, retail markets, changing household structures, education, health, and nutrition knowledge, water and inputs to eradicate food security. The majority of the population access food through money (income), and to procure a healthy balanced diet a minimum of ±R9.55 daily or R286 monthly is needed for an average South African, depending on inflation. According to Labadarios *et al.* (2011: 895) South African households have an average of four members and needs approximately R38.20 a day or R1146.00 every month to achieve and maintain a healthy, balanced diet. In poorer households the conditions are worse as there are usually more household members. The size of the family, the level of education and presence of both parents, as well as an inadequate level of income increase household food insecurity, and household food security depends solely on the total household income. The increase in the demand for more expensive imported foods over locally produced foods drives import demands, thereby constraining consumer purchasing power. This often results in consumers purchasing the cheapest foods, which are usually processed, lack micronutrients and are high in sugar and fats. These types of diets have long-term negative health implications (Pereira *et al.* 2014: 354; Sharafkhani *et al.* 2011: 31-34; UN 2010; Dorosty, Karamsoltani, Jazayeri, Siyasi, Eshraghian 2008: 1-10). Furthermore, for the majority of South Africans, the lack of land to grow food means that food has to be purchased commercially As much as economic growth is important to move forward as a country, household income to ensure food security is paramount. The ratio between taxpayers, unemployment and grant recipients is disproportionate. The number of people on social grant recipients rises every year. There are more people on social grants than with employment, placing a burden on tax payers. Grant are insufficient as a solely household income, therefore many households primarily dependent on grants will have insufficient money to purchase food (Hendriks 2014: 19; Labadarios *et al.* 2011: 896; SASSA 2013).

The income of rural communities is usually lower than urban communities. However, hunger is prevalent in both areas but on a different scale. Hendriks (2014: 4) and Nawrotzki *et al.*

(2014: 290) stipulate that households with a high percentage of working members have a stronger food security status. It is estimated that poorer households have between six and seven members, and the food items found in the grocery cupboards are below the average or minimum requirement to achieve or maintain a healthy well-balanced diet (Labadarios *et al.* 2011: 891). Faced with hunger, families often have to adopt drastic changes, reducing their consumption of high quality foods. Hendriks (2014: 4) believes that supporting rural farming not only increases food availability but also the nutritional content of food.

Difficult times can force households to put their means (animal stock or tools) of source of income for sale and sometimes families need to apply for loans to survive. These activities leave households impoverished and indebted for long periods of time, and basic essentials such as education and health are compromised and become expensive luxuries (Dewbre 2010: 22-23). Education programmes and new interventions are essential to create a healthier, food-secure nation in order to ensure a better future. Several studies confirm that families with a better household food security status have members with higher levels of education, therefore education is very important and is a strong protective factor (Nawrotzki *et al.* 2014: 290).

The fact that South Africa has a high HIV and AIDS rate creates an even bigger challenge for the country and its people. The UNAIDS (2014) reported that there were more people living with HIV and AIDS in South Africa than anywhere in the world, the report additionally indicated that 17% of deaths in South Africa are HIV-related and that 18% of population was HIV infected. The immune system of a HIV positive person is already compromised and any food insecurity or inappropriate diet worsens the condition. Furthermore, death in a family due to HIV and AIDS increases vulnerability to food insecurity and dependency on social grants (Nawrotzki *et al.* 2014: 290; Pereira *et al.* 2014: 341).

Growth and structural change may be seen as the key to achieving household food security but people cannot wait for that as hunger is an immediate need. Dewbre (2010: 22-23) also states that when people are hungry today it is a result of accessibility rather than availability food. Food can be available in the market but not accessible to people due to different factors. The most important thing is to ensure that the country and its people have access to food, either by growing produce or by purchasing food to eat. A substantial amount of money is invested annually to alleviate hunger and poverty via food assistance programmes; however there is no evidence to prove the impact and the effectiveness of such social relief aid (Hendriks 2014: 4,

19), Often these programmes are uncoordinated and duplicated, and agricultural programmes implemented by different government sectors focus on backyard production, which still has no significant and measurable international proof in terms of its impact on nutrition. For any food aid programme to be effective household food insecurity has to be identified (Dewbre 2010: 22-23). Food aid programmes may be a temporary solution to food security, hunger and poverty, but they are not a long-term solution to improving the lives of food insecure households (Hendriks, 2014: 19).

The objective for this particular study is based on the fact that South African food security is under threat and engulfed by a wide range of challenges that require significant interventions with respect of policies and strategies. The lack of a safety net and a food emergency system means that many South Africans will continue to suffer during extreme natural and non-natural disasters. In addition, there is inadequate access to education, limited access to resources and a lack of knowledge about food and nutrition, which inhibits South Africans from making informed decisions when it comes to food choices for optimum health. Convergent results from researchers in poverty, globalisation, climate change, urbanisation and population growth reiterate the need to conduct further research in order to provide future solutions (DOSD 2014: 4).

1.1.5 Rationale and motivation

Section 27 and 28 of the bill of rights highlights rights to access to food and water and basic nutrition for persons and children respectively. Statistics demonstrate a food secured South Africa at a national level while at local level many people are experiencing poverty and hunger (Constitution of the Republic of South African 1996: 6). Studies have proven that the incidence of household food insecurity and hunger is very high. Jacobs (2009: 410) defined household food insecurity as an insecure and temporary access to sufficient food to limits or prevent all individuals in the household to live a healthy life. Household food security has its own complexities and dynamics that need to be considered to ensure all households are food secure and everyone has access to an adequate nutritious diet to be healthy and live longer (Labadarios *et al*. 2011: 891; Godfray, Charles, Beddington, Crute, Haddad, Lawrence, Muir, Pretty, Robinson, Thomas, Toulmin 2010:812-818; FAO 2010d).

Poor access to an adequate amount of food indicative of food insecurity and an underlying cause of malnutrition. Basic food and nutrition is extremely important to every human being and food should be accessible to provide the body with the required nutrients in order to be healthy and to function at an optimum level. Poor nutrition and unhealthy eating habits result in decreased immunity, which leads to a deterioration in physical and mental growth and productivity. Despite all the efforts to eradicate poverty and hunger, malnutrition remains worse in rural communities (Barret 2010: 825; Cothron 2009: 54-56, 79; Sharafkhani, Dastgiri, Rasool, Ghavamzader 2011: 31-34; Steyn and Temple 2008: 166-168).

The concern about household food insecurity is that it is difficult to measure accurately because it is multidimensional in nature which makes reaching set policy targets challenging. The commitment by the South African government to reduce the levels of poverty by half between 2004 and 2014 required household food security reinforcement. In the review of the National Food Consumption Survey, Labadarios *et al*. (2011: 260) stated that the term 'food security' and its measures need to be urgently developed and defined in a context that is conducive to South Africa (Jacobs 2009: 410; Labadarios *et al*. 2011: 891; Godfray *et al*. 2010: 812-818).

Food security encompasses physical and financial means of accessing preferred nutritional food (World Food Summit 1996). People need permanent access to safe and healthy food throughout the life cycle. Food can be available at a market level and still not be accessible to people, or it may be accessible to people but not useful. Furthermore, food available in the markets at a national, regional and household level should be of sufficient quantity and of adequate quality at all times through different suppliers, including food aid programmes. Once the food has reached the market, it should be accessible to all people to enable them to have an adequate, nutritious diet, and people should have sufficient knowledge and skills to prepare food correctly and preserve the required nutrients. It is important that the stability amongst factors of food security i.e. food availability, accessibility and utilisation is achieved and maintained throughout the human life cycle, and risks of breaking the cycle should be minimised. Food security is extremely complex and dynamic and it needs to be studied and comprehended thoroughly in order to ensure it exists at national and household levels in all countries. (FAO 2006).

The need to access enough money for food is a priority for the majority of South Africans who have to mainly rely on income from employment. This creates a challenge since most households do not earn a substantial income. Labadarios *et al*. (2011: 895) stated that the South

African average monthly income is below R1000.00 for underprivileged households, and the average South African needed approximately R1146.00 monthly in 2011 to procure a healthy diet, therefore making it difficult for poor households to feed the whole family. The situation is worse for poorer households since there are usually more family members (Pereira *et al*. 2014: 348). The global economic crisis has further instigated high energy tariffs, increased fuel and food prices, and higher interest rates, further compromising the majority of people who are already struggling (Godfray *et al.* 2010: 812-818; Labadarios *et al.* 2011: 891). The FAO (2012) predicted that food prices in the next few years might stay relatively high. Concerns emerged when the FAO revealed an increase of 19% of hungry people in developing countries. This was the highest increase since 1997.

There has been a noticeable improvement in the overall status of global food security compared to the situation a decade ago with a significant reduction in the number of people who are hungry worldwide. However, the latest report presented by the FAO (2014) indicated that there were still 805 million people who were chronically undernourished between 2012 and 2014. Even though there has been progress made in hunger reduction, it is not enough as one in nine people in the world still experience hunger and does not have access to adequate food to lead an active healthy life (FAO 2015a).

The first Millennium Development Goal aimed to decrease hunger by at least fifty percent in 2015. The United Nations (UN) (2014) was positive that the goal would be achieved. However, there were several unexpected challenges throughout its inception that contributed to the goal not being achieved including the unforeseen 2008 global crisis and ubiquitous poverty which caused a major setback. Ubiquitous poverty further forced numerous people to migrate from rural areas to cities and sometimes from one country to another to seek employment and a better life. The migration resulted in shifts in diets through exposure to new eating habits and diets in cities or foreign countries. Orindi (2009: 1); Nelson, Rosegrant, Palazzo, Gray, Ingersoll, Robertson, Tokgoz, Zhu, Sulser and Ringler (2010: 1) and Dewbre (2010: 22) had predicted that many developing countries would not meet the MDG targets. The major anxiety is that hunger may never be eradicated and this could be disastrous in a few years to come. Although developing countries have made the most improvement with regard to hunger reduction, 795 million people living in these regions are still chronically hungry and underfed. The UN (2014) report further states that additional efforts are required to reduce hunger and more attention should be paid to countries that have made only slight progress.

Population growth further impacts on hunger reduction targets. Outputs need to be doubled in order to meet the food requirement for the projected nine billion people in the world in the next 40 years. During the global food price crisis in 2008 it was evident how severe the outcomes can be as more than twelve countries participated in riots (Labadarios *et al.* 2011: 891). Strategies and policies that are multi-level need to be put in place to address and prevent the impact and outcome in every country. In 2008 the G8 Heads of States agreed to act with urgency to achieve sustainable global food security by providing resources where they were needed the most (Barret 2010: 825).

While the majority of studies focus more on food production and food security, nutrition security is neglected. Nutrition security is just as important as food security. It does not make sense to provide a sufficient amount of food that lacks essential macro- and micronutrients required by the body. Measurement for food and nutrition security should be conducted at both individual or household and national level. The WHO (2001) considers food and nutrition security as a basic human right. Providing proper nutrition ensures growth and development in children, promotes health and prevents disease in adults. Nutrition security has its own challenges, and a greater shift in focus is required in order to ensure the Millennium Development Goal (MDG) target to reduce the prevalence of underweight children under five by half and the proportion of the population living with below minimal level dietary energy is reached. There are still billions of people lacking essential micronutrients, children suffering from chronic malnutrition or stunting at an early age and childhood stunting with cognitive and physical underdevelopment (Grant 2015: 87; Zezza, Carletto, Davis, Winters 2011: 1).

Food and nutrition security should be placed at the top of the agenda in order for every government in the world to reduce hunger. Hunger requires an integrated approach, starting with commitment from highest level, creating a conducive environment to improve investment, create better policies, form legal frameworks, and enhance stakeholder participation and a powerful evidence base for improving food and nutrition security (UN 2014; FAO 2014). Therefore this study aimed to establish the food security levels in this urban community in Durban and to determine the variables that impact on the coping strategies used during food insecurity.

1.2 South African studies conducted

Previous research studies have contributed to the body of knowledge for reference regarding the landscape of food and nutrition security in the country and globally. Table 1.1 highlights relevant studies that have been conducted in the last ten years pertaining to food security and coping strategies in South Africa.

Table 1.1: A review of South African studies in food security and coping strategies over the past 10 years.

Title of the study	Author	Measuring tools	Summary of results
Exploring the impact of the 2008 global food crisis on food security among vulnerable households in rural South Africa	Nawrotzki *et al*. 2014	Data was collected by means of a questionnaire by trained field workers in an interview situation. Agincourt Health and Demographic Surveillance System (Agincourt HDSS).	The study was conducted in a rural sub-district in the Mpumalanga province. There was a significant increase in food security; the study explores and elucidates factors that have contributed to the results e.g. government grants
Food security in rural areas of Limpopo province, South Africa	De Cock *et al*. 2013	Data was collected by means of questionnaires and interviews on food security (FS), Food frequency questionnaire (FFQ) and Socio demographic (SD)	Many South Africans remain food insecure at household level even though the country appears to be food secure at national level. The study confirms that there is still a lack of conducive and conventional methods to measure food security in South Africa and no proper monitoring tools.
Food and cash: understanding the role of the retail sector in rural food security in South Africa	Pereira *et al*. 2014	The mixed methods approach was utilised to determine food security and coping strategies at household level through in-depth interviews (questionnaires).	The study reveals that the majority of South Africans access food through cash instead of growing their own food due to global warming. Low income rate results in households relying on staple foods for dietary needs. Grants have become a main source of income for many households. Failure of local entrepreneurs due to lack of resources has implications for food utilisation
Culture and food security: a case study of homestead food production in South Africa	Trefry *et al*. 2014	Fifteen semi-structured and in-depth interviews were conducted, (recorded and transcribed)	Food production is heavily influenced by cultural changes in communities, including gender roles. The power placed upon higher authorities such as who can distribute agricultural products to local markets plays a major role in the status of household food security. There is lack of gardening resources in local communities.

City Without Choice: Urban Food Insecurity in Msunduzi, South Africa	Crush and Caesar, 2014	Data utilised was obtained from an African Food Security Urban Network (AFSUN) baseline survey. Food security was measured using the indicators developed by the Food and Nutrition Technical Assistance (FANTA).	Even though the city produces sufficient food, the majority of the households are food insecure and one third have confirmed to frequently have no food. There is a high employment rate and the source of income for many household is through social grants. The city depends on a modern supply chain for foods such as super markets.
Do Food Quality and Food Quantity Talk the Same? Lesson From Household Food Security Study in Embo, South Africa	Msaki and Hendriks, 2013	Data was collected through two consecutive household surveys (n = 200)	Dietary diversity for each household differs but the main source of energy was from starch and fats. Staple foods were mostly consumed and viewed as very important. Fruits and vegetables provided were the least source of energy. Diet quality was directly related to the seasonal availability of foods.
Determination of the Factors Affecting the Food Security Status of Households in Bophelong, South Africa	Sekhampu, 2013	Socio-demographic questionnaire (Household survey)	The study revealed that the food security status of households is influenced by household income, household size, age, employment status, gender and the marital status of the head of the household. Scarcity of land to plant their own food, high unemployment, poor health and nutrition and high population density are some of the major problems for urban communities.
Food Security in South Africa: review of national surveys	Labadarios *et al*. 2011	Data from national surveys between 1999 and 2009 was used in which the Community Childhood Hunger Identification project (CCHIP) index was utilised to determine food insecurity in South Africa	The study results revealed a significant increase in food insecurity between 1999 and 2008. Poor households show a prevalence of unhealthy diet and dietary patterns. Poor households spent less money on food compared to households that enjoyed food security and ate half the number of food items. Children showed low mean scores for dietary diversity and dietary variety. There was a decrease in stunting of children between 1999 and 2005.
Implications of supermarket expansion on urban food security in Cape Town, South Africa	Peyton *et al*. 2015	The mixed-methods approach was utilised including; Geographic Information Systems (GIS) analysis used to map distribution of supermarkets and compared with geography of poverty and city access; quantitative case study of neighbourhood and supermarkets and geospatial statistics for distribution of supermarkets compared with proximity of accessibility and food insecurity.	Poverty causes a lot of people to migrate to cities and with limited support from the public system many people and households barely survive. Supermarkets are not beneficial to low-income food insecure communities and limited excess to supermarkets due to their distribution results in expensive informal food retail outlet worsening the situation.

The National Food Consumption Survey (NFCS): South Africa, 1999	Labadarios *et al*. 2005	Validated socio-demographic, Knowledge Attitude and Behaviour (KAB) questionnaires; Food Procurement and HH Food Inventory and Hunger Scale; blood and urine samplse for micronutrient status; tap water and maize sample to test for iodine and vitamin A respectively.	A significant percentage of the country's population still live under adverse socio-economic conditions; 55% HHs had a monthly income of between R1–R1000; urban informal HHs had the highest percentage (6%) of no income and 35 had an income of R1–R500; 20.5% of children aged 1–4 years received a high dose vitamin A supplement and 10% never received; four percent obtained water from a borehole and nine percent from a river or dam
South African National Health and Nutrition Examination Survey (SANHANES-1)	Hoosain *et al*. 2013	Questionnaire-based data through interviews and clinical examination health measurements, selection of clinical tests including blood sample for selected biomarker analysis.	Six percent of participants had no schooling, 20% completed matric, and 8% completed a tertiary level of education; 39% lacked money for basic things, such as food and clothes, 18% had most important things, but few luxury goods; 46% of the males and 32% of the females received salaries and wages while a proportion of participants indicated a lack of formal income; 27% of females and 15% of males relied on pensions, grants and UIF.

1.3 Aim and objectives

1.3.1 Study aim

The aim of the study was to determine the food security status, coping strategies, food intake and nutrition status of the Kenneth Gardens community in order to plan interventions to address food insecurities with the aim of improving the nutrition status of the community.

1.3.2 Objectives

•To determine the socio-demographic profile of the households by means of a socio-demographic questionnaire.
•To determine the anthropometric status of the caregivers by weighing and measuring the participants in order to determine Body Mass Index (BMI).
•To determine the participants' dietary intake by completing 3x24-hour-recall questionnaires.
•To determine food variety intake of the participants by completing a Food Frequency Questionnaire (FFQ).
•To determine the food security status of the community by use of a coping strategy questionnaire.

1.4 Plan of research activities

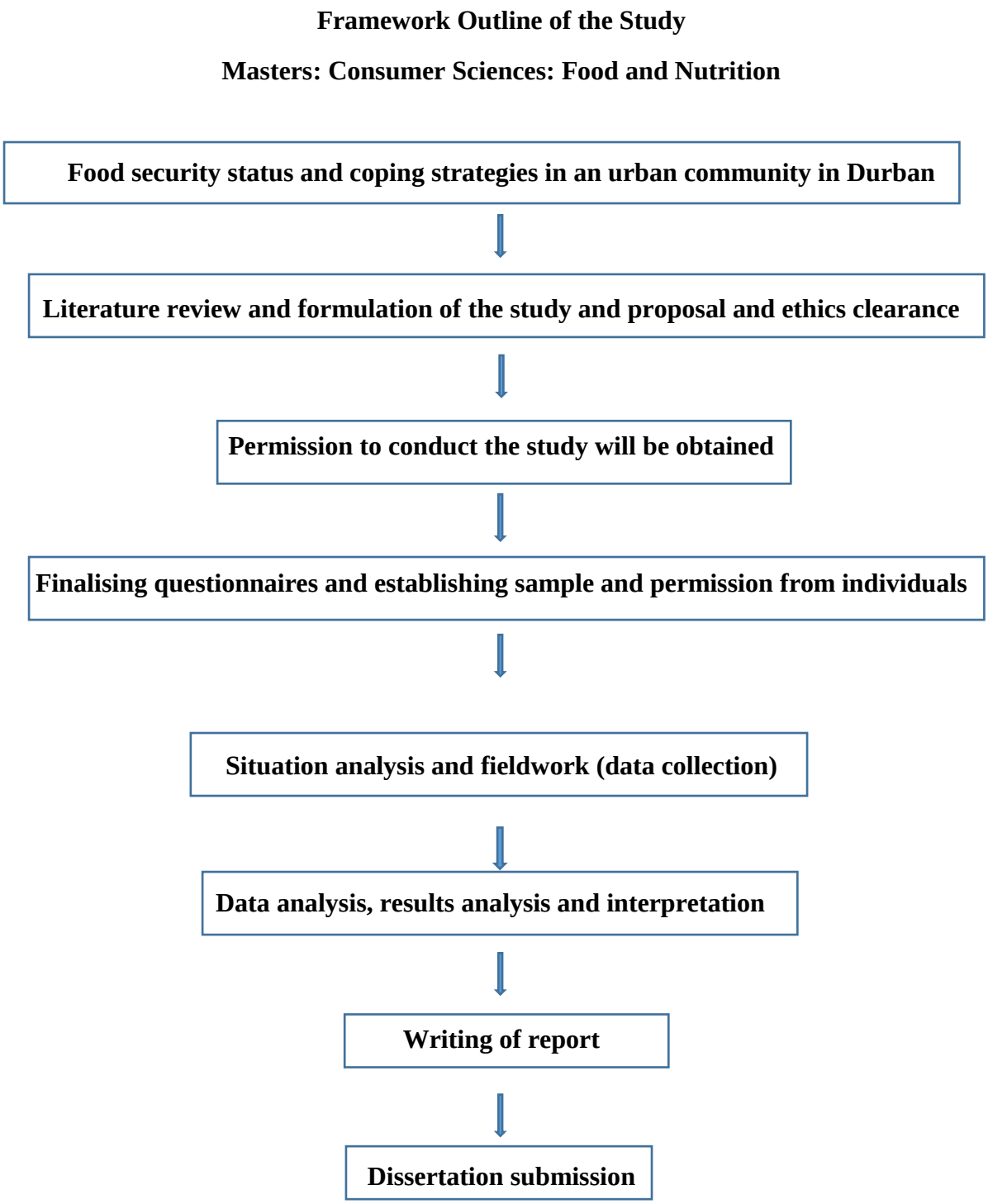


Figure 2.1: Plan of research activities

1.5 Structure of dissertation chapters

Chapter 1:	Introduction and motivation for the study
Chapter 2:	Literature review
	- Views and studies conducted by other researchers
Chapter 3:	Methodology
	- Method of work and tools to be used
Chapter 4:	Results
	- All results stated and discussed
Chapter 5:	Conclusions and recommendations
	-Suggestion for further development and investigation on study

1.6 Conclusion

Studies conducted locally and internationally clearly state the urgency and the importance of eradicating hunger and poverty in the world, and mainly in developing regions. Targets may not have been reached on time but there has been relative progress made by many countries around the world. The FAO report (2015c) announced a global reduction of 167 million undernourished people over the past 10 years. However, it was insufficient. Food insecurity still remains a global challenge and the number of malnourished people is unacceptable (Labadarios *et al*. 2011: 891; FAO 2015a).

Socio-economic growth, political instability and global challenges are some of the unpredictable factors affecting the progress in achieving all of the targets set. Furthermore, there has been an increase in vulnerability and food insecurity for many countries and population groups. Frequent food crises jeopardise the livelihoods of numerous households across the world, and thus it is paramount that each country has measures in place to protect vulnerable groups during economic, political or natural disasters as the most vulnerable are greatly affected and take longer to recover (Nawrotzki *et al*. 2014: 283; FAO 2015a; Drimie *et al*. 2013: 218).

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Food is one of the most significant aspects in the life cycle of a human being and plays a significant role to ensure a healthy and active life. Every human being has the right to constant access to nutritious food, which maintains human dignity; however food is not always available to people due to several factors such as economic, political and environmental factors. The food choices made on a daily basis influence the health of any individual in either a positive or negative manner. Food choice consequences, positive or negative, may not appear immediately but will affect an individual in later stages of life. Therefore, a healthy diet or good eating habits are crucial for health benefits and to prevent diseases. Although people realise and are aware of the benefits of making good food choices, there are several factors that manipulate the final decision: cost of food, availability, convenience, preference, eating habits and ethnic heritage or tradition (Rolfes, Pinna and Whitney 2011: 2).

The cost of living has been relatively high since the 2008 economic crises, more so in developing countries where poverty is more prevalent. This has resulted in many people compromising their diets in favour of cheaper, more affordable but less healthy foods which contain insufficient quantities of nutrients to support and maintain a healthy body and perpetuate lifestyle diseases such as obesity, hypertension, cancer and diabetes etc. Economic growth is principal in eradicating hunger and poverty in the world, especially in poverty-stricken households as it provides an opportunity to develop livelihoods and increase the productivity and income of small family farmers (Labadarios *et al*. 2011: 896; Pereira *et al.* 2014: 339).

The economic crisis has heightened the awareness of food insecurity both locally and globally. The number of undernourished people stills remains significantly high, and the FAO report (2015a) indicated that about 795 million people in the world were undernourished, an evident decrease when compared to the previous years despite the slow economic growth and political instability. Even though there was progress towards meeting millennium goal number one the pace was too slow for some countries to achieve the goal by the end of 2015. Between 1990 and the end of 2015 it was unquestionably apparent that food and nutrition security drive change and much effort is needed in order to provide everyone with an opportunity to live a healthy and active lifestyle (FAO 2015a).

The study under the field of nutrition is vital as it plays a major role in improving the health of a specific community or the population at large, as it determines the health problems and the factors associated with these problems. The data and information obtained from the Kenneth Gardens community study will be vital in determining food insecurity challenges within the community and the analysis of different methods to deal with food insecurity, and will also assist in developing new knowledge which can be of use in other similar communities.

2.2 FOOD SECURITY

'Food insecurity exists when food is inaccessible and when household struggle to securing adequate food' (Labadarios *et al.* 2011:891). The world produces enough food to feed the hungry but not everyone has access, Therefore insufficient production of food is only a fraction in wider context of food insecurity situation in the world. This is evident in many developing countries where there is sufficient production of food but high levels of food insecurity. People access food through purchasing it at local markets or growing their own food.

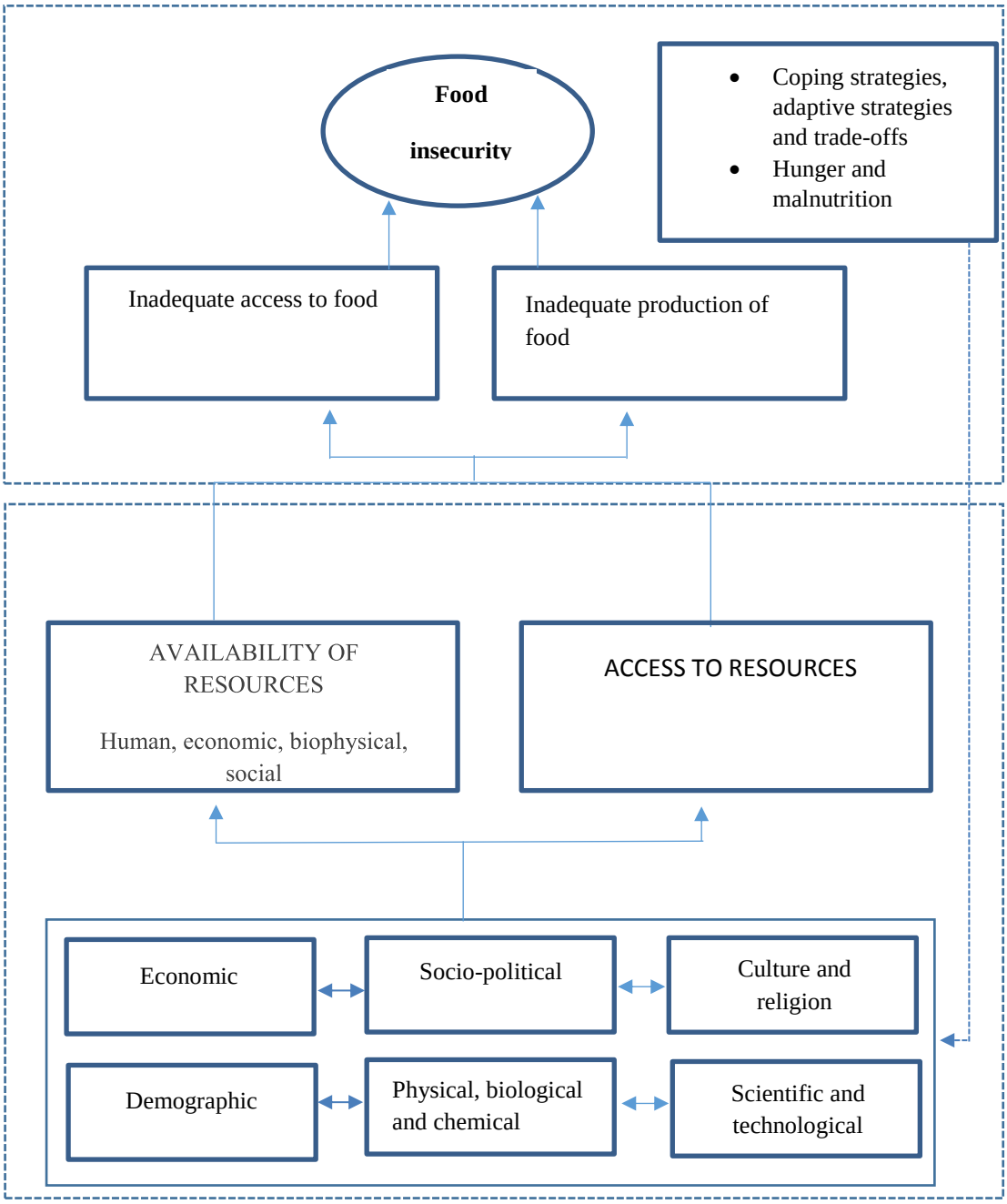


Figure 2.2: Theoretical framework of the process driving food insecurity and the outcome at household level (Misselhorn 2005: 35).

Pereira *et al.* (2014: 339) states that as much as accessing food commercially a vital security factor for poor households, not many earn an adequate income. In agreement with Pereira *et al.* (2014: 339), Labadarios *et al.* (2011: 89) points out that many South Africans lack sufficient income to meet their daily needs. Growing your own food is the most effective approach to cope with food insecurity but challenges posed by global warming make it a challenge for many agriculturally dependent people and furthermore many people lack land to grow food. This means that people have no choice but to continue to access food through purchasing at local markets (Labadarios *et al.* 2011: 896).

Food is extremely expensive and people will only buy what they can afford. That is often processed foods, high in fats and sugar, which lack micro nutrients (Pereira *et al.* 2014: 341). The nutrition transition is apparent to many middle income countries where shifts in dietary patterns have resulted in an increase in public health issues. There are many major factors that affect the state of food insecurity today and each actor needs to be scrutinised (Pereira *et al.* 2014: 339). Food availability, food access and food utilisation are elements of food security and each element can be vulnerable to different factors that require significant consideration if food insecurity is to be eradicated. Food security is complex in nature and requires a systematic approach (refer to table in Figure 2.2). (Misselhorn 2005: 35; Pereira *et al.* 2014: 354). These factors will be further discussed in this chapter.

2.3 THE ECONOMY AND FOOD SECURITY

2.3.1 Increase in food prices

The global economy is in transition and presently under strain since the economic crisis recovery has been slow. The WB (2016) study on economic prospects reported that emerging markets were a major boost to the world's economy, however the world's economy had failed to achieve expected targets in 2015 and if emerging markets regress, it may continue to hinder economic growth. The majority of these markets are based in developing countries where most of the world's vulnerable live; however if there is to be hope for economic growth, high income earning countries need to continue their momentum (DBSA 2010).

One of the worst consequences of a weak economy is the cost of living, including food costs. The cost of food affects everyone and unfortunately it has remained high in past few years. Despite the economic crisis, food prices are interrelated to energy prices mainly because food production, the supply chain and the cold chain relies on energy. Diversion of agricultural

resources to the production of biofuels also influences food prices. Price control only applies to certain foods such as bread, maize meal and dairy products and makes no significant change to household food insecurity. Food prices in South Africa and across the globe will mostly continue to increase in the next few years. There has not been a significant decrease to the level it was years ago. High food prices negatively affect food security. Poor households are susceptible to sudden food price swings and are normally affected the most as a large percentage of their income is reserved for food. High food prices influence people's diets and lead to serious health implications and also start social unrest (DBSA 2010; WB 2016a; Bellemare 2015: 3).

2.3.2 Inflation

The global economic situation creates instability. Due to differences in the financial, social and cultural structures of countries, barriers prevent increasing urgent solutions to create and develop a stable economy from being found. According to Cette and De Jong (2013: 2579), inflation rates are affected by the state of the global economy. Globalisation makes it a challenge to control inflation rates; nonetheless efforts to control inflation have proven to be effective in certain countries. An inflation targeting strategy is one of the interventions to try to provide stability in prices. It was initially implemented by New Zealand to increase monetary performance and has proven to be effective. Lower inflation rates are achieved by all the countries that have utilised an inflation targeting strategy (Simionescu 2015: 63).

2.3.3 Sales of assets

In time of food insecurity, increase in indebtedness and selling of assets is one of the most common coping strategies. Loss of assets due to bad economic conditions may not be easy but it is inevitable for the world's poor. Even though assets such as livestock and farming equipment are a very important part of rural people's livelihoods, low income people in particular are vulnerable to sudden economic shocks or food insecurity. Rural households depend on assets to generate income; however when faced with a crisis, the response to sell assets is not an arbitrary one. Losing productive assets further increases vulnerability and household food insecurity (Kirkland, Kemp, Hunter and Twine 2013: 69). It is quite common for urban communities to lose or sell homes to settle unserviceable debts and they sometimes sell consumer goods such as jewellery and electronic appliances. Valuable assets such as cars are sold to recover from debt (Heltberg, Hossain, Reva and Turk 2012: 710). Musemwa,

Muchenje, Mushunje, Aghdasi and Zhou (2015: 648) stated that the selling of assets as a coping strategy has a long-term damaging effect and hinders future productive capacity.

2.3.4 Scientific and technological

Proper infrastructure and technology have been phenomenal tools in global development and economic growth. Building proper distribution networks and infrastructure is a wise investment for any nation. Although considered new, technology is a crucial factor in determining agricultural future. Marilia Mitidieri Fernandes de Oliveira *et al*. (2015: 1680) claims that new technology will contribute immensely to meeting the demand for food and will also assist in monitoring food management, quality, safety and nutritional value. The world is still to embrace the presence of new technology. Investment in agriculture and technology has made an enormous contribution to the development and progression of many nations in the world. New skills and expertise are required to maximise on gains (Roy and Chan 2014: 120).

Biotechnology is one of the technologies that can contribute to adequate production. It uses modern technology to accelerate development of crops and animals, which means longer production of food, leading to higher income, less damage to the environment, food security is strengthened, nutritional value in food is increased and it also reduces production costs. The concern is that it is tailored to large-scale farmers and disadvantages small-scale farmers in terms of sustainable development and equal market opportunities. To an extent it poses some food safety risks and furthermore prevents the re-use of seeds, which could potentially result in complete failure (FAO 2012).

2.4 DEMOGRAPHIC FACTORS

Misselhorn (2005: 35) furthermore presents demographic factors connected to food security in the process driving food insecurity framework (figure 2.2). The author explains that at the level of the community and household, food shortages are determined less by a local production deficit, than by failures in the ability to access food, largely through food purchase, though exchange (such as food for work), gifts are also a means to meet food requirements amongst communities in time of food insecurity (Misselhorn 2005: 37).

Migration and urbanisation

The driving force behind migration is the fact that urban areas are more developed and provide better access to employment and government services including education, health care,

electricity and water. In the past few years a trend of people migrating to urban areas has been apparent. There has been a significant increase in urbanisation throughout the word, particularly in developing nations. It is expected that by 2052 one in three people will be living in an urban area. There are already more people in urban areas than in rural areas, increasing by 60 million annually. Approximately 80% of South Africans will reside in urban areas by the year 2050 (UN 2014). The economies in rural and urban areas are totally unique. There is more investment in urban areas. Therefore, they provide better infrastructure and income. People living in urban areas have 40% more income on average. Relatively, adequate income improves the overall household income, not only for the person who migrated but also for the people remaining behind. A significant proportion of rural populations depend on migrated family members or relatives for means of income (Pretorius and Sliwa 2011: 178-179; Meacham 2014: 1).

Life in urban areas moves at a faster pace than in rural areas, people have less time to prepare food and normally adapt to a western diet which consists mainly of convenience and processed foods which are high sugar, salt and saturated fat. Furthermore, they tend to neglect consumption of fruit and vegetables. Physical inactivity accompanied by poor diets in both rich and poor countries, urban and rural increase the risk of chronic diseases such as heart disease, stroke, cancer and diabetes. People are thus encouraged to engage more in physical activities because over fifty percent of deaths equate to chronic disease worldwide. More than 82% of deaths are related to non-communicable diseases (WHO 2014b). Furthermore, urban populations are less active and rely on transport to get around compared to rural people who, being generally more physically active, tend to walk to work, school or to the neighbour's house. Physical activities in urban areas such as playing sports are often replaced with sedentary activities such as video games or watching television. Changes in lifestyle and diet have serious health implications. Knowledge about healthy lifestyle practices is vital when adapting to a western lifestyle. Western dietary guidelines can be applied both in an urban or rural community (Pretorius and Sliwa 2011: 178-179).

Although there are great benefits associated with migrating, there are also challenges. Urban communities have rising levels of unemployment and food insecurity. Meacham (2014: 1) explains that issues of food insecurity and malnutrition increase as urbanisation statistics rise. Urban communities are more susceptible to high food prices and normally purchase food at supermarkets which mainly favour high-income consumers. The UN (2014) agrees with the finding that an apparent increase in poverty has become more prevalent in disadvantage urban

settlements including inner cities. Other risks associated with urbanisation are high concentrations of people and buildings which could potentially lead to extreme events such as natural disasters, change in weather patterns and unpredictability (UN 2014; Meacham 2014: 12).

2.5 SOCIO-POLITICAL FACTORS

Social and political unrest has been part of history since the beginning of time, primarily because people are unique and have different beliefs and perceptions, which can result in protest and attacks. Unfortunately the consequences are brutal and chronic and often shorten lifespan. During and after the world wars, people suffered immensely. There was widespread starvation when food supplies ran out and billions of people could not meet their nutrition needs adequately. However, the world was able to recover eventually through the concerted efforts of agricultural research and development, infrastructural improvements and advances in technology. Social and political upheaval affects all aspects of human life including the economy, food systems and healthcare (Barrett 2013: 2).

Socio-political stability and food security have an interrelationship. Whenever there are wars, one of the first things that are affected is the supply of food and food riots occur when there is food insecurity (Ozor, Umunnakwe and Acheampong 2013: 404). Availability of, access to and utilisation of food are foundation of food security. Without any of these pillars, food insecurity occur. Food availability is the key limiting factor to achieving food security. Without food availability, access and utilisation remain dormant. The focus should be on how social and political stability affect food security. Initially, the supply side of food security relates to availability. When food supply chains are affected, access to food is restricted. Thus there is a strong correlation between the two. An unstable economy is another adverse effect of socio-political instability. Interruption of the world's economy sparks an increase in food prices and since the world's poor access food commercially, this means millions of people cannot afford to eat a healthy diet, causing a vicious circle of poverty and malnutrition (Barrett 2013: 13).

The world health system relies on healthcare workers to assist in dealing with all health related issues facing the world today. Socio-political unrest undermines this and threatens the health system when health workers are killed. Recently 14 healthcare workers were killed and 37 injured by a rocket in Afghanistan, and in Syria over 50% of healthcare workers have been killed. The number of healthcare workers who become the casualties of socio-political unrest increases in the countries that are currently involved in wars and accordingly the level of food

insecurity increases (WHO 2015c). Price and Bohara (2013: 309) agree with the WHO (2015) that utilisation of healthcare decreases during wars and contributes to unnecessary deaths.

2.6 CULTURAL AND RELIGIOUS FACTORS

To many people in the world food is associated with cultural identity and a sense of belonging. Each culture has its own traditional food patterns and culturally accepted foods. This is not only in respect of food choices but preparation methods as well. Many different cultures have acceptable and non-acceptable foods. Foods that are accepted in one culture may be prohibited in another. Trefry, Parkins and Cundill (2014: 555) indicated that culture can either constrain or enhance food security. Food becomes a social and cultural symbol. Culture is defined as 'the shared patterns of behaviour and interaction, cognitive constructs, behavioural norms, expectations and effective understanding that are learned through a process of socialization'. The customary ideas, rules, and rituals about access, utilization of food is known food and culture (Steyn and Temple 2008:200; Barasi 2003: 30-31).

It is extremely difficult to change food habits and often people are resistant to change. Traditional and western cultures have different belief systems and are frequently reluctant to revolutionise mainly because their culture has been practiced from generation to generation. Perceptions and a lack of education are the primary reasons why most people are reluctant to change particular dietary habits. The majority of people believe that by adopting healthy eating habits they are letting go of their heritage and are conforming to a new dominant culture. Certain foods hold strong relevance to certain cultures and without these foods, identity is lost. Food habits are often belief-driven. In countries where there is not a strong food culture and knowledge about nutrition is limited, food choices are often associated with beliefs including religious beliefs (Trefry, Parkins and Cundill 2014: 557).

Different religions dictate which foods are acceptable; for example followers of the Islamic and Jewish religions eliminate pork from the diets. The most important component when planning individual or community education is changing beliefs as beliefs influence food choices and determine behaviour in relation to food. Schools provide an ideal platform since beliefs are easy to change at an early age. However, they should not be seen as a platform to indoctrinate children. Inappropriate food habits associated with culture and religion can affect the health status of many people. However, women are more willing than men to adapt to healthy eating habits and try new lifestyles than are men with health issues, young adults, the elderly and those diagnosed with life threatening diseases (Barasi 2003: 3).

South Africa is a diverse country rich in tradition and culture. There are eleven official languages and nine are indigenous. This cultural diversity influences food habits and dietary patterns. South Africa primarily embraces four diets which include the African diet, also known as a traditional diet, the Indian diet, the western diet and the vegetarian diet. Traditional diets are based on harvested agricultural products, wild plants, hunted wild animals and indigenous foods. Indian diets are dictated by their religious beliefs and many Indians are accustomed to the vegetarian diet. The most common foods are curries, samoosas and rotis (Steyn and Temple 2008: 200).

The majority of white South Africans follow a western diet, which consists of three meals that are high in fat, low in carbohydrates and include a moderate amount of protein and are low in fibre. This diet has been adopted by many South Africans from different cultural backgrounds. Vegetarian diets are mostly followed by Indians and other South Africans for different reasons ranging from religious beliefs, health concerns, ethics and hunger strikes (Steyn and Temple 2008: 200; Drimie, Faber, Vearey and Nunez 2013: 220).

Religious beliefs influence the dietary patterns followed by many people. Religion and culture are important aspects of life especially in adults. Their behaviour and lifestyle is often shaped by their religious beliefs. People who follow the same religion tend to form a social cycle spending time together and participating in similar activities. Certain religions forbid particular foods and consumption of these foods can be regarded as a sin. For example, the Hindu religion prohibits taking life including that of animals, therefore diets mainly consist of vegetables and may include eggs. Hindu diets vary with its diverse traditions and some include certain kinds of meat, as long as the trauma and suffering of an animal is minimised. The Islamic religion follows the Koran religion and Muslim often fast, especially during the holy month of Ramadan, and don't eat pork. Other religions in South Africa include Judaism, Buddhism, Mormonism, Protestants, Rastafarianism, Seventh-day Adventists and Roman Catholicism. Among people who follow the same religion there are other factors that influence their food choices, such as the availability and food cost and personal preference (Kim, Mcintosh, Kubena, Sobal 2008: 206; Steyn and Temple 2008: 207).

Certain religions advocate strict diets mostly based on holy texts, for example, the Bible, Torah or Koran etc. Fruit and vegetables are the most common food consumed by followers of various religions. There is an intercalation between religion, eating habits and nutrition. Certain religions associate their health status with their belief system and are adamant that the more

religious you are the better your nutritional status will be. Some religions encourage certain diets that are believed to heal diseases (Steyn and Temple 2008: 200). Hye-Cheon Kim *et al*. (2008: 206) found that religious people with influenced food choices had a higher nutrient adequacy, lower energy intake and lower BMI than those who were not of these religions. Not all religions follow healthy diets and some religions prohibit or eliminate certain foods, restricting essential nutrients required by the body, and therefore compromising the health of individuals for example, triple burden malnutrition (Steyn and Temple 2008: 211).

2.7 AVAILABILITY OF RESOURCES

2.7.1 Human resources

Humans are an integral part of the agricultural sector, and investment in human resources development (HRD) is a critical component in enhancing agricultural productivity. Human contribution is equally important as all the other agricultural inputs. Agricultural performance depends on the capabilities of human workers. Therefore, it is imperative that workers are educated and skilled to be effective and productive. Lack of human resource development strategies (HRDS) hinders productivity. Knowledge-based economy and competitiveness can easily be achieved through human resource development (Roy and Chan 2014: 120).

A large number of farmers, particularly rural farmers, are poor and lack education. Educated workers often migrate to the cities in order to gain better employment. Kimhi (2009: 169) further states that the productivity of workers increases with their level of education and is the phenomenon that has established economic growth. Spronk, Kullen, Burdon and O'Connor (2014: 1713) believes that education not only improve knowledge, but also support comprehensive dietary intake of a community. A positive correlation between high level of education and high level of nutrition knowledge.

Technology has proven to be a success in the agricultural industry. However, advanced technology is only as effective as the person's capabilities. Roy and Chan (2014: 120) attest to a lack of knowledge in soil fertility resulting in poor yields for rice farmers in Bangladesh. Upgrading of the quality of human resources employed is paramount (FAO 2010a). Ele, Okon, Ibok and Brown (2014: 442) stated that inefficient traditional technology was one of the reasons for poor performance in Nigeria's agricultural sector.

Global challenges put pressure on agriculture, and strengthening human capacity is not only necessary to cope with challenges but also to adapt to the changes (FAO 2010a). Human resources are heavily influenced by the income of farmers, and farmers need to generate sufficient revenue to remain self-sustainable and be able to retain farm workers. Inadequate production results in loss of profits and eventually loss of skilled workers (Roy and Chan 2014: 120).

2.7.2 Economic resources

The agricultural sector contributes significantly to the economy of many countries and thus remains vital. Most countries' Gross Domestic Product (GDP) is boosted heavily by the agricultural sector (SSA 2015). One third of the GDP in Sub-Saharan Africa is generated by agriculture. Even though the GDP from South African agriculture has decreased over the years, the agricultural sector still contributes substantially to the overall economy and continues to be profitable. SSA (2015) shows that the gross farming income was R131 billion. In Bangladesh 18.6% of the country's GDP came from the agricultural sector, providing employment to half of the labour force (Roy and Chan 2014: 120).

Economic resources include capital, land and labour. Land is a limited and a fixed resource for many economies. The key to sustaining economic growth and uplifting the socio-economic condition of farmers is capital. Capital as a monetary resource is vital in the agricultural system, for purchasing natural resources, land and other capital goods and also physical assets to produce various goods or services (FAO 2013; Roy and Chan 2014: 123).

Availability of economic resources assists in increasing agricultural productivity, profitability and sustainable socio-economic development. Furthermore, it accelerates poverty alleviation. Funds are allocated primarily for development and improvement of the agricultural sector. Without these funds, serious implications emerge. It is notable that the agricultural sector provides more than food, as it is also a livelihood for many people. Agricultural interventions are critical in controlling high food prices. According to the FAO (2011) scarce and declining food resources may continue to have an impact on food prices in the future. The World Bank (WB: 2015) supports investment in agriculture and further states that the agricultural sector is more effective than any other sector in raising income amongst the poor. Increasing evidence from many studies reiterates a positive correlation between government expenditure and economic growth (Ele, Okon, Ibok and Brown 2014: 442; FAO 2015a).

2.7.3 Social resources

People have co-managed agricultural resources for years and such collaborations are institutionalised in different forms including local association, clan groups, traditional leadership, youth clubs, women's self-help groups etc. These groups operate in terms of rules and norms embedded in many cultures and traditions. Social capital is divided into numerous forms that can be utilised in the construction of social resilience as part of human resources to food insecurity. The social capital includes institutions fused by common rules, trust relations, norms and networking among communities and social group networks with the common goal to build sustainable livelihoods (Godfray *et al.* 2010: 327). The WB (1998) indicates that it is the cohesion of the institution that is important and attributes to economic development.

Social bonds and norms are important for sustainable livelihoods. However, these bonds can easily be affected by unforeseen challenges such as HIV and AIDS, socio-political unrest, poor economic growth and poverty. HIV and AIDS affect community livelihood of and families in several ways. Firstly it causes the health status of patients to deteriorate, reducing productivity. It also increases vulnerability to poverty and increases the instance of child headed households. Skills and knowledge, including behavioural norms that could have been transferred from generation to generations, are lost and in some cases property rights as well (Godfray *et al.* 2010: 327; Misselhorn 2005: 39; FAOb 2011).

HIV and AIDS together with poverty, poor financial resources, and political and economic instability encourage disinvestment in family agriculture to seek better livelihood strategies. Godfray *et al*. (2010: 327) indicated that not investing enough in agriculture is part of the poverty trap and increases vulnerability. Socio-political unrest triggers migration of communities, disturbing family units, values and shared knowledge. Social investment creates jobs, welfare and economic growth. Adequate resources ensure maximum impact in terms of agricultural production. Lack of social investment increases vulnerability and widespread poverty. Therefore local capital is significant in sustaining livelihood, improving food security and combating poverty. All social protection programmes need to be designed in ways that encourage agricultural production (FAO 2011b).

2.8 ACCESS TO RESOURCES

Agricultural production depends on the availability and accessibility of resources. The gender gap in agriculture limits adequate production of food. The FAO (2011) stated that production in agriculture would improve if women were not discriminated against and were given equal opportunities; moreover decrease hunger in the world. Resources such as land access and rights, financial services, markets access, education opportunities and access technology still favours men over women. The financial sector invests more in male-driven agriculture than women. Credit programmes and agricultural production loans are mainly directed to men. Only a small number of NGO's target women and the loans are on a small scale. There is further inequality in extension services and agricultural training. Kambou (2015: 23) indicated that researchers around the world have repeatedly shown that empowering women can assist in improving the global economy. Providing equal opportunities to resources and education of women to improve knowledge and skills is the starting point. Some co-operations and governments have incorporated this social dimension into their 'think forward' policies.

The yields of plots cultivated by women are smaller than those cultivated by men and furthermore, land ownership is usually dominated by men. The limited legal right to land and other assets drives women to prioritise consumption over investment. Livestock is equally the same, as men tend to take responsibility for livestock production such as cattle. There are relatively few women in livestock production and they tend to farm pigs and poultry. There are inadequate policies in the agricultural sector. Policies should promote gender equality and eliminate discrimination. Not only towards women, but to all people involved in the agricultural sector. The policies will enable women to have equal opportunities to access markets and can be better rooted in national and international supply chains furthering access to critical resources such as small business loans (FAO 2015a; Kambou 2015: 23).

2.9 AGRICULTURE

2.9.1 Inadequate production of food

Agricultural production is the key to food availability and sustainability in the growing world. However, the 21st century poses multiple challenges that have caused a major shift in agricultural production. The fact that the world demands more food than it can produce exacerbates the situation. Fereres, Orgaz and Gonzalez-Dugo (2011: 4079) state that there will be a substantial increase in food demand. Contributing to the demand for food is the major

annual population growth. The 2015 world's population prospects indicate that the world's population is approximately 7.3 billion and is expected to be 8.5 billion by the year 2030. In the past 12 years the world population has increased by 1 billion and Africa is the fastest growing continent. (UN 2015b; Fereres *et al.* 2011: 4079). Population increase in the world means increase food demands (FAO 2015a).

The significant role water plays food production is paramount, as it supports the main production of all terrestrial ecosystems. The continuing increase in water scarcity due to environmental and economic limitations in numerous regions in the world further challenges agricultural food production and therefore contributes enormously to the state of food insecurity. Strategies to address water management in terms of supply and demand are thus imperative. The food production system needs to be part of the development agenda for any country in order to improve resilience and cope with the fast-growing population (FAO 2015a; Fereres *et al.* 2011: 4079).

Inadequate production of food in the 21st century is essentially due to global warming (climate and environmental stressors), insufficient agricultural inputs, property rights and land access, low regional cereal availability, and pests and diseases negative impact crop production, livestock and overall food production system. Technology and extensive policies are key in dealing with any drivers in food production systems (Misselhorn 2005: 35).

2.9.2 Climate and environmental stressors

In the early 90's, changes in environmental patterns were noticeable and the impact has escalated to unacceptable proportions possibly due to modern activities. Gas emissions from cars, refrigerators, air conditioners and foam insulation are some of the factors that contribute to global warming, which interferes with clean air, safe water, and the availability of adequate food, tolerable temperatures and a stable climate. Global warming is among of the most challenging issues in the history of mankind today. It has exacerbated the extent of poverty, hunger and food insecurity in the worldwide and further threatens any sustainable development. It also threatens to impair the health of mankind and increases vulnerability to hunger and poverty today and in the future, adding to an already severely overburdened tendency to stress. Arguably the most affected are the species and the ecosystem (Martens 2014: 1; FAO 2016b).

Global environmental change has instigated development in trends and trade and altered production patterns. El-Sharkawy (2014: 174) indicated that in the past 50 to 70 years, temperatures have risen by 0.8° C due to an increase in biogenetic gases and they will most likely continue to rise. Low agricultural production is expected with unfavourable high temperatures. The impact on crop production is projected to effect crops negatively in low latitude but positively in high latitude tropical regions (El-Sharkawy 2014: 174; FAO 2015b). Extreme weather patterns not only affect food production and malnutrition but also transportation, supply chains and logistics. The impact of this, forces countries to be dependent on global markets for imports, which increases the countries' risk to high market prices and price volatility (FAO 2015b; FAO 2016b)..

Although climate change is not the main driver of food insecurity, it is a trigger for most other drivers. The FAO (2016b) raises anxieties about climate change with regard to ending hunger and malnutrition. Unpredictable weather conditions negatively affect the ability to meet food demands, adding to the inadequate food productions that already exist. Traditional ways of producing food are the most preferred methods. However, it is important to acknowledge environmental change and its effect on yield production in the past few years. Food is an essential part of every human diet, inadequate production of food indicates that many people would go hungry and the increasing population growth puts more pressure on food production demands. This continues to disadvantage the world in all areas of sustainable livelihood (Godfray *et al.* 2010: 812).

According to Martens (2014: 1), global warming or climate change is a general umbrella over the range of problems that have emerged over the years and have caused a demographic trap for most developing countries as many fail to self-sustain. The failure to self-sustain is associated with poverty and malnutrition. The impact of climate change also affects the nutrient content in food whereby the high concentration of carbon dioxide (CO_2) has caused a decreased or lower concentration of the levels of vital nutrients and increased levels of carbohydrates and sugar in wheat, rice and soya beans, adding another deficit in the malnutrition challenge including obesity in food insecure communities (Martens 2014: 1).

The FAO (2015a) estimated that 58.3 million people globally engage in the fisheries sector and the majority live in low and middle income countries. Ninety percent engage in small-scale activities which include self-employed fishers and households who fish as part of their livelihood activities. Global warming triggers floods or tropical storms causing the sea level to

rise and therefore further impacting on the fishing sector dependent communities by posing increased physical risk depending on the nature of fishing resources and catch methods. The other risks include fluctuation in fish stocks, health risks (bilharzia, malaria), political, security, and market risks due to market devaluation and fuel prices. El-Sharkawy (2014: 174) was certain that the temperature will continue to increase at an ever accelerating rate causing changes in rainfall patterns and an increase in sea levels. The agriculture, forestry and fisheries sector has to evolve with these trends to meet and manage production demands and furthermore withstand accelerating climate patterns. Development of suitable policies and impactful strategies, allows for needs affecting climate change thereafter food security to be recognised and characterised. Strategies to fight climate change need to be undertaken in conjunction with eradicating hunger and poverty (FAO 2013c).

2.9.3 Insufficient agricultural inputs

Agricultural inputs are the direct and indirect resources used in farm production and a critical element in food production. Direct resources include seeds, plant material, water, fertilizers and pesticides and indirect resources would be equipment and fuel. Unfortunately most farm inputs are purchased and operations are no longer powered by animals. Over the years the cost of agricultural inputs has escalated relative to commodity prices and has led to a cost price squeeze which refers to the relationship between prices paid for inputs compared to prices received for outputs. This alone can decrease agricultural production and put small scale-farmers out of business. Furthermore, insufficient inputs limit diversity and make it impossible to expand production (FAO 2010a).

The cost of inputs is normally regulated by the government where pricing is fixed for all inputs based on procurement and production costs. Increase in agricultural operation costs including labour costs and fuel prices results in a reduction of farmers and planted land. Challenges and factors affecting agricultural production have caused changes in policies regarding pricing and distribution and have allowed private sector participation which creates competition and puts farmers out business (FAO 2010a; FAO 2010c)..

2.9.4 Property rights and land access

Property rights and land access has a broad impact in the livelihood of communities. The FAO (2010b) stated that land is essential for agricultural production for many communities in the world and it is the source to secure natural resources through fishing, hunting, pasturing or

other activities. However, many people lack property rights and land access. The concern is that many people in developing countries depend on agricultural produce to survive. Lack of land not only limits access to food but also forces people to purchase food commercially and the difficulty with that is that not everyone has the buying power to secure the right foods (Labadarios *et al*. 2011: 897).

Many African countries were colonised by Europeans and this resulted in systematic displacement of the indigenous people who lost land and productive assets (Hendriks 2014: 2; Pereira *et al*. 2014: 342). Land has social, cultural and political functions unique to a country's history. A big part of history was lost when people were relocated. After the colonisation in South Africa indigenous people only owned 13% of the land area which was fragmented and in isolated pockets with poor infrastructure. As a result of this many people relocated to become labourers to support their families (Pereira, Cuneo and Twine 2014: 342).

Land reform ensured that inequality to land access was addressed and people could be relocated to their homelands. Nonetheless, the utilisation of the land for agricultural use is minimal, and little or no income from agriculture contributes to household income (Pereira *et al*. (2014: 342). Labadarios *et al*. (2011: 897) suggest that the best wat to address property rights and land access is through non income dependent measures that are maintainable, for example by promoting subsistence farming. Pereira *et al.* (2014: 342) further states that people lack the necessary equipment for large-scale production, and therefore opt for small gardens for domestic production rather than big fields for commercial sale.

2.9.5 Low regional cereal availability

Cereal is the number one food source and the most essential crop in the world. Not only for human consumption but also as an input to livestock production. The cereal sector directly affect hunger rates. Any negative impact in the production system results in proliferation of undernourishment rate in the world. The majority of people consume cereals like maize, rice and wheat as staple foods and persistent poverty prevents a significant number of people from meeting their nutritional needs (Ray, Mueller, West and Foley 2013: 1; FAO 2015b). Dinesh, Bett, Boone, Grace, Kinyangi, Lindahl, Mohan, Ramirez-Villegas, Robinson and Rosenstock (2015) indicated that the production of maize and beans which are the two staple foods in Africa will decline by 20-40% due to increased regional temperature.

The growing world population has put pressure and more demand on food production. In the past four decades there appears to have been more demand in developing countries and they will become more dependent on imports. Other countries have rapidly increased from medium to high levels of consumption. In order to feed more people in the future, a new approach to boosting yield production is urgently needed (Ray *et al.* 2013: 1). Developing countries could produce up to 86% of their own needs by 2030, three times the present level. However, factors that influence and interact with agricultural production such as agricultural information is paramount. Agricultural information not only assists in boosting production through providing useful, relevant and reliable information but also assists in making decisions affecting the agricultural sector. The FAO (2015a) Cereal Supply and Demand Brief indicated that a decrease of 1.3% in cereal production compared to the 2014 statistics had been achieved. The shifts in diets and increasing biofuels are one of the major contributors to today's cereal demand. Cereal production in 2015 is now forecast at 2 527 million tonnes globally. Even though production seems positive there are areas of concern as most areas have shown a decrease in yields. Climate change is one of the reasons for the substantial decrease in certain regions of the globe. Other declines are location specific and due to socio-economic and physical factors. The influence of transient factors such as a demand in the transition economies, use of cereals for animal feeds and cereal imports have played a progressively smaller part.

The potential solution is for traditional and new exporters to assist in filling the gap provided that the challenges of food security and environmental degradation are addressed. FAO 2015b; Ray *et al.* (2013: 1) indicates that crop production can be improved by sustainable intensification and expansion of croplands. However, which would have to be done at a cost to the environment in terms of biodiversity and carbon emissions.

2.9.6 Pests and diseases of crops and livestock

Pests and diseases have been part of agriculture since its very existence and have serious economic consequences. Global warming increases the risk of pests and diseases in agricultural systems and affects production yield of crops, livestock and fisheries, posing a risk of pesticide residues in food. The higher the temperature rises, the more infestation of pests and diseases occur. New pests and diseases are born which requires extensive use of pesticides. The problem with the high use of pesticides is that it creates resistance leading to reduced efficacy and food safety risks. There is an urgent need to improve pest management. A total of one-sixth of field

production globally was lost due to pests and diseases. High temperatures further contribute to the loss of crops in storage facilities (Dinesh *et al*. 2015: 2; Russell 2013: 3; FAO 2013a).

Farmers who rely on livestock-based systems lose a substantial amount of profits if the quality and productivity of livestock deteriorates as a result of temperature increase and disease. Convergent results indicate that premature death of livestock is caused by infectious diseases. Fifty eight percent of diseases affecting animals are climate sensitive. Animal diseases are transmissible and may also have an impact on human health (Dinesh *et al*. 2015: 3).

Pests and diseases affecting crops and livestock can be managed or controlled in three ways: by avoidance of pests and diseases, direct control measures and biological control but it also requires elimination strategies to be already in place. Such capacity enhancement that assists in detecting and responding to pests and diseases. Furthermore, provides education and information on diseases present, the level of impact and costs for control. Other strategies include co-ordinating data quantity and quality, pre-emptive breeding, resilience of the production system and research and development (Dinesh *et al*. 2015: 3; Russell 2013: 10; FAO 2013a).

2.9.7 Inadequate access to food

A relationship between the inadequate accesses to food and food supply has always existed. Nonetheless, over the years the focus has begun to shift to the factors that negatively affect food access. Since the emergence of hunger, food access has been the fundamental element. While attention has traditionally been on the production of food, experts have identified that accessibility of food as one of the crucial drivers of food insecurity (FAO 2010c).

Many countries provide enough supplies for their people, either through own agricultural production or exporting from other nations. The issue is that a lot of people faced inaccessibility. Maxwell (1996: 157) stated that ‘it is impossible to mention food security while exclusively and completely disregarding problems with supply or at least making reference to the importance of access and entitlement’. The big question that remains is ‘what causes food inaccessibility when food is available?’ Amongst many answers, affordability and proximity of food resources are top of the list. Inadequate access for many communities or people is an issue of affordability. Economically, many people are unable to access healthy foods due to poverty and often including unemployment and they therefore opt for cheaper foods.

Geographically, food systems are uneven throughout different living areas. Food deserts exist in economically disadvantaged areas where local residents do not have sufficient access to large or affordable outlets for a healthy diet. Access to food in urban and rural areas is dynamic and unique. However, food deserts exist in both geographic areas. Although research has focused more on urban food deserts, rural food deserts are responsible for the deterioration of food access but both suffer from market realities. Physical access to food for urban communities is much easier when compared to rural areas where distance has an impact. Rural areas are widely spread and people have no choice but to travel long distances to access food. Besides long distances, poor road conditions, limited transport and transportation costs that prohibits communities to access fresh and healthy foods as opposed to urban areas where grocery shops, usually supermarkets, are within closer proximity. There is certainly a better selection of food items for urban communities but they may be inaccessible due to high food prices thus creating limited access for most poor households. The impact causes a shift in diet to more stable foods with insufficient fruits and vegetables, leading to negative health implications (Battersby and Crush 2014: 143; Peyton, Moseley and Battersby 2015: 37)**.**

2.9.8 Poor market access

Poor access to markets is a limiting factor in agricultural growth and development. Increasing evidence of the importance of agricultural production cannot be questioned since the occurrence of food insecurity in the world. Food producers, or farmers, rely on access to markets to survive, and weak links to markets lead to a decrease in agricultural production and economic growth, further perpetuating hunger and poverty. Agriculture is crucial to the world's poor as it represents over 50% of low income national exports. Strong links to markets ensure that farmers can sell produce and receive a competitive price thereby enabling investment in their own companies, boosting diversity of produce and moreover, quantity and quality strengthen food security through income regeneration (FAO 2015a).

The FAO (2011a) stated that poor access to market information results in produce wastage and low prices for farmers. High tariffs create trading barriers for famers that export produce. Another barrier experienced by farmers that creates distrust and dishonesty is lack of relevant information about the market. Often farmers are misled about current market prices for different produce. Small-scale farmers are often isolated from large-scale retailing and consequently have to trade from small spaces. In Uganda, a part of the challenge was the involvement of development agencies that crowded and corrupted the business sector that

mainly focused on expanding market intelligent services as a lucrative business (FAO 2011a). Investment in infrastructure to enhance market access including education about markets, food handling, processing, distribution and marketing is needed (Lybbert and Sumner 2012: 116).

2.9.9 Poor distribution network and infrastructure

Agriculture is one of the most vital sectors in any country's economy. Stagnation in agricultural production has serious economic implications. Firstly, the county has to rely on imports to feed the nation which are astronomically high in cost compared to producing own food, exhausting funds that could be utilised for development and investment. The cost of food increases, driving people to poverty and food insecurity. In addition, vast areas in developing countries lack proper infrastructure, creating barriers for effective distribution of produce to various parts of the countries including cities (Collier and Dercon 2014: 92).

Agricultural productivity increase in Africa is the slowest in the world and this is due to a lack of adequate policies in place, lack of land rights and insufficient investment in the agricultural sector. Furthermore, Lybbert and Sumner (2012: 114) state that climate change continues to affect agricultural production and exacerbates the problem. Despite development efforts, progress has certainly been difficult for certain nations, particularly in Africa where public infrastructure such as roads, research and extension, irrigation systems and long term weather forecasts are inappropriate to adapt efficiently (Lybbert and Sumner 2012: 1). The DBSA (2014) believes investment in agriculture is the key pillar for growth and development and plans to invest billions as part of the National Development Plan (NDP) up to 2030. The current investment on infrastructure in South Africa is R13.0 billion.

Poor infrastructure affects distribution networks. In the early 90's many developing countries invested in their infrastructure mainly to advance the economy and improve living standards; however they still face poor levels of services which lead to deteriorating production. Reduced depletion in markets increases costs. Distribution chains commonly favour large-scale food producers and neglect smaller farmers. Moreover, many other factors contribute to poor distribution of food. For instance, poor roads, expensive transportation to markets due to distance, long distance travel and inadequate processing and storage capacity. Infrastructure related constraints need to be addressed, otherwise there will always be a threat to the production and distribution of produce (FAO 2003; Ele, Okon, Ibok and Brown 2014: 442). Godfray *et al.* (2010: 327) indicated that poor transport and market infrastructure increase the price of inputs such as fertiliser and transport costs.

2.9.10 Physical, biological and chemical drivers

Physical, biological and chemical drivers of food insecurity directly and indirectly impact on the state of food security over both a short period and a long period. The physical drivers encompass poor human health, including HIV and AIDS, the impact of global warming and environmental stresses in agricultural food production, production potential of land and insufficient agricultural inputs. Pests and diseases are regarded as biological and chemical drivers. Pests and diseases are accounts to many livestock losses and low regional cereal production. The drivers are interrelated and have a distinct influence on the overall state of food insecurity. There is a substantial increase in diseases affecting both plants and livestock. Climate change alters the patterns of diseases and increases the potential for new diseases that can result in death. Livestock losses relating to diseases are common if not treated. The link between climate change, diseases and biological dynamics requires policies to assist in minimising stock losses, reduce healthcare costs and improve the economy through more animal and animal product sales (Cáceres 2012: 209).

The FAO (2016) indicated that pests and diseases will increase due to favourable weather conditions and are most likely to move to areas of food production that are less biologically and institutional prepared, therefore have high negative impact. New emerging trends in boosting agricultural production might be a solution forward. Physical, biological and chemical threats to food production also raise food safety concerns about a poor agricultural sector, low regional availability of cereal, disease and pest in crops and livestock (Godfray *et al*. 2010: 812; FAO 2015b).

2.11 COPING STRATEGIES, ADAPTIVE STRATEGIES AND TRADE-OFFS

Coping strategies are more closely linked to food access than food availability. Inadequate access to food forces people or households to adopt contingency mechanisms to cope when faced with insufficiency of food. Access to food depends on entitlement. Entitlement failure increases household vulnerability and food insecurity. Food insecurity coping strategies can either be short- or long-term. However, the impact on the household is different. Food insecurity can either be chronic or transitional or cyclic. The short-term coping strategies are immediate and include alternation of consumption patterns and long-term strategies are usually concerned with alteration of income and food production patterns. However, the accurate indicators of food security are short-term consumption strategies. Short-term practices relating to food include consumption of inexpensive and preferred food and utilisation of more severe

strategies such as not eating the whole day (Maxwell 1996:292; Maxwell, Watkins, Wheeler and Collins 2003: 291).

Food security measurement and monitoring have proven to be complicated and very expensive. During emergencies there is no time to collect and analyse data and the conditions are usually not conducive to such an activity. A simple system that was quick and easy to administer was needed to assist as an indicator for household food Insecurity. The development of the Coping Strategy Index (CSI) made it possible to measure food insecurity as well identify coping strategies used. It's been used in many countries throughout Africa to determine how many households were able to cope with unfavourable conditions and which coping strategies were used. CSI provides reliable methods for distinguishing short-term food insecurity at household level. It can also be used to measure food aid impact, and monitor food security risks (Maxwell *et al*. 2003: 294).

There are four types of consumption coping strategies that food insecure household can use. The first coping strategy is a shift in diet, usually a shift from more preferred foods to cheaper and unhealthy foods (Maxwell *et al.* 2003: 294). This is a natural progression and most people are affected. People will only buy what is affordable. A study done by D'Souza and Jolliffe (2012: 283) in Afghanistan into the behaviour prior to and after a price shock showed that people shift their diet to cheaper foods after price increases. However, the impact of price shocks varies from household to household and from country to country. The impact depends on various characteristics of the household and country affected such as the degree of price transmission, dependency on food imports, level of household food insecurity, and whether or not households are net buyers or sellers of food. Developing countries are most vulnerable and suffer high price increases due to the fact that there are high levels of food insecurity, they usually depend on imports and most of the population spend large portions of their income on food.

The second coping strategy refers to the short-term strategies that has severe long-term effects on the state of the household in the future. This is when households try to increase food supplies by using unsustainable strategies. The strategies include purchasing food on credit, borrowing food and sometimes severe strategies such as begging or gathering wild foods (Maxwell *et al.* 2003: 294). Borrowing food from friends and relatives was a common practice indicates Maxwell (1996: 292) in a study conducted and it is further stated that this practice has long-term household effects and may lead to permanent indebtedness. The third strategy is medium

term migration where household members go to the neighbours or relatives to eat. The most common coping strategy is managing the shortfall of food available in the household by rationing it. The household would reduce portion sizes, frequency of meals, sometimes fast the whole day for other household members to eat, for example, adults sacrifice meals for small children to eat. Low income communities or households use this coping strategy often. The majority of participants indicated that fewer meals would be consumed if there is insufficient food, however the meals would be satisfying. Going the whole day without food is one of the most severe coping strategies and participants indicated that they engage in this strategy only at certain times of the year. Another common strategy is maternal buffering where mothers limit their consumption in order for children to consume enough. This strategy was used by mothers only in the entire food security research in this study conducted in rural South Africa. Previous research recognises that food insecurity is linked to poverty, and by addressing issues around the prevalence of poverty it can certainly assist to improve income, and access to education, and build resilience to economic and food related shocks (Maxwell 1996: 29; Maxwell *et al.* 2003: 294).

2.12 ECONOMIC IMPACT ON MALNUTRITION AND DIETARY INTAKE

2.12.1 Impact on a country's economic system

Global economic growth has struggled to recover from economic crises since 2008. The WB (2016) reported on yet another disappointment when the global growth decreased by 2.4% and was projected to recover sluggishly in 2016. The decrease in economic growth was more prevalent in developing countries where the majority of the poor live. The fear is that previous efforts to reduce poverty and improvements made, will go to waste.

The WB (2010) stated that malnutrition undermines economic growth and increases poverty. Excess healthcare expenditure creates a burden on any country's economy. A proportion of the losses are linked to malnutrition. In a study done in Cambodia and neighbouring countries on the economic consequences of malnutrition, the results showed similar findings. The study revealed that millions lost were linked to malnutrition. In Cambodia malnutrition cost -2.5% of the country's GDP, approximately a $400 million loss. Cambodia is one of the 28 developing countries severely affected by malnutrition. Countries that invest better in nutrition for future generations get high returns on expenditure, adding approximately up to 2-3% to the yearly GDP. This will assist in reducing poverty at national level and promote economic growth, thus

reducing the need to generate sufficient revenues (Bagriansky, Champa, Pak, Whitney and Laillou 2014: 527; Kramer and Allen 2015: 422).

First world nations are able to deal with economic upsets better than developing nations where the impact has long-term effects and severe consequences. First impacted are prices which are an enormous driver of food insecurity and malnutrition. The state of the economy determines the price of commodities. Food price increases have long-term effects on people's future earning capacity and ability to escape poverty. Companies that are involved in small imports due to trade restrictions which increase prices, are exposed to volatility on international markets, reducing the overall income of the country. Therefore there is less revenue to combat malnutrition and more expenditure on malnutrition decreases the overall GDP, hindering the country's development (Bagriansky *et al*. 2014: 527; FAO 2011b; Kramer and Allen 2015: 422).

2.12.2 Impact on a country's health system

The impact of a weak economy on the health system of a country has severe long-term implications on the country's economy and on the health status of its people in numerous ways. Firstly, malnutrition increases health system expenditure and child mortality and depresses the future productivity of children and the current productivity of adult workers (Bagriansky *et al*. 2014: 527). Nearly half (40%) of people from developing countries are underprivileged. The latest report of the WB (2016) showed a decline in economic growth mainly in countries where poverty is already predominant. This means more people will be impoverished and much needed recovery will be prolonged. Healthcare expenditure, particularly in developing countries, is covered exclusively by the government.

Commitment to combating poverty and hunger is a priority for most organisations including the WHO and FAO. However, there are unforeseen challenges that emerge such as the global economic crisis. The global economic crisis not only reduced hard-earned gains over the years but also continues to slow economic growth. Fuel prices increased astronomically influencing the price of commodities including food prices. Furthermore, job losses increased, worsening employment rates and food insecurity (UN 2014). There is a negative association between worsening economic conditions and diet. Poor income shifts diet and a poor diet increases vulnerability to disease and sickness thus more people in poor countries will use health care (Bagriansky *et al*. 2014: 527).

The WHO (2008) stated that the impact of the economic situation can be chronic, as a result of fuel crisis, soaring oil prices, and that fuel and oil prices respond negatively to economic instability. The impact can be mirrored from the soaring oil and fuel crises in the 1980's, where international investments in the social sectors were shifted away, especially in the education and health department. Many countries are still suffering the legacy of these crises. Many developing countries are faced with the same situation whereby cuts in social spending including health, education and social protection are made. This is devastating for health, development, security and prosperity. Investment in health and the social sector is very important to cope with such crises. It is evident that poor people suffer more due to limited finances. UNICEF (2009) reported that about half a million women annually die from complications of pregnancy from poor health care services, weak economy and social consequences and there are many unnecessary deaths that stem from the similar problems. Large funds are directed to HIV and AIDS activities, and overall this has resulted in a reduction in external funds available (Price and Bohara 2013: 310).

Unlimited healthcare access is a human right and one of the WHO's missions is to ensure that every one has access to healthcare services. However, many developing countries lack money to invest in healthcare, resulting in poor health care facilities, hospitals with limited supplies of vital medication and proper medical equipment. These conditions have caused many health workers to seek other jobs or move from rural to urban areas and they sometimes emigrate to other countries seeking a better salary and working conditions with a better health outcome (WHO 2015c).

Throughout the world the shortage of health workers is in crisis. The health worker ratio is approximately one third for every hundred patients in Sub-Saharan Africa. The major challenge in health care is the significant number of health worker deaths, related to similar diseases health workers are trying to prevent. WHO (2015c) encourages countries not only recruit more health workers but also make great effort to retain. A healthy ratio would be 205 workers per 1000 people to realise SDGs. Emerging WHO crises have added unnecessary stress to the healthcare system. The latest report revealed that 603 health workers were killed as a result of socio-political action (WHO 2015c).

The WHO has a number of strategies that can assist countries to recover during economic crises. These are to protect the poor by improving healthcare expenditure and creating stronger social safety nets, to promote economic recovery though investment in the social sector,

promote social stability, to generate efficiency using pre-payment with pooling of resources to finance health expenditure and to build security by investment in the health system and maintain surveillance and response capacity in the face of the pandemic threat (WHO 2008). Although some millennium goals have not been met, remarkable progress has been observed throughout all the goals (WHO 2015c).

2.12.3 Government policies

Food security policies ought to remain at the forefront of a development agenda. Although food security policies are complex, multi-dimensional and require long-term commitment, every nation should be committed to guaranteeing food security for all citizens. Food security policies globally and nationally are extremely vital to safeguard food availability. Food security policies and programmes can be improved based on reliable and timely information on incidents and causes of food insecurity, malnutrition and vulnerability. Food policies need to be shaped around four key dimensions: availability, access, utilisation and stability (FAO 2014). Pereira *et al*. (2014: 339) suggest that food policies need to have a holistic appreciation of the food system and believe that food policies mainly focus on government interventions such as food aid programmes. Food policies need to be multi-level to be effective and should consider diverse factors such as a growing retail sector. Education, retail markets, social grants, access (to land and water), sources of revenue and inputs should all be integrated into the nation's development.

Food access is still a challenge in the country although regardless of improvements and achievements in some areas (DOA 2013). Previous and current governments in South African have interpreted food security policies differently and that has led to the lack of co-ordinating and monitoring (Hendriks 2014: 1). The FAO (2014) reiterates the importance of monitoring and specifies that it promotes evidence-based decision making. South Africa lacks enforceable policies that ensure food security. Mainly because there is no vision of attainment towards a food secure nation and there is a lack of common understanding. Food security policy primary goal is to ensure that everyone is food secure and there is support in accessing adequate dietary needs (Hendriks 2014: 6). The National food and nutrition security policy challenge is making sure that everyone has access to food. (DOA 2013).

The South African government developed quite a number of food security and social strategy programmes incorporated into policies to assist in improving the food security of poor people. The security programmes are streamlined, harmonised and integrated by the Integrated Food

Security Strategy (IFSS). Furthermore, the government launched the National Development Plan (NDP) to address and combat poverty, unemployment and disparity (Hendriks 2014: 19).

2.12.4 Factors contributing to poor human health and malnutrition

2.12.4.1 Insufficient health services

The WHO is committed to fighting global health issues and works hard to ensure that every human being has access to quality health services. The WHO (2015) states that every human being has the right to quality health services. A human being in complete physical state with a healthy mind and social wellbeing in absence of any disease is regarded as healthy. Health services need to be accessible with no discrimination in terms of race, age, gender, culture or beliefs and in addition it has to be affordable (Rogelj and Brezovnik 2013: 687). Unfortunately some countries are still developing and lack economic resources to provide adequate health services. This often results in poor healthcare, short supply of medicine, equipment and staff (WHO 2015c).

Healthcare expenditure impoverish millions of people every year. Healthcare expenditure for most developing countries is high, disadvantaging economic development and increasing poverty. Vulnerable people living below the poverty line often don't enjoy the right to health services, and furthermore are engulfed by communicable and non-communicable diseases (WHO 2015c).

Government policies need to focus on improving access to health services and promoting human rights. Access to health care is every human being's right and is as important as other human rights such as the right to food, work, housing, education etc. According to the South African Constitution (2009) section 2, chapter 2 of the South African Bill of Rights, the right to healthcare, sufficient and safe food and water as well as social grants is for every South African to realise. These rights are further emphasised in section 28, particularly for children in regards to parenting, support grants, nutrition and health care access.

2.12.4.2 Diseases and illnesses

Diseases and illnesses have always been part of human live. However, the state of the world has certainly transformed and humans are faced with unpredicted diseases and illnesses. There are many factors including global warming that have contributed to the proliferation of different diseases that cause illness. WHO (2015) reported that as a result of climate change,

millions of lives have been lost, approximately seven million deaths from air pollution alone. Extreme weather conditions trigger outbreaks of diseases such as cholera, malaria, diarrhoeal diseases, heat stress contributing to malnutrition and undernutrition which will claim 250 000 deaths annually by 2030 because of global warming. Droughts or water scarcity drive people to drink unsafe water from unapproved sources, thus leading to a number of related illnesses. The UN (2015) reported that MDG seven to improve sanitation and provide safe and clean water for many communities around the world was met. All degrees of malnutrition particularly nutrition disorders negatively affect the health status of individuals and is a primary cause of illnesses, infections and diseases. The world today faces triple burden malnutrition where undernutrition, overnutrition and nutrient deficiency exist in the same household. Inadequate diet is the source of malnutrition, which is associated with a number of different diseases that lead to illnesses that need to be treated. Inadequate access to health facilities presents a huge challenge and contributes to high mortality rates (Rolfes, Pinna and Whitney 2014: 21; Kramer and Allen 2015: 423). The MDGS stated that 32% of diseases could be eradicated by combating malnutrition and micronutrient deficiency.

2.12.4.3 Education

Knowledge is vital in reducing or eliminating poverty, food insecurity and malnutrition in the world. Many studies acknowledge the significance of education in eradicating poverty and hunger in the world. Education is significantly linked to reducing the prevalence of food insecurity. Poor health outcomes of people are linked to social inequalities as a result of limited economic resources or the complete lack thereof. High income households have better food security and education levels than low income households, irrespective of the health status, thus the need for education (Meacham 2014:50).

Poor social and economic infrastructure results in catastrophic consequences in times of crisis as it impacts on the delivery of health services and education. Investment in social and economic infrastructure will not only bring short-term relief in times of disaster but will further strengthen and promote resilience. The Ebola epidemic has certainly verified the significance of social and economic infrastructure, adequate healthcare and education. Long-term sustainable growth depends on quality education. Policy makers need to ensure education remains a priority, not only to improve food security but for a better socio-economic status. (DBSA 2015: 5).

The South African government believes that by addressing education issues it will improve food security and nutrition knowledge, Therefore education was included in the strategic mandate vision of 2030 as part of the NDP (DSD 2013). The DBSA (2015: 90) has further committed to another three years to support areas of education. The goal is to create better access to education and improve learning outcomes. Education is a human right and every human being deserves an opportunity to be educated. Level of education improves knowledge and household economic status.

Nutrition education is vital in improving the health status of people as it can assist with meal planning and the use of correct cooking methods to prevent nutrient loss and furthermore improve consumer literacy, better food management and efficient use of food resources. The NFCS-FB-I 2005 revealed that one out of two people knew about the food fortification logo and six out of ten never used the logo to make informed food choices, thus the need for education (Labadarios *et al.* 2005: 257). Maternal education improves household knowledge. Mothers are generally caregivers in the majority of households. Therefore, through educating the mother everybody in the household gets educated. Nutrition education is aimed at fighting malnutrition and improving health status through advancing knowledge. Rolfes, Pinna and Whitney (2014: 21) support nutrition education and further state that social factors such as education level influence food choices. People with better education status are significantly more likely to be food secure or have a better food security score, and additionally have a better food diversity score. Ronquest-Ross, Vink and Sigge (2015: 64) found that consumers who had better nutrition education made more healthy choices. Nutrition education in SA should be based in the SA Food Based dietary guidelines and should also be included in the healthcare profession curricula to educate patients about better treatment and prevention of diseases. Home or community gardens is an effective adaptive strategy to address and improve food insecurity by providing adequate availability, accessibility, utilisation and stability of food supply (DSD 2013).

2.13 MALNUTRITION

The UNICEF conceptual framework below shows the relationship between various determinants of nutrition status.

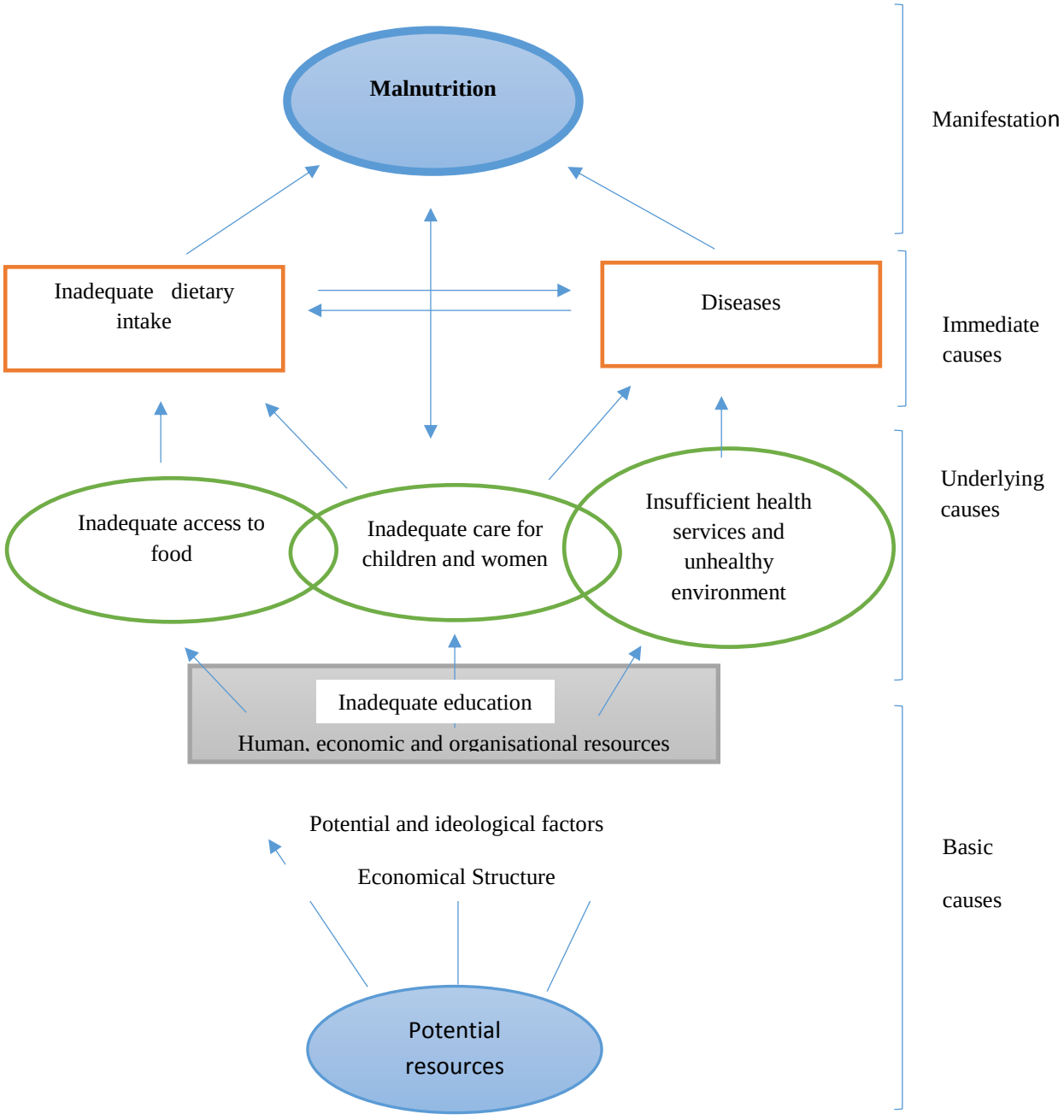


Figure 2.3: UNICEF conceptual framework for determinants of nutrition status (UNICEF 2008).

2.13.1 Definition of malnutrition

According to Rolfes, Pinna and Whitney (2014: 21), malnutrition is a deficiency of nutrients or energy in the body. People are considered malnourished when the diet does not provide adequate calories and nutrients Deficiency of nutrients or energy is defined as undernutrition and excess of nutrients or energy as overnutrition The world today faces a triple burden of malnutrition where undernutrition, overnutrition and micronutrient deficiencies exist (UNICEF 2015). Figure 2.3 above shows a UNICEF framework for child malnutrition, but it can also be adapted to indicate household malnutrition factors.

2.13.2 Overnutrition

An imbalance of the amount of energy intake and energy expenditure leads to numerous health problems such as overweight. If and when overweight is not controlled it leads to obesity. Overnutrition is associated with various lifestyle indicators that are risky and can contribute to coronary diseases, hypertension and diabetes (Rolfes, Pinna and Whitney 2014: 21).

2.13.2.1 Obesity

Parameter Index	BMI Classification
Body Mass Index (BMI)	Underweight (<18.5)
	Normal weight (>18.5-24.99)
	Overweight (>25.00-29.99)
	Obese 1 (>30.00-34.99)
	Obese 2 (>35.00-39.99)
	Obese 3 (=40)

Table 2.1: WHO (2004) BMI classification.

Obesity is the excessive accumulation of body fat, when the ratio of weight (kg) to height² (m) is above 30. When the ratio exceeds 40 it is considered as gross obesity. The desirable range of body mass index (BMI) for optimum life expectancy is between 20 and 25, from 25 to 30 is considered as overweight (refer to table: 2.1). People who are 50% and above their desirable weight are mostly likely to die prematurely before those within the desirable weight range. The BMI needs to be calculated using the standardised formula [weight (kg) / height ^{2} (m)]

developed by WHO (2004). Obesity is associated with health risks that proliferate when the BMI increases and furthermore raises the mortality risk. Researchers confirmed that obesity can be genetic and can also be environmental (Rolfes, Pinna and Whitney 2014: 21). The WHO (2015) declared obesity an epidemic when the number of obese people doubled globally. The latest update on obesity indicated that 600 million people in the world over the age of 18 were obese. An increase in energy dense foods and a decrease in physical activities are the main reasons for the increase. The concern is that the consequences of overweight and obesity result in life-threatening diseases. Walton and Allen (2011) indicated that malnutrition is more prevalent in Southern Asia and Sub-Saharan Africa and believes these areas needs an urgent intervention. The challenge is greater in developing nations due to low resource healthcare settings. WHO (2014b) stipulated that one in three (31.3%) people in South African was obese and declared that it was the most overweight nation in the southern hemisphere. In the latest report by the South African Medical Research Council (SAMRC 2014) over 61% of South Africans are described as overweight or obese. The report further states that 70% of women above 35 years were obese, the majority being black women; conversely white men (18%) in the same age category were obese. Only of 9% Asian men were obese, 8% of coloured men and 6% black men. Overweight and obesity is a serious issue in South Africa and kills an estimated 2.8 million people annually. In addition, many people run the risk of developing overweight and obesity with related non-communicable diseases. South African adults' deaths are more related to overweight and obesity than poverty (WHO 2014b; SAMRC 2014; Ng *et al*. 2014: 777).

2.13.2.2 Diseases of lifestyle

Non-communicable diseases (NCDs) predominately affect developing countries where diets are influenced by economic circumstances. According to Day, Groenewald, Laubscher, Chaudhry, van Schaik and Bradshaw (2014: 660), NCDs are the leading cause of death triggered by diabetes, tobacco-related cancers and strokes. Other lifestyle diseases include cardiovascular disease which manifests in various ways such as heart attacks. Cardiovascular disease in particular is a primary NCD cause of death throughout different age groups and it is largely brought on by the risk of high blood pressure (BP), obesity and diabetes. Diabetes is a group of metabolic diseases which causes the body to accumulate high blood glucose (blood sugar), either because the body's insulin production is inadequate or the body cells do not respond well to insulin or sometimes both. There are two types of diabetes. Type one diabetes occurs when the body fails to produce insulin and it is normally referred to as insulin dependent

diabetes. Type two diabetes occurs when the body fails to produce sufficient insulin for proper functioning, or cells in the body are unable to react to insulin. Type two diabetes is referred to as insulin resistance.

According to the Cancer Association of South African (CANSA) (2016: 3) non-communicable diseases are among causes of death. Most NCDs are linked to obesity. Undoubtedly obesity is the new world burden and obesity rates have escalated to unacceptable numbers. Moreover, millions of deaths were accountable to it (WHO 2015c; Day, Groenewald, Laubscher, Chaudhry, van Schaik and Bradshaw 2014:680; Rolfes, Pinna and Whitney 2014: 274). The Department of Health (2013: 16) strategic report for prevention and controlling NCDs stated that NCD's can be preventable through managing physical activities, the use of tobacco, poor diets and alcohol abuse. These risk factors can assist with the objective of the DOH to promote good health and reducing NCDs. Prevention of NCD not only promotes health but contributes to the development of the social and economy. A physically and mentally healthy nation performs and learns better, produces more and can save on health related costs which assist in family and community development. The major NCDs in SA include: diabetes, cancer, cardiovascular disease, chronic respiratory diseases and mental illness. In 2013 alone, 38.034 people died from cancer related illnesses. The recent SA report from WHO (2016) stipulated that two in five deaths related to NCDs, with approximately over 49% deaths. NCDs are known to be killing more men than women. There were 16.2% of people that smoke including the youth, hypertension prevalence was 42.2%, and high rates of obesity where over half of the nation was overweight and physically inactive, causing death.

2.13.3 Undernutrition

UNICEF (2006) defines undernutrition as 'the outcome of insufficient food intake and repeated infectious diseases'. It includes children being underweight for age, too short for age (stunted), dangerously thin for height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition). Malnutrition appears in many forms and can result in a decrease in immunity and an increase in proneness to illnesses. Almost 50% of deaths of children under five are attributed to undernutrition, claiming three million lives annually. The WB (2010) indicated that the increased cause of deaths is from the increase of severity diseases. Undernutrition has a direct and indirect cost on the economy. It directly raises expenditure on the healthcare system and indirect costs are incurred in the loss of productivity. Adult underweight occurs along a range of inadequate intake, impaired absorption, altered transportation and altered nutrient

absorption leading to weight loss. Undernutrition in adults similarly poses a morbidity and mortality risk (White, Guenter and Jensen 2012: 730).

2.13.4 Protein Energy Malnutrition

Protein Energy Malnutrition (PEM) is a potentially fatal-depletion disorder. It occurs when the consumption of protein and energy are insufficient to meet the body's nutrition needs. It develops in both children and adults. PEM applies to a group of related disorders that include marasmus, kwashiokor and intermediate states of marasmus-kwashiokor. Marasmus involves inadequate intake of protein and calories and kwashiokor is inadequate protein consumption with reasonable caloric intake. PEM also occurs in people who are unable to absorb vital nutrients or convert them to energy (Rolfes, Pinna and Whitney (2014: 184). According to Hoang, Agger, Cassidy, Christensen and Andersen (2015: 2123) PEM increases susceptibility to infectious diseases and poor health outcomes. Despite health care costs incurred from PEM there are associated high mortality rates. PEM affects adults in several ways including loss of appetite which leads to weight loss and decrease in productivity as a result of low physical functioning (Van der Pols-Vijlbrief, Wijnhoven, Schaap, Terwee and Visser 2014: 115).

2.13.5 Micronutrient deficiencies

Micronutrient deficiencies occur throughout the human life cycle, from infancy to childhood, adolescence and adulthood. The health implication as a result of deficiencies differ in each generation and affect people in various ways. The figure below shows micronutrient deficiency cycle over generations (Bailey, West Jr and Black 2015: 23).

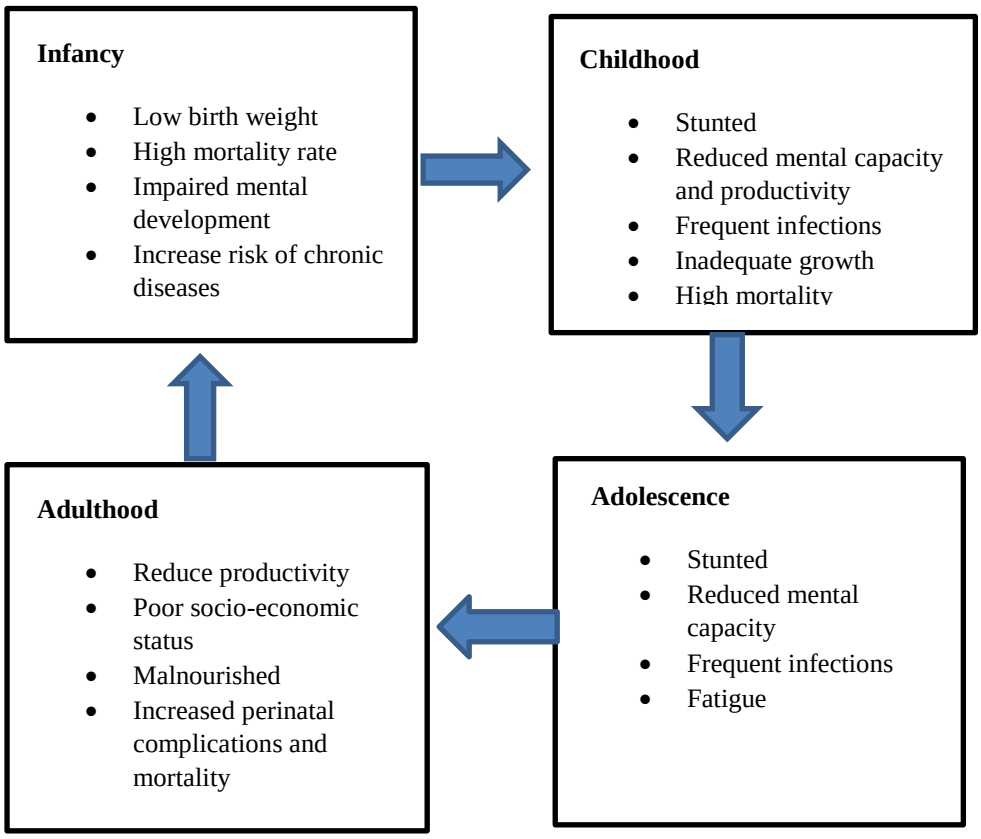


Figure 2.4: Micronutrient deficiency cycle over generations (Bailey *et al*. 2015: 23).

Lack of essential vitamins and minerals in the body leads to micronutrient deficiency. Micronutrients are essential for proper growth and development and good health and can occur throughout the life cycle as reflected in Figure 2.4. Micronutrients include minerals and vitamins such as fluoride, selenium, sodium, iodine, copper and zinc, vitamin A, D, E, K and B-complex vitamins (Rolfes, Pinna and Whitney 2014: 5). Micronutrient deficiency has serious health implications and affects people that live in the most vulnerable parts of the world. The most at risk people are children less than five years old and pregnant women are most at risk. Approximately 11% of the SSA deaths of children under five relate to micronutrient deficiency. Allen (2014: 3455) indicated the saturation of the deficiency is worse in SSA and Asia.

According to the WHO (2015) micronutrient deficiency is a serious and dangerous health risk factor. Most familiar micronutrient deficiencies include iodine deficiency which is normally responsible for brain damage. Iodine deficiency in women during pregnancy increase stillbirth risks, permanent mental retardation and miscarriage. In South Africa, iodised salt is preventing this deficiency (Bailey *et al*. 2015: 23; Fiedler, Afidra, Mugambi, Tehinse, Kabaghe, Zulu, Lividini, Smitz, Jallier, Guyondet and Bermudez 2014: 26).

According to Bailey *et al*. (2015:23), micronutrient deficiency impairs the ability to learn, decreases work capability prohibiting future income earning opportunities. However micro nutrient deficiency is preventable, (refer to Figure 2.4). The biggest issue with micro nutrient deficiency is that it is pervasive across generations and consequently extends to future populations. Vitamin A deficiency result in blindness and miscarriage in pregnant women. According to WHO (2015), a quarter of a million children are Vitamin A deficient. Approximately close to half a million children become blind and have a higher risk of dying within 12 months of being diagnosed blind. The most common deficiency in the world is iron deficiency Anaemia affects over 30% of people globally. The results of the South African NFCS showed that children and adults lack essential nutrients in their diet due to poverty and hunger. Vitamin A, iron and zinc deficiencies are deficiencies that need to be addressed. At national level vitamin A deficiency was high in women and children, two out of three and one out four women had a poor vitamin A status. The majority of the women with high Vitamin A deficiency lived in KwaZulu-Natal (Labadarios *et al.* 2005: 261; Fiedler *et al.* 2014: 26). Allen (2014: 3455) suggest that one of the most effective approaches to address micro nutrient deficiency is through supplementation, fortification, and dietary intervention.

2.14 MACRONUTRIENT AND MICRONUTRIENT REQUIREMENTS OF ADULTS

Macronutrients and micronutrients are extremely important to prevent diseases and to promote a healthy, active lifestyle. The Dietary Reference Intake (DRI) provides a guide to limiting nutrient deficiency and improving well-being (NICUS 2003). Energy and nutrient requirements for adults between the ages of 19 and 50 changes slightly, excluding individuals involved in physical activity and pregnant and lactating women. However, energy requirements differ for different individuals depending on the age, gender and physical activity level. The demand for energy and nutrients associated with growth and maturity decrease after adolescence and therefore most nutrient requirements in adulthood are lower than in adolescence. A healthy balanced diet and lifestyle is important to acquire all the nutrients

required by the body. A varied diet ensures that all the micronutrient needs are met. Eliminating certain foods in a diet increases the risk of being unable to acquire certain nutrients. The recommended intake for macronutrients for adults suggests that 45-65% of total kilojoules come from carbohydrates, 20-35% from fat and 10-35% from protein. It is essential to consider the ideal distribution of kilojoules in addition to the energy intake (Langley-Evans 2015: 219; McGuire and Beerman 2013: 289).

The term DRIs is a collective one and refers to a set of four nutrient-based reference values. Each type of DRI refers to the average daily nutrient intake and it is understood that some deviation around this average value over a number of days would be expected. It is, therefore, the average mean intake over time that has a nutritionally important reference value (NICUS 2003).The application of the four reference values are explained in table 2.2.

Table 2.2: Dietary Reference Intake (NICUS 2003)

Dietary Reference Intake (DRI)	
Estimated Average Requirements (EARs)	The amount of nutrients estimated to meet the needs of 50% of people in the same gender and life-stage group
Recommended Dietary Allowances (RDAs)	Recommendation calculated to meet the needs of nearly all healthy individuals in each gender and life-stage group.
Adequate Intakes (AIs)	Intake used as a goal when no RDA or EAR exists. An approximation of the average nutrient intake that appears to sustain a desired indicator of health.
Tolerable Upper Intake Level (UL)	The maximum level of daily intake of a nutrient that is unlikely to pose a health risk to almost all individuals in the specific group. A level that can probably be tolerated; not a recommended level.

The above table 2.2 gives the Dietary Reference Intakes (DRIs), the Estimated Average Requirements (EARs) which indicates the average amount of nutrients required for people in the same gender and life stage group, Recommended Dietary Allowances (RDAs) which recommends the needs of nearly all healthy individuals in each gender and life-stage group. The Adequate Intake (AIs) are used as a goal when no RDA or EAR exists, and the Tolerable Upper Intake Level (UL), which represents the maximum level of daily intake of a nutrient that

is unlikely to pose a health risk to almost all individuals, however it refers to a level that can be tolerated, it is not a recommended level.

Table 2.3: Recommended Dietary Reference Intake: Macronutrients

Macronutrient	Example of food source	Functions	DRI	Men	Women
Energy (kJ/day)	-	-	EER	12 881	10 093
Carbohydrates (g/day)	Starch and sugar are the major types of carbohydrate. Grains and vegetables (corn, pasta, rice, potatoes and breads) are sources of starch. Natural sugars are found in fruit juices. Sources of added sugars are soft drinks, candy, fruit drinks, and desserts.	Energy -providing glucose for immediate use and glycogen reserves.	EAR	100	100
Fibre (g/day)	Mainly found in plant sources vegetables and fruits.	Improves laxation, reduces risk of coronary heart disease, assists in maintaining normal blood glucose levels.	AI	19-50=38 51+=30	19-50=25 51+=21
Protein (g/day)	Sources of protein are both from animal and plant, and include meat, fish, poultry, legumes and nuts.	Aids in the function, development and maintenance of cells and enzymes.	RDA	56	46

Table 2.3 represents the macro-nutrient requirements, sources and functions in the body for adults aged 19 years and above. Macro-nutrient refers to nutrients consumed in large quantities. Nutrients are classified into micro- and macro nutrients, non-essential and essential categories. Essential nutrients are derived from diets and the concept of essential refers to the ability of the body to synthesise the nutrients (Langley-Evans 2015: 300).

Table 2.4: Recommended Dietary Reference Intake: Water soluble micronutrients

Micronutrient	Example of food source	Functions	DRI	Men	Women
Thiamine B1 (mg/day)	Vegetable sources: beans, nuts and seeds, whole cereal, fortified cereal, animal sources: liver and pork	Neural function	EAR	1.0	0.9
Riboflavin B12 (mg/day)	Beef liver, cereal Fortified cereal, milk, yoghurt, cottage cheese	Metabolism of carbohydrates, amino acids and lipids. Metabolism of vitamin and minerals	EAR	1.1	0.9

Nicotinic Acid (mg NE/day)	Lean meats, poultry, fish, butter, organ meats	Cell metabolism Energy metabolism	EAR	12	11
Vitamin B6 (mg/day)	100% fortified cereal , potato with skin	Amino acid metabolism, cellular growth. Boosts immunity	EAR	19-50 =1.1 51+= 1.4	19-51=1.1 51+=1.3
Folic Acid (µg/day)	Vegetable sources: Green leafy vegetables: spinach, broccoli, and asparagus. Animal source: Liver	Produces and maintains cells. Formulation of red and white cells in bone marrow	EAR	320	320
Vitamin B12 (mg/day)	Organ meats: liver, kidneys, heart. Seafood, ham	Formulation of red blood cells; functioning of the nervous system	EAR	2.0	2.0
Vitamin C (mg/day)	Citrus fruits, guavas, strawberries, pineapples	Production of collagen. Protects cells against free radicals. Enhances iron absorption.	EAR	75	60

Table 2.4 above represents the Recommended Dietary Reference Intake for water soluble micronutrients. Micronutrients include vitamins and minerals and are nutrients required in small quantities; however they are as important as macro-nutrients. Water soluble refers to the fact that all the nutrients cannot be stored by the body (Langley-Evans 2015: 300).

Table 2.5: Recommended Dietary Reference Intake: Fat soluble vitamins

Micronutrient	Example of food source	Functions	DRI	Men	Women
Vitamin A (µg/day)	Carrots, broccoli, spinach, squash, sweet potatoes, peaches, apricots, mangos, pap	Light and dark colour vision, night blindness. Maintains healthy cells that line internal and external surfaces. Cell growth and differentiation.	EAR	625	500
Vitamin D (µg/day)	Sunlight, fatty and oily fish	Body uses calcium as it helps the body absorb calcium and reduces excretion of calcium.	AI	19-50=5 51-70=10 70=15	19-50=5 51-70=10 70=15
Vitamin E (mg/day)	Plant oils (soy bean, corn, cottonseed, sunflower), margarine, mayonnaise and oil-based salad dressing wheat germ, nuts, seeds, shrimps, peanut butter	Antioxidant and helps body fight against free radicals	EAR	12	12
Vitamin K (µg/day)	Liver, green leafy vegetables, broccoli, green beans, peas	Blood clotting and bone formation	AI	120	90

Table 2.5 above shows the Recommended Dietary Reference Intake for different fat soluble vitamins which refers to nutrients that are soluble in lipids and can be stored in the body. The nutrients include Vitamin A, Vitamin D, Vitamin E and Vitamin K (Langley-Evans 2015: 308).

Table 2.6: Recommended Dietary Reference Intake: Minerals

Micronutrient	Example of food source	Functions	DRI	Men	Women
Calcium (mg/day)	Low fat dairy products, calcium, fortified juice, dark leafy greens, broccoli	Plays an important role in maintaining the strength of bones and teeth, in muscle contraction, nerve function, normal blood clotting, and may lower blood pressure.	AI	19-50=1000 51+=1200	19-50=1000 51+=1200
Phosphorus (mg/day)	Red meat, poultry, fish, and dairy products and cereal grains	Plays an important role in energy metabolism, affecting carbohydrate, fat, and protein.	EAR	580	580
Magnesium (mg/day)	Whole wheat bread, low fat dairy products, lean meats, beans	Involved in energy utilization, muscle contraction, nerve function, and may lower blood pressure.	EAR	19-30=330 31+350	19-30=255 31+265
Iron (mg/day)	Organ meats, shellfish, lean meats, poultry, fish, beans, egg yolks, whole grain and enriched breads and cereals	Assists in the transportation of oxygen and carbon dioxide, and immune function.	EAR	6.0	19-50=8.1 51+=5.0
Zinc (mg/day)	Lean meats, low fat dairy products, beans, peanut butter, grain products	Immune function, protein synthesis, and maintaining taste awareness.	EAR	9.4	6.8
Iodine (µg/day)	Iodised salt and seafood	Needed to make thyroid hormones, which are necessary for maintaining normal metabolism in all cells of the body.	EAR	95	95
Selenium (µg/day)	Meat, fish, seafood, whole grain foods and nuts	Plays a role in mineral antioxidant in human nutrition, and reducing muscular oxidative stress.	EAR	45	45
Chromium (µg/day)	Whole grain breads, cereals and meats	Helps cells use glucose	AI	19-50=35 51+=30	19-50=25 51+=20

Table 2.6 presents the recommended dietary reference intake of different minerals. The body's physiological function and normal cellular maintenance is performed by minerals. Minerals are inorganic components of food and water and can be accumulated in storage form. It is estimated that 3% of the human body mass comprises of minerals and trace elements (Langley-Evans 2015: 306).

2.15 METHODS TO DETERMINE DIETARY INTAKE

To obtain quantitative information about the energy and nutrient quantities consumed, dietary intake measurements are required and are the best way to describe actual food intake. Dietary intake measurements include all foods and beverages consumed by an individual, excluding dietary supplements and condiments due to identification and quantification challenges or limited information in regard to their composition. Dietary intake not only assists in determining food, beverage and nutrients consumed but also assesses dietary adequacies and shortcomings and the potential impact of diet in health and monitors dietary trends. Dietary intake data assesses nutrient adequacy of energy and nutrients. The amount of energy and nutrients found in food does not necessarily mean it is available for the body's metabolism therefore dietary intake measured as food intake is not a direct measure of energy and nutrients for body metabolism but only a guide. Individual food intake varies in quantity and type on a daily basis. Therefore dietary intake is only for short-term and not long-term habitual intake. It is very important that proper procedures are followed to ensure accuracy of data. There are different methods designed to obtain dietary intake of individuals; these include Food Frequency Questionnaire (FFQ), 24-hour recall, food record, dietary history. The reproducibility and validity of dietary assessments depend on the dietary assessment instruments thus quality data is essential for the success of the study (Grandjean 2012: 101; Rodrigues, Souza, Cnop, Monteiro, Coura, Brito and Pereira 2016: 2).

2.15.1 FFQ

A Food Frequency Questionnaire is a list of foods that are related to the population of study to determine their dietary intake. The questionnaire can be qualitative whereby a respondent can indicate how often a certain food is consumed and quantitative when the average amount is indicated. These questionnaires are more suitable for groups than individuals and are commonly used in epidemiological research investigating relationships between diet and disease. Most studies use FFQs to assess dietary intake and can be self-administered by large numbers of people over a short period of time but the response rate may be low and it requires literacy skills. Grandjean (2012: 101) and Fallaize, Forster, Macready, Walsh, Mathers, Brennan, Gibney, Gibney, and Lovegrove (2014: 14) believe that FFQ's are cost effective but not quantitatively precise and data can be misreported. However, these questionnaires are easy to standardise. Each questionnaire may need to be altered to suit different populations of study, for example, to include indigenous foods eaten by that specific group. The size, complexity

and length of the questionnaire depend on the objectives and can be quantified or not. The limitations are that portion sizes are often a challenge to determine accurately, it does not provide meal pattern data, it is dependent on the subject to describe diet, total consumption is difficult to obtain and needs special computer programmes to analyse data when used to determine nutrient adequacy (Rutishauser 2005: 1105; Joubert and Ehrlich 2007: 295; Spronk, Kullen, Burdon and O'Connor 2014: 1721).

2.15.2 24-hour recall

The 24- hour recall is a dietary intake assessment whereby an interviewer asks the respondent to recall in detail all the food and drink consumed in the previous 24-hours. It requires a trained dietary interviewer to administer a 24-hour recall. It is normally used in large samples, 50 or more, and the data is used to determine trends and eating patterns. One 24-hour recall determines the usual or habitual intake of a person therefore a few may need to be conducted for accurate results. It takes time and practice to be able to fill it in individually and the experience of recalling what was eaten, the portion sizes, the ingredients and recipes helps train people to complete it accurately on their own. An interviewer needs to assist the respondent in determining portion sizes of foods and drinks consumed by using food samples. If food samples are not available it makes it difficult to determine portion sizes accurately. This questionnaire is cost effective, quick and easy to use (Rutishauser 2005: 1104; Joubert and Ehrlich 2007: 296; Spronk *et al.* 2014: 1721)

2.15.3 Food records

Food records are often referred to as a food diary where the participant keeps a record of all their food and drinks, types and amounts at the time of consumption. Food records are used to determine tendencies in eating patterns or usual intake. Participants quantify their consumption by using household measures or a scale if available to estimate portion sizes. Training is necessary to weigh and measure the food for accurate data capturing. This includes reports of foods containing a variety of ingredients such as pizza or stews. The records can be for as long as seven days. (Joubert and Ehrlich 2007: 296; Rodrigues *et al*. 2016: 9). According to Fallaize *et al.* (2014: 10) weighed food records (WFR) are the most accurate measure of food intake and are perceived as gold standard, although there are challenges in regard to the prospective recording of food which can alter the type and quality of food consumed.

2.15.4 Diet history

Dietary history is a quantitative method of dietary assessment and has been used for a number of years. This is a comprehensive method of gathering dietary and relevant information. Dietary history is more effective than other dietary assessment, as it is more complete and accurate. This assessment is used to determine and assess an individual's usual eating patterns and food selection variables influencing food intake over time from a month to a year. It takes about an hour and a half to complete one assessment and both the 24-hour recall and food frequency questionnaires are used. The FFQ confirms the 24-hour recall or 3-day food record dietary information and results are coded, checked and processed.

The trained interviewer gathers information about the number of meals eaten per day, appetite, food dislikes, and the incidence of nausea and vomiting, and habits related to sleep, rest and work. Dietary history may take longer to complete but a large quantity of information can be obtained (Rutishauser 2005: 1104; Joubert and Ehrlich 2007: 297).

2.15.5 Focus groups

A focus group is another tool to collect data for certain qualitative studies. The focus group method usually includes a group of people, between six and ten, under the guidance of a facilitator, or observer, or recorder. Participants engage on a particular subject to convey attitude, perception and opinion. The duration of the discussion should be between 60 and 90 minutes. Professional management skills are required to conduct a focus group discussion. A schedule can be planned but it should not limit discussion. Results of the focus group discussion may be based on feelings. Group settings often reveal facts and opinions that would not have been revealed in a different environment. Focus groups provide a platform for participants to clarify attitudes and beliefs. Focus groups are flexible and have the ability to build community engagement. However, peer pressure within the group can inhibit true opinions. Rules should be set to provide comfort and the venue should be private (Joubert and Ehrlich 2007: 320; Connelly 2015: 369).

2.16 METHOD TO DETERMINE NUTRITION STATUS

2.16.1 Anthropometric indicators

Malnutrition directly affects the body size of individuals and anthropometric indicators are used to measure the nutrition status of children and adults. Weight, height and age are the measurements used in children and these three measurements are used to form the indicators weight-for-age (wasting/ thinness), height-for-age (stunting/ short for age) and weight-for-height (BMI-for-age). Height and weight results for children can be compared to the World Health Organisation growth charts. Body weight is interpreted by using different methods when assessing the nutrition status of adults which includes weight and height to determine BMI. BMI calculation is the ratio of weight (kg) divided by height² (m). Refer to table 2 for weight categories (Joubert and Ehrlich 2007: 299; Gibson 2005: 41).

An electronic calibrated scale should be used to measure weight and height. Participants should remove excess clothing and items in pockets that might add extra weight. The scale is placed on a smooth level surface and switched on until it reflects zero before use and then participants should be asked to step on the scale and stand upright with both feet flat and apart while measurements are taken. Measurements should be taken twice and the scale reset to zero after each measurement. The scale should be re-calibrated after each day (Gibson 2005: 235).

Height is measured in metres (m) using a stadiometer. Participants should remove shoes and excessive clothing including hats. The stadiometer is placed on a flat surface against the wall. Participants stand up straight facing the fieldworker with the head level, feet and knees together, shoulders and arms relaxed and buttocks slightly touching the scale. Measurements should be taken twice, with the stadiometer touching the head and allowed to rest. All measurements are recorded in centimetres (Gibson 2005: 235).

2.16.2 Circumferences

2.16.2.1 Mid-upper-arm circumference (MUAC)

MUAC can be measured using a flexible non-stretch tape made out of fibreglass or steel. It is not a complicated procedure and is time effective. The body consists of muscle and fat tissue and a decrease in MUAC can be a result of both. The measurement is usually used to diagnose protein-energy malnutrition and starvation and to monitor progress during nutrition therapy. The participant should remove sleeved clothing for accurate measurement and should stand

upright and sideways with the head in a Frankfurt plane, arms relaxed, palm facing inwards and legs apart. The measurements should be taken between the acromi and tip of the olecranon (mid-point of the upper arm). The tape should be wrapped gently around the arm but not lose or too tight. The formula to calculate MUAC is mid-upper-arm muscle circumference, and triceps skinfold thickness: MUACMC=MUAC – (π x TSK) (Barasi 2003: 12).

2.16.2.2 Waist-to-hip-circumference ratio

The waist-to-hip circumference is usually used to measure obesity as an indicator for fat distribution. The circumference of the waist at the umbilicus and of the hips around the buttocks is used to calculate this ratio using a simple calculator or nomogram. The fat depositions are measured at values of 0.8 in women and 0.9 in men and these indicate the possibility of a health risk. The waist-circumference cut-off point for women is 88cm and for men 102cm and the waist-to-height ratio is 0.5 (Barasi 2003:12; Gibson 2005: 279-281).

2.16.3. Other

2.16.3.1 Skinfold thickness

The ratio of fat mass to fat-free or lean body mass (mostly muscle and bones) is the body composition and it could be determined by a number of techniques which include skinfold thickness and bioelectrical impedance.

Skinfold callipers are used to measure fat under the skin in millimetres by double folding the thickness of skin. The body position can be assessed by measuring the triceps, biceps, sub scapula, supra-iliac, thigh and medical-calf. The accuracy is dependent on the fatness of the body: the higher the fat content, the less accurate the result will be. There are different formulas that are used to calculate the fat percentage from skin fold thickness (Joubert and Ehrlich 2007: 300).

2.16.3.2 Biomedical

A biomedical test should be conducted with caution as it can affect the disease state and therapy of a patient. This is the most objective and sensitive measure of nutrition status, several specimen types are used for nutrient and nutrient related substances. These include serum, plasma, erythrocytes, leukocytes, other tissue, urine and other faeces (Bassi 2003: 13).

2.16.3.3 Nutrition knowledge survey

A nutrition knowledge survey is used to determine the knowledge of individuals in regard to nutrition and nutrition related problems. Malnutrition can result from many factors and these factors contribute to an individual's overall nutrition status. The data collected in a nutrition knowledge survey can be collated with other surveys to form a full report. These surveys provide information about the dietary, nutrition, and health-related status, the relationship between diet and health and the factors affecting dietary and nutrition status. These type of surveys can include a demographic health survey, food and nutrient consumption survey, national food based consumption surveys and knowledge and attitude and behaviour assessment (Brown 2011: 42; Spronk *et al*. 2014: 1713).

2.16.3.4 Health surveys

Health surveys are used to measure many health related topics including mortality, disease occurrence, and intervention coverage and risk behaviours. Health assessment methods assess nutrition assessment and health related variables. These surveys collect important data from a sample of the population using a questionnaire with health related topics, physical activities, disabilities, medication, and tobacco and alcohol abuse. A survey may also include blood samples or measurement of height and weight. They not only provide information on levels and trends, but also on equity (WHO 2012; DOH 2013).

2.16.3.5 Blood pressure

Blood pressure (BP) measurements are an extremely vital piece of medical information that require accuracy to eliminate blood pressure related risks and to provide a management guide. Poor monitoring of blood pressure increases patient risk of under treatment or over treatment. Furthermore, accurate measurements contribute to screening for hypertension and assist in monitoring effectiveness of treatment in patients diagnosed with hypertension. BP measurements are done through an air-filled occluding arm cuff and auscultatory sounds using the systolic (SBP) and diastolic BP in conjunction with mean blood pressure(MBP) and pulse pressure (PP) (Corrado 2015: 628). A well trained professional with proper techniques is crucial for the consistency and reliability of measurements. A stethoscope and sphygmomanometer are the essential equipment to measure BP. Patients who recently engaged in physical activities, ingested caffeine or consumed food 30 minutes prior to examination should be eliminated. BP classification for adults is defined as a systolic pressure less than 120

mm Hg and a diastolic pressure less than 80 mm Hg. Prehypertension and hypertension as an indication of higher blood pressure are divided into two stages as indicated in table 2.7. (Williams, Brown and Conlin 2009: 4; Adji and O'Rourke 2016: 279; Corrado 2015: 628).

Table 2.7: Classification of blood pressure

Blood Pressure Classification		
Classification	**Systolic (mm Hg)**	**Diastolic (mm Hg)**
Normal	<120	<80
Prehypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	≥160	≥100

2.17 STRATEGIES TO ADRESS MALNUTRITION

The South African government has implemented various strategies over the years to try and address poor nutrition status and food insecurity in the South African population. The key to becoming healthy and staying healthy is to follow a healthy eating plan that guides in selecting the right foods in adequate quantities in order to obtain essential nutrients required by the body (Faber 2013: 40).

Dietary recommendations have evolved over the years and have become a crucial aspect of human lives. There are two types of dietary recommendation: food guides and dietary guidelines. The main purpose of dietary recommendations is to improve public health. Food guides and dietary guidelines work differently. Food guides focus on guiding individuals on selecting the appropriate diet in correct servings or quantities from each food group. Dietary guidelines provide advice on a particular area of the diet based on public needs, such as reducing fat intake for energy from saturated fat and consuming starch with a high fibre content. The FAO and WHO developed and published dietary guidelines which place emphasis on nutrient intake instead of dietary intake. There are set limits within each food group for populations that consume more from the same food group (Temple and Steyn 2016: 276; WHO 2015c).

Individual foods and diet can be healthy or unhealthy. Hence, the development of a healthy eating and food guide. Figure 2.5 below shows the South African food guide that is meant to assist in addressing nutrition needs of the population and should be used as part of nutrition education programmes. The visuals support the Food Based Dietary Guidelines for healthy eating. The large circle indicates foods that should be consumed in bigger amounts, while the small circles indicate foods that should be consumed in moderate quantities (Faber 2013: 40).

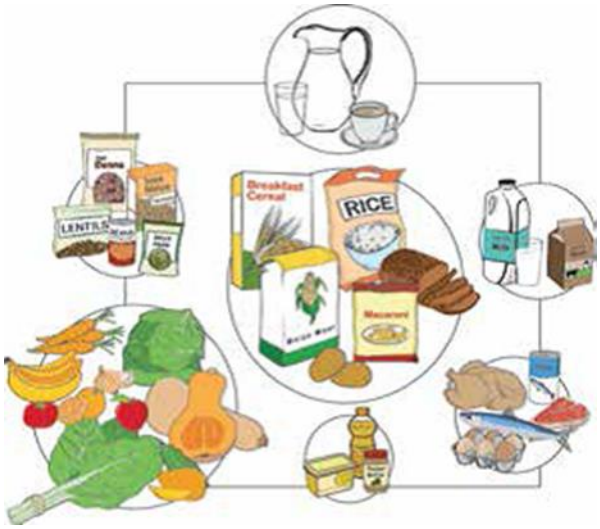


Figure 2.5: South African Food Guide (DOH 2013).

2.17.1 Food based dietary guidelines

The South African Food Based Dietary Guidelines (SAFBDGs) were developed by nutrition experts to assist South Africans make healthier eating choices by developing a set of guidelines that promote good health and the prevention of disease. Bad choices lead to deficiency and excess malnutrition (overnutrition and undernutrition). Undernutrition results in the body being extremely thin through loss of tissue, deteriorating the immune system that protects against infection and disease. Overnutrition leads to overweight or obesity, increasing vulnerability to disease. The South African Department of Health (DOH) adapted internationally related guidelines to suit the South African population. When you compare the South African guidelines to those of the United States of America they are almost similar. The aim of the guidelines is to improve and promote the importance of nutrition through education, fight burgeoning diseases and existing nutrition disorders related to poverty and malnutrition. There are two sets of these guidelines; one is for children up to the age of seven and the other for individuals from seven through to adulthood. These guidelines are practically similar in goals and objectives and were recently revised. The FBDGs should be used as a basis for developing Nutrition Education material for the population (DOH 2013; Rolfes, Pinna and Whitney 2014: 269; Faber 2013: 40).

The revised SAFBDGs were tailored to suit all South Africans over the age of seven from different backgrounds. The eleven guidelines are as follows:

- Enjoy a variety of foods.
- Be active.
- Make starchy foods part of most meals.
- Have mass, milk or yoghurt every day.
- Eat plenty of fruits and vegetables every day.
- Eat dry beans, split-peas, lentils and soya often.
- Lean meat, fish, chicken, milk and eggs can be eaten every day.
- Eat fat sparingly, choose vegetable oils rather than hard fats.
- Use salt and food high in salt sparingly.
- Drink lots of clean, safe water.
- Use sugar and foods and beverages high in sugar sparingly.

2.17.2 Food fortification

Food fortification is defined as an addition of one or more nutrients to food to increase the level of consumed nutrients in order to improve nutrition status. Some food manufacturers fortify food items as a marketing strategy to improve sales. Refined foods are usually fortified due to nutrient loss during processing. One of the South African DOH goals is to promote optimum health for all. To achieve this goal, strategies were put in place by addressing the causes of malnutrition. One of the outcomes was the Integrated Nutrition Programme (INP) that recognised the significance of food fortification. In April 2003 fortification was made mandatory for certain staple foods in SA. Fiedler *et al*. (2014: 26) and Allen (2014: 3455) agree that fortification of food largely consumed by the public is an effective intervention to improve micronutrient deficiency. Fortified foods include maize, wheat and wheat flour to address the issues of micro nutrients. All the producers of these products display a logo for easy identification of these food items. However, there is still more work that needs to be done in promoting fortified foods and educating people about fortified foods especially in rural areas (DOA 2013; DBSA 2008).

According to Labadarios *et al*. (2005: 261) essential nutrients are lacking among South African women and children. Fortified complementary foods provided through public feeding

programmes and commercially marketed foods have also made a positive impact. The Micronutrient Control Programme Policy Recommendation Group is to review the micronutrient fortification levels of the current food vehicles in light of the poor micronutrient status of children. The interest is with vitamin A and iron, and strengthening the standards compliance monitoring systems for fortified foods. It also seeks to explore the option of promoting Vitamin A for children between 12–59 months through a social marketing or communication strategy. This includes implementing iron sulphate supplements for children between 6–24 months and exploring options for improving the availability of fortified foods for young children, for example home fortification with multiple micronutrient powders for children between 6–24 months, advocating and strengthening the use of WHO/UNICEF protocol of zinc with oral rehydration salt (ORS) in the management of diarrhoea, and implementing a food diversification communication or social marketing strategy in line with the Paediatric FBDG (DBSA 2008).

2.17.3 Food supplementation

Nutrient deficiencies can be addressed through dietary intake, supplementation and commercial and home-based fortification of complementary foods. Nutrition supplements are very important to children and adults. Sometimes the diets consumed, lack adequate nutrients required by the body. Supplements increase survival rate and psychomotor development. Most supplements are safe, and in South Africa, supplementation starts early and semi-solid foods are introduced before children reach six months. However it is not recommended for mothers to stop breast feeding in the first four months due to contamination that can lead to diarrhoea. Fortified foods with iron, folic acid and other nutrients such as cereal flours, cooking oils and dairy products may appear to have a small contribution to the nutrient intake but it is significant in preschool children. In a study conducted in Japan, Hirayama, Lee, Binns, Watanabe, Ogawa (2008: 281-283) indicated that nutrient requirements increase with age, malnutrition is common in older people and it is associated with various consequences among older people. The most popular dietary supplements were multi-vitamins and natural supplements for known health benefits (DOH 2003: 18-20; Ehrlich 2014: 1).

2.17.4 Food diversification

Food technology and new development concepts can assist in combating food insecurity thus improving nutrition status. Lack of access to adequate foods has a direct impact on the nutrition status of many already impoverished people. The FAO (1997) states that food diversification

is crucial for global stable access to nutrition and sustainable food supply; additionally food manufacturers can contribute immensely by boosting production through the use of new advanced technology, enhancing and maintaining a regular flow of various foods throughout all seasons. According Dona and Arvanitoyannis (2009: 164) food diversification can also pose health risks to the population. There are many different genetically modified foods and there are insufficient studies to prove the safety of these foods since each food should be treated differently; nonetheless there are certainly genetically modified foods that are unsafe for consumption and could result in various diseases and health complications.

Food diversification from a community perspective is not limited to improving food security, it also improves business for farmers. Dietary diversification enables communities to consume a great variety of food in adequate quantities. Food based activities is an effective tool to exploit availability, diversify foods, introduce new crops and farming system, promote mixed cropping, and additionally, income generation. However, nutrition education to encourage the consumption of a healthy and nutritious diet year round is imperative (FAO 1997).

2.17.5 Nutrition education

Nutrition education is one of the most effective tools to promote health. According to the FAO (2013) it is essential to improve food and nutrition security and it further stated that knowledge empowers communities and people. When educated people are able to maximise resources to ensure nutrition wellbeing, diet related non communicable diseases could be prevented by imparting relevant information to people. Kushner, Van Horn, Rock, Edwards, Bales, Kohlmeier and Akabas (2014: 1167) stated the need for nutrition education is extremely high and medical schools in the USA have introduced it in the curriculum in response to the recommendation to improve medical education and patient outcomes. The curriculum has evolved in the past seven years in an aim to bridge the gap between personal health and nutrition in communities. The goal emphasises the relevance of nutrition education and engaging medical school students in community population health initiatives, addressing problems as a result of a lack of knowledge or information and education. Education eliminated ignorance, acquired knowledge, assisted people to plan well-balanced diets and make wise food choices at adequate prices, and educated others about healthy eating (FAO 2013b; WHO 2014a).

Thinking forward and finding new ways to reach people is a great way to eliminate some of the barriers to imparting knowledge to communities. Social media is the fastest growing platform of communication. Cell phones and the means to connect on the internet have evolved and information is available at the touch of a button. Over 50% of people (different age groups) own cell phones and have access to the internet. Recent studies engaged in using social media as a tool to educate people. Tobey and Manore (2014: 128) believe that social media is the most convenient way to reach the masses; in addition it is cost effective and quick. The main idea is to create easy access to information, messages can be sent directly or messages can direct people to information. Positive results were observed in a study conducted by Herring, Cruice, Bennett, Davey and Foster (2014: 613) on using the media to promote weight loss in a low income urban community. Nutrition education needs adaptive and efficient strategies to remain effective.

2.17.6 Other government initiatives

Government departments play a significant role in implementing the food and nutrition policy plans across all developed mechanisms, programmes and institutions. The effectiveness of government initiatives depend on alignment, coordination and monitoring. Therefore various government departments and partners need to provide guidance, share knowledge and information, technical leadership and resolve issues relating to implementation of these programmes. The South African Department of Health (DOH) developed and implemented food and nutrition programmes and further provides a framework for the orientation and repositioning of nutrition and nutrition related problems in the country, of which the Integrated Nutrition Programme (INP) is one. Several short- and long-term programmes were developed and significant gains were made since its inception. The main focus for the government is more investment in resources on intervention that have a big impact on targeted groups (DOA 2014).

2.17.7 The South African Integrated Nutrition Programme (INP)

The South African INP was initiated in 1995 by the Department of Health to address and prevent malnutrition. The programme targets poor communities particularly children under the age of five, pregnant and lactating women, persons suffering from lifestyle-related and chronic diseases and at-risk elderly and disabled persons The goal is to promote optimum nutrition for all South Africans. The approach is comprehensive, and includes addressing the underlying causes of malnutrition such as micronutrient supplementation, food fortification and disease support. The programme encompasses provision of healthcare services; improved access to

food; parasite control and delivery of clean and safe water. The INP has launched various campaigns and programmes in the past to ensure goals were achieved including the 'healthy lifestyle' that addressed childhood obesity, the 'Move for Health Campaign' in 2005 that promoted physical activities and healthy behaviour, and the Quick Service Restaurants (QSR'S) that encouraged fast food outlets to provide healthy meal options. Other programmes included nutrition to child survival interventions, the baby-friendly hospital initiative, the Vitamin A campaign, HIV and AIDS education programmes, and community-based growth monitoring and promotion (DOH 2013).

2.17.8 Integrated Food Security Strategy (IFSS)

The Department of Agriculture (DOA 2002) introduced the Food Security Strategy (IFSS) with the vision to provide safe and healthy food for all South Africans and eradicate food insecurity, hunger and poverty. The approach is mainly based on focusing on household food security and national food security simultaneously. The food security intervention addresses issues of access to resources, empowers target groups to have safe nutritious food and provides short and medium term relief measures in extreme conditions of destitution. The IFSS works in parallel with other government interventions such as the Integrated Rural Development Programme (IRDP) and Rural Development (RD), Integrated Food Security and Nutrition Programme (IFSNP), Integrated Growth and Development Plan (IGDP), Operation Phakisa, and the Food and Nutrition Policy Framework (festsa Tlala). These are all part of the DOH strategic plan 2015-2022 (DOH 2015).

2.17.9 Reconstruction and Development Programme (RDP)

The South African Reconstruction and Development Programme (RDP) identified food security as a priority policy objective. The RDP programme is mainly for disadvantaged people and focuses on improving food security conditions. Through this policy other initiatives were established with the same focus of improving the lives of South Africans.

Since 1994, social programmes prioritised school feeding schemes, child support grants, pension funds for the elderly, and free health services for children between 0-6 years. The RDP further supports and has programmes for pregnant and lactating women. Community upliftment programmes include: working for water, community public works programmes, and provincial community food garden initiatives like Kgora and Xoshindlala (Republic of South Africa 1994).

Programmes targeted at improving agricultural production and farming such as land reform and farmer settlement, production loans scheme for small farmers, infrastructure grant for smallholder farmers and the presidential tractor mechanization scheme form an important part of the development programme (Republic of South Africa 1994).

2.17.10 Food parcels

Food aid has played many roles in supporting the most vulnerable communities. Food aid is a global initiative to fight hunger and reduce malnutrition. This initiative was adopted by various governments and incorporated into food security policies to act during emergencies and also feed the poor in unfavourable conditions (Diriye, Nur and Khalif 2013:396). The Department of Social Development (DOSD) introduced food parcels to the most vulnerable South Africans as a food insecurity relief strategy. Part of the government policies stipulate such strategies to assist in emergency situations. The parcels normally contain basic grocery items such as maize meal, tinned pilchards, sugar, soya mix, tea, cooking oil, dried peas, dried beans, rice, salt, peanut butter, soap and petroleum jelly. The vulnerable groups include elderly people, children and child-headed households, orphaned children, people with disabilities, female-headed households and HIV and AIDS affected households. Applications for food parcels are made through a welfare officer and it takes about 35 days to be processed. The South African Food Bank along with DOSD joined forces in 2009 to promote community food bank initiatives. As a result, millions of food parcels have been distributed to the less fortunate. The initiative normally targets orphanages, shelters for abused women and children, old age homes and early childhood development facilities. Diriye, Nur and Khalif (2013: 396) suggested that even though food aid parcels are effective as a social relief, the way forward is to adjust current policies in agriculture to improve food security (Steyn and Temple 2008: 290; DOSD 2012).

2.17.11 Government grants

The social protection programme is one of the most advanced and wide-reaching for a middle-income country, helping to reduce income inequality among the poor, elderly and disabled. Crush and Caesar (2014: 174) stated that the majority of people's main source of income in South Africa was social grants. The most common grants in South Africa with the highest number of recipients are child support and pension grants. According to Statistics South Africa (StatsSA 2016), R129 billion is spent on social protection alone, and social grants are estimated to reach R165 million by year 2019. The total number of social grant recipients increased from

four million in 1994 to 16.9 million by the end of 2015. Grants differ in amount; as of 2016 the South African old age, disability and care dependency grant is currently R1500.00, the child support grant is R350.00, the foster care grant is R890.00, the war veteran's grant is R1520.00 and the grant-in-aid is R350.00 per person monthly. South Africa also offers a social relief distress grant that is awarded to people affected by natural disasters such as floods and also includes people awaiting payment of an approved social grant (StatsSA 2016).

Nawrotzki *et al*. (2014: 287) and Crush and Caesar (2014: 174) both agree that grants provide a safety net for poor households and improve food security. Although grants are proven to be effective there are still concerns with regard to the poverty scale. Other South African grants include care dependency and foster care grants. The Government's social programmes include: school feeding schemes, children, pension and disability grants, free health services, public works programmes and agricultural programmes. Drimie and McLachlan (2013: 222) and StatsSA (2015) estimated that over 75% of rural populations relied exclusively on dependent grants and women were more likely to receive grants then men.

2.17.12 Millennium Development Goals

There are eight United Nations Millennium Development Goals. All 191 UN member states committed to accomplish the goals by the end of 2015. The declaration to combat poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women was signed in September 2000. The MDGs were derived from the declaration, and all had specific targets and indicators. These goals underline most of the government initiatives developed in different countries (WHO 2012).

Goal one was to 'Eradicate extreme poverty and hunger'. The main aim of this goal was to decrease hunger and poverty by half. The second goal was to 'Achieve universal primary education'. The third goal was to 'Promote gender equality and empower women' by eliminating gender disparity in primary and secondary education by 2005 and at all levels. The fourth goal was to 'Reduce child mortality' by two-thirds among children under five. 'Improve maternal health' was the fifth goal. This goal focused on decreasing the mortality rate by three-quarters. Goal number six was to 'Combat HIV and AIDS' by reversing the spread and incidence of malaria and other diseases. Goal seven was to ensure 'Environmental sustainability' by integrating the principles of sustainable development into government policies and programmes, reverse loss of environmental resources, reduce half the proportion

of people without sustainable access to safe drinking water and achieve significant improvement in the lives of at least 100 million slum dwellers by 2015. Goal eight was to 'Develop global partnership for development' (UN 2015c).

The UN (2015) reported on the progress of all the goals as 2015 was the last year to achieve the goals. Goal number one was not achieved. MDG1 was not met, however it managed to reduce the number people living under $1.25 a day from1.9 billion in 1990 to 836 million in 2015. MDG2 was also not met, with the primary school enrolment rate increasing from 83% in 2000 to 91% this year. MDG2 was achieved since two thirds of developing nations now have gender equality in education. MDG4 was not met, but mortality rates were reduced from 90 to 43 deaths per 1 000 live births. MDG5 was almost achieved as maternal deaths decreased by 45%. MDG6 was not met; however new HIV infections decreased by 40%. MDF7was achieved in 2010 as 2.6 billion people now have access to safe drinking water. MDG8 was met since global partnership improved to 66% (UN 2015c; FAO 2016).

The end of 2015 marked the end of the MDG initiative and the birth of Sustainable Development Goals (SDG) which are part of the United Nations Development Programme (UNDP) strategic plan. The new SDGs were developed in September 2015 with the vision to create a sustainable and resilient development. There are 17 SDGs aimed at ending poverty, fighting inequality and injustice and tackling climate change by 2030. No poverty is SDG1 with the focus on ending poverty in all forms everywhere; SDG2: Zero hunger through strengthening food security, improving nutrition as well as promoting sustainable agriculture; SDG3: Good health and well-being; SDG4: Quality education by providing lifelong opportunities; SDG5: gender equality through empowerment of women and girls; SDG6: Clean water and sanitation for all; SDG7: Affordable and clean energy that is modern, reliable and sustainable; SDG8: Decent work opportunities and economic growth; SDG9: Industrial innovation and infrastructure; SDG10: Reduce inequality within and among countries; SDG11: Sustainable cities and communities; SDG12: Responsible consumption and production; SDG13: Climate action; SDG14: Life below water; SDG15: Life on land; SDG16: Peace, justice and strong institutions; SDG17: Partnerships for the goals (UN 2015c; FAO 2015c).

2.18. CONCLUSION

The literature in this chapter focused on the status of food security and insecurity globally, on the African continent and in South Africa and highlighting the root causes and the underlining factors that affect human wellbeing. The findings from most research articles support the significance of this study and assist in providing a prospective framework. Even though MDG number one to eradicate hunger was not met, tremendous results were achieved towards this goal. Poverty being the main driver of food insecurity is layered in numerous dimensions that all need to be examined and scrutinised. Convergent results from different literature reviews recognise the role of economic development and employment in eradicating poverty. Due to poverty and malnutrition, many people are hungry and sick, resulting in poor health and wellbeing. Present and emerging food security challenges require a systematic approach with contingency plans for sustainable results.

CHAPTER 3-METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the methodology used in the study to determine the food security status, coping strategies, food intake and the nutrition status of n=150 caregivers in the Kenneth Gardens community, which is situated in an urban area in KwaZulu-Natal. The research tools of the study included a food security questionnaire, anthropometric measurements, a socio demographic questionnaire, a food frequency questionnaire, and three 24-hour recall questionnaires. The main objective of this chapter is to explain the planning, research design, administration of the study, data collection, data analysis and statistics used in the study. The study will assist in providing vital information on food security and the impact this has on human nutrition in the Kenneth Gardens community.

The aim of the study was to determine the food security status, coping strategies, food intake and nutrition status of the Kenneth Gardens community in order to plan interventions to address food insecurities with the aim of improving the nutrition status of the community.

Figure: 3.1: Study area

Kenneth Gardens is located in the Umbilo area, Durban, KwaZulu-Natal. It is the largest municipal housing estate in Durban and has 286 units in 28 blocks of flats with approximately 1500–1800 residents refer to figure 3.1 above. The estate forms part of an extensive network of cluster housing schemes developed by the apartheid government as a protectionist strategy

for safe and affordable housing for poor and working class white people. It is currently owned by the ruling South African government and managed by the KZN Province. Kenneth Gardens offers subsidized housing to residents from diverse backgrounds. Accommodation in the estate still remains in high demand. Residents are low income bracket earners and many rely on state disability and pension grants for survival. Kenneth Gardens has a wide range of social problems such as alcohol, drug abuse, domestic violence, unemployment and limited access to education (Marks 2013:26).

3.2 PERMISSION AND CONSENT

The research proposal was submitted and approved in 2013 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 obtained from the Institutional Research Ethics Committee (IREC) 005/13 (Annexure A).

Permission for the study was obtained from the Kenneth Gardens Community Board. The study was approved by the University of KwaZulu-Natal (UKZN) ethics committee as part of a wider Kenneth Gardens study (Annexure B). UKZN also created a community forum that agreed to any work/research on the Kenneth Gardens grounds. Randomly selected participants were approached at their homes and if they agreed to participate signed a consent form; participation was on a voluntary basis. All the participants were informed that all information was confidential and that participants were to be given a participant number that would be used on the questionnaires.

Participants were also informed that they had the right to withdraw at any time without any penalties being imposed. None of the participants were remunerated to participate in the study and none of the participants incurred any costs to participate in the study. When approaching randomly selected households, the study was explained and an information letter was presented that explained the study in detail (Annexure C), the participants were requested to sign a consent form once the participant understood the content of the information letter. Only the researcher and the supervisor had access to the information that will be locked away in a cabinet in the Department of Food and Nutrition, Durban University of Technology for a period of five years after which it will be destroyed by shredding; electronic data will be password protected.

3.3 STUDY DESIGN

An empirical study design was used to collect primary data about the Kenneth Gardens community. The study was designed as a survey study using quantitative measures complemented by qualitative techniques and was descriptive in nature. Various measuring instruments were used to collect relevant data in this study. Quantitative data was collected using questionnaires and Anthropometric measurements were taken and recorded with the aim of identifying variables in the area and providing vital answers to the research problem during the interviews. Face to face interviews were conducted.

3.4 SAMPLING STRATEGY

The sample size of this study was 150 participants (households). The sample size was calculated using a power calculation indicating that 150 participants represent a reliable sample (Cole, Nie and Chu 2006: 483-491), with a 95% confidence level, out of a possible 283 households. The sample was based on the number of formal households in Kenneth Gardens. This community was selected based on its geographical location as it is an urban community with middle to low income households. The focus will only be on households in the community in Kenneth Gardens. The sampling procedure is simple random sampling Data was collected from 150 participants 18 years of age and older in 150 randomly selected households. Each caregiver took approximately 60-90 minutes to complete the assessment and questionnaires.

Sample size calculation

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

Where:
Z = Z value (e.g. 1.96 for 95% confidence level)
p = percentage picking a choice, expressed as decimal (0.5 used for sample size needed)
c = confidence interval, expressed as decimal = .07 (three units on both sides of the normal).

All the households at Kenneth Gardens (n=283) had an equal opportunity of being selected. The caregivers in the households were selected as the participants to get accurate information on food practices and coping strategies. Male and female caregivers were included in the study in order to give more households the opportunity to participate in the study thus increasing the validity of the study, refer to Table 3.1.

Table 3.1: Inclusion and exclusion criteria

Inclusion criteria	exclusion criteria
• Women and men who were primary caregivers in each household at the time of the survey. A caregiver is anyone who assumes the responsibility of others, provides care and assistance for children or any family member. Prepares most of the meals and this could include; grandparents, aunts, other relatives and foster parents. • Participants older than 18. • Kenneth Gardens residents.	• Non Kenneth Gardens residents. • Residents under the age of 18. • Visitors.

3.5 SELECTION OF FIELDWORKERS

Two residents from the Kenneth Gardens community were trained as fieldworkers by the researcher to assist in on administering the questionnaires, which included Socio-demographic, Food Frequency, and Food security questionnaires for the study. A consent form to participate as fieldworker was signed by all fieldworkers (Annexure E).The significance of the study was explained and discussed. A fieldworker guide was used to train the fieldworkers (Annexure D). Training included how to approach respondents, the code of conduct and the administration of questionnaires. The researcher together with the two fieldworkers administered the questionnaires and did the focus group discussion of all the selected 150 household. The trained fieldworkers accompanied the researcher to see how the research was conducted and the researcher monitored and evaluated the fieldworkers on the first day. The researcher conducted the anthropometric measurements and 24-hour recall questionnaires.

All fieldworkers were fluent in English and Zulu and were allowed to translate questions in English into Zulu to avoid a language barrier. All participants were treated with respect by the fieldworkers and made to feel as comfortable as possible. All fieldworkers were very friendly and patient with the participants. Fieldworkers were responsible, committed and reliable and this was the key to an effective study.

3.6 ADMINISTRATION OF MEASURING INSTRUMENTS

Household were randomly selected and approached due to the socio-demographic profile of the Kenneth Gardens community and surroundings. The area has a high crime rate and visible drug use, therefore most households keep their doors locked. However, households who had their doors open were approached first. A brief fieldworker introduction was done and their name and the institution were identified. The study was thoroughly explained and participants were asked to sign a consent form confirming their agreement to participate. Some of the participants did not allow the fieldworkers inside their homes and data was thus collected on the front stoop. A number of households refused to participate or some asked the fieldworker to return on another day. To administer the socio-demographic, anthropometric, food frequency and food security questionnaires per household required one day visit. Sometimes participants felt the questionnaires were too long and would ask you to return the following day. A minimum of three days was required to administer three 24-hour recall questionnaires as participants had to recall the previous day's meals. Overall it took an average of 45 minutes to an hour to administer all the questionnaires depending on the participant's ability to provide information.

3.6.1 Study variables

Several questionnaires were used to measure various variables. To determine the socio-demographic profile of the household a Socio-Demographic Questionnaire was used. Anthropometric measurements conducted included body weight in kilograms (kg) and height in metres (m). The 24-hour recall and Food Frequency questionnaires determined dietary intake. The coping strategies in the households were determined for a period of 30 days in times of food insecurity or scarcity. All questionnaires were checked for completeness and accuracy every day after the data was collected. If any data was missing the researcher returned to the household the next day.

3.6.2 Socio demographic survey

The socio-demographic questionnaire developed by Oldewage-Theron *et al*. (2008) covers aspects of life including general information, such as subject number, field worker name and date personal information, such as role in the family, date of birth, age and gender and information on accommodation, family composition, work, income status, education, language and assets. The participants were advised that the answers to the questions were strictly confidential and information would not be identifiable in any reports or publications. The questionnaires were conducted in English and Zulu depending on the level of bilingualism of the participant.

3.7 PROCEDURE FOR COLLECTING ANTHROPOMETRIC MEASUREMENTS

3.7.1 Anthropometric data

A trained researcher collected the anthropometric measurements; weight and height for calculating the BMI for the participants. All measurements were conducted twice and the average recorded on an anthropometric data sheet (Annexure F) to ensure accuracy. Participants were weighed and measured using a good quality electronic calibrated scale (PPS 2000) and stadiometer. Precise standard measuring techniques were applied for the anthropometric measurements to be valid.

3.7.2 Weight

An electronic calibrated scale (PPS 2000) was used to measure weight in kilograms (kg) and measurements were rounded off to the nearest gram (g). The scale was tested twice using the same weight in kg before weight measurements were taken. All participants were asked to remove excess clothing and items in pockets that might add extra weight, e.g. jackets, hats, coins, wallets, cell phones etc. The scale was placed on a smooth level surface and switched on until it reflected zero. The scale was re-calibrated after each day (Gibson 2005: 235). Participants were asked to step on the scale and stand upright with both feet flat and apart while the measurement was recorded on the anthropometric sheet. Before the second measurement was taken the researcher ensured that the scale reflected zero. The weight measurements were combined and the total average weight was used. Weight was measured by a skilled researcher who was familiar with the procedures (Gibson 2005: 235)

3.7.3 Height

A stadiometer was used to measure the height of all participants in metres (m). The stadiometer was placed on a flat surface against the wall. All participants were asked to remove shoes, excessive clothing and hats. The participants had to stand up straight facing the fieldworker with the head level, feet and knees together, shoulders and arms relaxed and buttocks slightly touching the scale (Gibson 2005: 235). The measurements were taken twice with the stadiometer touching the head and allowed to rest. The two measurements were recorded in centimetres (cm) in the relevant field on the anthropometric sheet. The measurements should not vary by more than 5mm and were taken to the nearest 0.5cm. The measurements were taken by the researcher who was familiar with the procedures and the same procedures were applied for each participant (Gibson 2005: 235).

3.8 Coping strategies (CS)

A food coping strategy questionnaire developed by Maxwell *et al*. (2003) was modified for the Kenneth Gardens community in a focus group discussion with 10 caregivers from the community who were not included in the study to identify specific coping strategies used by the community in times of food scarcity (Annexure G). The trained fieldworkers completed 150 questionnaires in a one-on-one interview situation. The participants were asked if there had been times in the past 30 days where there was not enough money to buy food and how often the household had to use the specific coping strategy. The relative frequency scores vary from 7: all the time, everyday; 4.5: pretty often 3-6 x/week; 1.5: once in a while 1-2 x/week; 0.5: hardly at all 1 x/week and 0: never. The coping strategies were also weighed for severity by the 10 participants, scoring from one to four, one being for least severe and four for most severe. The questionnaire results were interpreted and discussed in chapter 4.

3.9 Dietary assessment

One of the major components of the study was to determine the food variety and dietary intake of the Kenneth Gardens community. The dietary assessments were conducted using a 24-hour recall and food frequency questionnaires. Each participant completed three 24-hour recall questionnaires and one food frequency questionnaire.

a) Food frequency questionnaire –FFQ

The Food Frequency Questionnaire (FFQ) developed by Oldewage-Theron and Kruger (2008) was adapted for the Kenneth Gardens community in a focus group discussion with 10

caregivers from the community who were not included in the study (Annexure H). The caregivers identified various foods consumed in the community. The FFQ determines the food group variety and dietary diversity consumed by participants over a period of seven days. The dietary diversity score (DDS) consisted of a simple count of single foods and food groups. The foods were categorised into nine groups which are group 1: flesh foods (meat, poultry, fish) diversity; Group 2: eggs diversity; Group 3: dairy products diversity; Group 4: cereals, roots and tubers diversity; Group 5: legumes and nuts diversity; Group 6: Vitamin A rich fruits and vegetables diversity; Group 7: other fruits (and juices) diversity; Group 8 other vegetables diversity including onion, tomato, cabbage etc; Group 9: oils and fats diversity as per the FAQ nine nutrition food groups (FAO 2010c). One hundred and fifty questionnaires were completed in an interview situation by trained fieldworkers where the participants were asked to indicate food items consumed in the previous seven days; foods consumed were not quantified. The FFQ instrument was used to validate the 24-hour recall questionnaire.

b) 24-hour recall

A structured 24-hour recall questionnaire was used to determine actual food intake, food items and quantities consumed over a 24 hour period (Annexure I) by caregiver reflecting on the household intake. The three 24-Hour recall questionnaires were conducted in an interview situation with all 150 households. Food models were simultaneously used to assist participants in estimating portion sizes and identifying certain food items. The 24-hour recalls comprised of a weekend day and two week days. The data was captured and analysed for the nutrient adequacy of the diet.

3.10 DATA ANALYSIS AND STATISTICS

3.10.1 Socio demographic questionnaire

The socio demographic questionnaires were checked for completeness and accuracy by the researcher (Annexure J). The data was captured onto an Excel® spreadsheet. The questionnaires were analysed using the Statistical Package for Social Sciences (SPSS) for Windows Version 21 software program. Descriptive statistics were determined. Data was presented as frequencies and percentages and presented in tables and graphs.

3.10.2 Anthropometric measurements

The weight and height (average of the two readings) measurements of all the participants (n=150) were captured on an Excel® spreadsheet and used to determine body mass index (BMI). The BMI was calculated by dividing weight in kilograms (kg) by height in metres squared (m^2). The results were compared to the WHO (2008) cut-off points [moderate weight (BMI 18.5-24.9), overweight (BMI=25-29.9), obese 1 BMI>30, obese 2 BMI>35 and obese 3 BMI>40 which is high risk]. The BMI was used to estimate and predict the prevalence of underweight, overweight and obesity in the community and the associated risks.

3.10.3 Dietary assessment questionnaires

The dietary intake and food consumption data from the 24-hour recall questionnaires were analysed by a Food and Nutrition specialist using the Food Finder Version 3 computer program (Langenhoven, Kruger, Gouws and Faber, 1991; Food Finder 3, 2002). The results of the 24-hour recalls were then used to determine the actual intake with mean standard deviation and nutrient intake calculated and compared to DRIs. Estimated Average Requirements (EARs) were used as the references measure and if this was not available, adequate intake (AI) as Recommended Daily Allowances (RDAs) are indicated for use in individuals and not groups of people (NICUS 2003). The top 20 food items consumed were determined and presented in total intake, mean intake and frequency. Fruit and vegetable intake was compared to the WHO guidelines of >400g/day. The Daily Recommended Intake (DRI) expresses the distribution as the acceptable macronutrient distribution range (AMDR) as per percentage of kilojoules. Energy contribution to daily requirements WHO cut-off points: Protein: 10-35%, Fat: 20-35% and Carbohydrates: 45-65% (WHO 2003) was calculated. The Nutrient Adequacy Ratio (NAR) was calculated.

The data from the FFQs over the past seven days in each household was used as a measure for the food group diversity score (FGDS) and food variety score (FVS) and were captured on an Microsoft Excel® spreadsheet and analysed with the assistance of a statistician using SPSS version 21 for descriptive statistics. The captured data was then used to find out whether there was a low, medium or high food variety in the household. The FVS and FGDS of all households were then compared and the most frequently consumed food items in all households determined.

Table 3.2: Food Variety Score and Food Group Diversity Score

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

Food Variety score (FVS) is a simple count of food items. Table 3.2 above shows the food variety and food group diversity score, and indicates a low score if less than 30 individual foods were consumed between zero to three food groups. A medium score consists of 30-60 individual foods from four to five food groups. Six to nine food groups with over 60 individual foods indicates a high score. Dietary Diversity Score (DDS) refers to the food group count (FAO 2013).

3.11 Correlations

Bivariate correlations (Pearson correlations – 2 tailed) were drawn between some of the variables to establish a relationship. Food security score and BMI, household income per month and food security, household income and BMI, money spent on food and BMI, money spent on food and food security score, household income and money spent on food per month was used. A $p<0.05$ was used as an indication of statistical significance. The Food group diversity score were correlated with macronutrients and certain micro-nutrients to determine if a relationship existed between an increased FGDS and increased nutrients. Table 3.3 below shows all the correlations done between different variables.

Correlation between different variables was examined as shown in Table 3.2 above. Some results revealed statistical significance and all were analysed and discussed in the next chapter.

Table 3.3: Correlations of different variables

Variables
BMI of men vs Women
Weight of men vs Women
Energy vs BMI
BMI vs Fat
BMI vs Income
Income vs FVC
Income vs FGDS
Income vs Coping strategy score
Coping strategy score vs Money spent on food
Coping strategy score vs FVS
Coping strategy score vs FGDS
Coping strategy score vs Number of people in household
Coping strategy score vs Income
Number of people in household vs Frequency of meals
Number of people in household vs Energy
Number of people in household vs Carbohydrates
Number of people in household vs Protein
Number of people in household vs Fat
Fat vs Income
Education levels vs FGDS
Education levels vs FVS
Education levels vs Income
Education level vs Coping strategy score
Education level vs Number of people in household
Coping strategy score vs BMI

3.12 CONCLUSION

In this chapter all the instruments used to determine the food security, socio-economic and nutritional profile of all the participants in the Kenneth Gardens community have been discussed. The measuring instruments used in this study were appropriate, effective and reliable in gathering the data in order to achieve the study aim. The next chapter includes a compilation of all the data collected.

CHAPTER 4: RESULTS AND FINDINGS

4. SOCIO-DEMOGRAPHIC RESULTS

4.1 INTRODUCTION

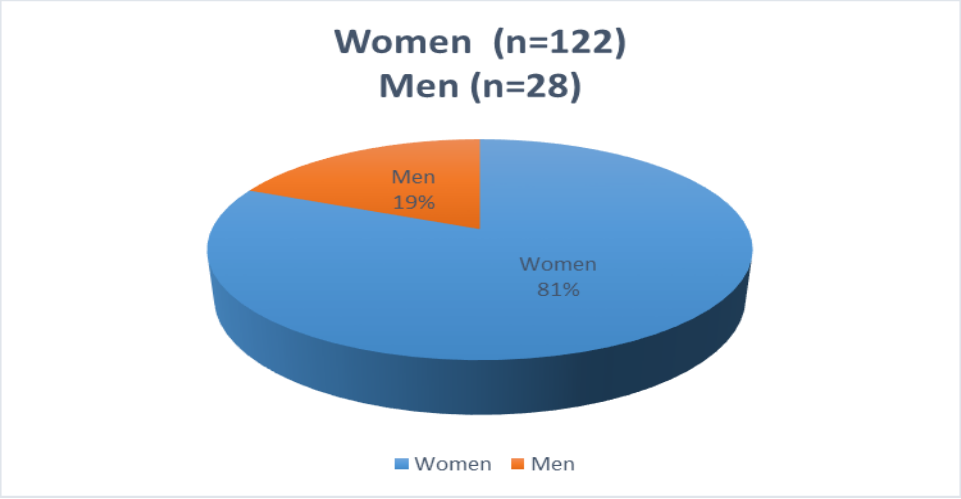
The purpose of the study was to determine the interaction between the socio-economic conditions, nutrition status, dietary diversity, nutrition adequacy, coping strategies and food consumption of the Kenneth Gardens community in Durban, KwaZulu-Natal. Socio-demographic data provides essential information about the study population background and it forms the basis of the study.

This chapter focuses on reporting the results obtained in the study. All the processed data is presented in the form of tables and graphs interpreted and evaluated. The results are presented in the form of percentages (%) and numbers (n).

4.2 STUDY RESULTS OF KENNETH GARDENS COMMUNITY

The sampling techniques resulted in 150 selected participants forming part of the sample population, with a total of 100 percent of participants completed the study, that included 28 men and 122 women from age 18 years and above with a mean age of 48.9 years (SD±16.439) as indicated in Figure 4.1.

4.2.1 Personal Information



Mean age Men (n=28) = 42.04
Mean age Women (n=122) =50,58
Whole group (n=150) =48.99

Figure: 4.1 Gender and age

Table 4.1 indicates that the participants spoke different languages. . The majority of participants, 52% (n=78), spoke English and the least spoken languages were Sotho and Afrikaans with 1.3% (n=2) and 2.0% (n=3) respectively. Zulu was the second most spoken language (43.3%; n=65).

Table 4.1: Percentage of language spoken distribution within household

Variables	Number (n= 150)	Percentages (%)
The language spoken in the house		
Zulu	65	43.3
Xhosa	2	1.3
English	78	52.0
Afrikaans	3	2.0
Sotho	2	1.3

Table 4.2 below reflects the role of the participants in the family. Fifty eight percent (n=87) of the participants were the mother in the family. Ten percent (n=15) of the caregivers were the father, followed by 7.3% (n=11) grandmothers and 0.7% (n=1) grandfathers. The other 24% (n=36) represent a sibling, cousin, friend, son and spouse as the caregivers in the family.

Table 4.2: Distribution of caregiver by status within household

Role in the family	Number (n= 150)	Percentages (%)
Mother	87	58.0
Grandmother	11	7.3
Father	15	10.0
Grandfather	1	0.7
Other	36	24.0

4.2.2 Accommodation and family composition

The results in Table 4.3 indicate that all participants n=150 (100%) live in a formal urban area. All the flats are owned by the eThekwini municipality. One hundred and forty nine of the households consisted of 3-4 room flats with running water, flush toilet and electricity, while one participant stayed in a domestic outbuilding with a toilet and running water but no electricity. The municipality was in charge of maintaining the residential facility and waste removal. A total of 94% (n=141) of the participants lived with other people in the flat and 6% (n=9) lived alone. One hundred and thirty one (83.3%) of the participants had lived in Kenneth

Gardens for over five years and only 17.7% (n=19) for less than five years. The table also reflects how many residents lived in the flat.

Table 4.3: Accommodation and family composition

Variables	Number (n= 150)	Percentages (%)
Type of location		
Town or city	150	100.0
Type of residence		
Flat	149	99.3
Domestic outbuilding/ backroom	1	0.7
Number of rooms		
3-4	149	99.3
1	1	0.7
Other people residing in the flat		
Yes	141	94.0
No	9	6.0
Duration of period of residence		
≥1 years	5	3.3
≥5 years	14	9.3
<5 years	131	87.3
Number of people living in the flat		
1	9	6.0
2	24	16.0
3	32	21.3
4	27	18.0
5	32	21.3
6	16	10.7
7	6	4.0
8	3	2.0
10	1	0.7
Water facilities		
Tap in the flat	149	99.3
Tap outside the outside	1	0.7
Flush toilet facilities		
Yes	150	100.0
Municipal waste removal system:		
Yes	150	100.0
Electricity available in the household		
Yes	149	99.3
No	1	0.7

Pest infestation in households could possibly contribute to poor food safety and hygiene. Table 4.4 reflects pests that were a problem in the households. A large percentage of the households 48.7% (n=73) experienced problems with ants, 27.3% (n=41) mosquitoes, 9.3% (n=14) Geckos, 2% (n=3) frogs and 8.1% (n=12) flees, snakes and bed bugs.

Table 4.4: Pest infestation in households

Variables	Number (n= 150)	Percentages (%)
Mice/ rats	12	8.0
Cockroaches	72	48.0
Ants	73	48.7
Fleas	4	2.7
Mosquitoes	41	27.3
Geckos	14	9.3
Frogs	3	2.0
Snakes	4	2.7
Bed bugs	4	2.7

4.2.3 Problems experienced with the flat

The state of the flat is presented in Table 4.5. Only 31% (n=46) of the tenants had problems with the condition of the flat, namely: 91% (n=42) had damaged doors and windows, 17% (n=8) experienced roof leakage, 50% (n=23) had damaged floors, 30% (n=14) needed t to be repainted, 33% (n=15) had broken taps and 13% (n=6) had a malfunctioning toilet.

Table 4.5: State of the flat

Variables	Number (n= 150)	Percentages (%)
State of the flat	46	31.0
Damaged doors and windows	42	91.0
Roof leaks	8	17.0
Damaged floors	23	50.0
Maintenance paint	14	30.0
Broken taps	15	33.0
Malfunctioning toilet	6	13.0

4.2.4 Employment status and income

Work and income status of the participants is presented in Table 4.6. The unemployment rate was 36% (n=54) with 26% (n=39) actively seeking employment, however 43.4% (n=65) were employed. Out of the 65 participants that were employed, 10% (n=15) were employed on a permanent basis, 4.7% (n=7) were employed part time and 2% (n=3) were on contract. The results also illustrated that 8% (n=12) had retired, 14.7% (n=22) were housewives, 8% (n= 12) were students and 17.3% (n=26) were pensioners.

Table 4.6: Employment and education status

Variables	Number (n=150)	Percentages (%)
Employed at the time of the study	40	26.7
Permanent	15	10.0
Part-time	**7**	4.7
Fixed contract	3	2.0
Unemployed	54	36.0
Current status		
Retired	12	8.0
Housewife	22	14.7
Student	12	8.0
Pensioner	26	17.3
Currently seeking employment	39	26.0
The period of unemployment		
>6 months	10	6.7
<3 years	38	25.3
The total income in the household per month		
<R1500.00	25	16.7
≥R1500.00 and <R3000.00	17	11.3
≥R3000.00 and <R6000.00	47	31.3
≥R6000.00	56	37.3
Number of people that contribute to the household income		
0	6	4.0
1	57	38.0
2	64	42.7
3	17	11.3
5	4	2.7
6	2	1.3
Education level of caregiver		
Tertiary	11	7.3
Matric	71	47.3
Standard 8	44	29.3
Primary	13	8.7
None	11	7.3

The total household income per month as indicated by 16.7% (n=25) of the participants was less than R1500.00, 11.3% (n=17) earned between R1500.00 and R3000.00, 31.3% (n=47) earned between R3000.00 and R6000.00 and 37.3% (n=56) earned more than R6000.00. It was also found that the majority 58% (n=87) of the households had more than one person contributing towards the total household income, while only 38% (n=57) had one person and 4% (n=6) had no one contributing towards the household income. Most participants 47.3% (n=71) had matric, 7.3% (n=11) had a tertiary level education, 29.3% (n=44) standard 8, 8.7% (n=13) primary school level and 7.3% (n=11) never attended school.

4.2.5 Food and money spent on food

According to Table 4.7, 4% (n=6) of participants spent less than R500.00 on food monthly. The majority, 92.7% (n=139) of the participants spent more than R500.00 and 3.3% (n=5) did not know how much money they spent on food. Sixty five participants (43.3%) indicated they had no shortage of money to buy food and 3.3% (n=5) always lacked money to buy food. Ten percent (n=15) of the participants experienced a shortage of money to buy food often, 29.3% (n=44) once a week and 14% (n=65) once a month. Table 4.7 further explains that supermarkets (95.3%; n=43) were the most favoured place to buy groceries, followed by 4% (n=6) buying from street vendors and one (0.7%) from tuck shops. None of the participants used wholesalers. Most meals 96.7% (n=145) were eaten at home, 1.3% (n=2) of the children ate most meals at school and 2% (n=3) of the adults ate most meals at work. The type of transport mainly used by 64% (n=96) of the participants was public transport and 36% (n=54) had private transportation.

Table 4.7: Food and money spent on food

Variables	Number (n=150)	Percentages (%)
Money spent on food		
>R500.00	6	4.0
<R500.00	139	92.7
Do not know	5	3.3
How often food is purchased		
Every day	9	6.0
Weekly	29	19.3
Monthly	102	68.0
Shortage of money to buy food		
Always	5	3.3
Often	15	10.0
Once a week	44	29.3
Once a month	21	14.0
Never	65	43.3
Where food is purchased		
Tuck shop	1	0.7
Street vendors	6	4.0
Supermarkets	143	95.3
Wholesalers	0	0.0
Number of meals consumed per day		
<3	48	32.0
=3	91	60.7
>3	11	7.3
Where are most meals eaten		
Home	145	96.7
Work	3	2.0
School	2	1.3
The type of transport used to move around		
Own	54	36.0
Public transport	96	64.0

The information in Table 4.8 displays the participant's household assets. Although the income status of the majority of participants is low, participants owned a number of electrical appliances. Most households (97.3%; n=146) owned a television, 98.7% (n=148) a refrigerator, 93.3% (n=140) an electric stove. A small number of participants 4% (n=6) used paraffin stoves and 18.7% (n=28) had gas stoves as an alternative cooking source. One hundred and thirty three (88.7%) had microwave ovens, 94.7% (n=116) owned either a cell phone or a landline telephone. The majority of the participants 98% (n=147) had beds and only 2% (n=3) used mattresses only. Sixty participants (40%) owned motor vehicles and 7.3% (n=11) motorbikes.

Table 4.8: Household assets and electrical appliances

Variables	Number (n= 150)	Percentages (%)
Electrical appliances		
Television	146	97.3
Electric stove	140	93.3
Hotplate	16	10.7
Microwave	133	88.7
Refrigerator	148	98.7
Freezer	79	52.7
Radio	116	77.3
Cell phone / Landline telephone	142	94.7
Non electrical assets		
Gas stove	28	18.7
Paraffin / primus stove	6	4.0
Bed	147	98.0
Lounge suite	145	96.7
Dining room suite	84	56.0
Car	60	40.0
Motorbike	11	7.3

4.2.6 Household responsibility distribution according to member status

Table 4.9 reflects duties and responsibilities in the household. This table also includes the head of the household, the person responsible for deciding how much money to spend on food, the person/s responsible for buying food, preparing the food and feeding the children.

Most of the households (52.7%; n=79) were headed by women. Men headed 40% (n=60) of the households and 2.7% (n=4) of the households were headed by grandmothers. In the absence of parents, certain households were headed by siblings 1.3% (n=2) or cousins 0.7% (n=1) cousins and other 2% (n=3) refers to a brother or a sister who took on the responsibility of a parent.

The decision on the amount of money to spent on food was taken mostly by mothers 64.7% (n=97), and 76.7% (n=115) of the mothers also decided on the type of food to buy. In other households fathers 22% (n=33) were responsible for deciding how much money was spent on food. A small number (n=5) 3.3 % of grandmothers were responsible for buying food, while 8% (n=12) were aunts, 3.3% (n=5) were siblings, 0.7% (n=1) was a grandfather and 0.7% (n=1) refers to a relative in the absence of a parent. Food preparation was done mostly by mothers in 79.3% (n=119) of the households, fathers 8% (n=12), grandmothers (2.7%; n= 4) and siblings (2%; n=3). In the majority of the households the mothers 66.7% (n=100) were responsible for feeding the children. In other households the responsibility was taken by fathers (16.7%; n=25), siblings (3.3%; n=5), grandmothers (2.7%; n=4), or alternatively, the responsibility was shared between siblings and other people living in the house.

Table 4.9: Household responsibility distribution according to member status

Variables	Number (n= 150)	Percentages (%)
Person responsible for preparing food		
Father	12	8.0
Mother	119	79.3
Sibling	3	2.0
Grandmother	4	2.7
Aunt	1	0.7
Other, e.g. daughter, sister, brother, son, friend	10	6.7
Person responsible for buying food		
Father	11	7.3
Mother	115	76.7
Sibling	5	3.3
Grandmother	5	3.3
Grandfather	1	0.7
Aunt	12	8.0
Other, e.g. daughter, sister, son, friend	1	0.7
Person responsible for feeding the children		
Father	25	16.7
Mother	100	66.7
Sibling	5	3.3
Grandmother	4	2.7
Aunt	1	0.7
Uncle	1	0.7
Other, e.g. daughter, sister, son, friend	11	7.3
Person deciding how much money to spent on food		
Father	33	22.0
Mother	97	64.7
Sibling	5	3.3
Grandmother	4	2.7
Other: daughter, brother, son	1	0.7
Head of household		
Father	60	40.0
Mother	79	52.7
Sibling	2	1.3
Grandmother	4	2.7
Cousin	1	0.7
Other, e.g. brother, son and daughter	3	2.0

4.2.7 Fuel and material of pots used to make food

The main source of energy used to prepare food as displayed in Table 4.10 was electricity 97.3% (n=146), 0.7% (n=1) used gas, 1.3% (n=2) used paraffin as an alternative. One (0.7%) did not cook. The most common material of the pots used to prepare food was aluminium 56% (n=84) and 43.3% (n=65) used stainless steel. The remaining 0.7% (n=1) refers to the participant who did not cook.

Table 4.10: Fuel and material of pots used to make food

Variables	Number (n=150)	Percentages (%)
Type of fuel used to prepare food		
Paraffin	2	1.3
Electricity	146	97.3
Gas	1	0.7
Other	1	0.7
Material of pots		
Aluminium	84	56.0
Stainless steel	65	43.3
None	1	0.7

4.2.8 Child information per household

The results in Table 4.11 present information with regard to the children living in the households. According to the results 67.3% (n=101) of the children had birth certificates. Sixty eight percent (n=102) had completed the immunisation process. One hundred children (66.7%) were still in school. In terms of travelling to school, the results show that 28.7% (n=43) walked to school, 20.7% (n=21) relied on public transport, 8% (n=12) used lifts and the other 4.7% (n=7) used arranged transport. Most meals were eaten at home by 78.7% (n=118) of the children and 2% (n=3) took lunch boxes to school. Twenty one children had died in this community of which 90% (n=19) died due to illness such as jaundice and other illnesses which were not indicated, 4.8% (n=1) died due to an accident and one child (4.8%) died from a heart attack.

Table 4.11: Child information per household

Variables	Number (n=150)	Percentages (%)
Children with birth certificates		
	101	67.3
Children with completed immunisation		
	102	68.0
Children in school		
	100	66.7
Type of transport to school		
Walk	43	28.7
Public transport	21	20.7
Lift	12	8.0
Other	7	4.7
Place where children eat most meals		
Home	118	78.7
School	3	2.0
Children deceased in the household		
Yes	21	14.0
Cause of death	**(n=21)**	
Sickness	19	90.4
Accident	1	4.8
Heart attack	1	4.8

4.3 ANTHROPOMETRIC HEALTH INDICATORS

4.3.1 Mean and standard deviation for age, weight and BMI of the caregivers

Table 4.12 describes the mean age, height, weight and BMI of the total group (n=150). The mean age for women was 50.58 years with a SD±16.285 and the mean age for men was 42.04 years with a SD±42.036. The results indicate that women with a mean weight of 78.67kg were heavier than men. The mean weight for men was 79.42 kg, with the mean BMI of 26.00. The mean BMI for women was 31.46, 5.46 higher than the men. A significant difference was observed between the BMI of the men and the women (p=0.001).

Table 4.12: Mean and standard deviation for age, weight and BMI of the caregivers (n=150)

Variables	Mean age ±SD	Mean height ±SD (cm)	Mean weight ±SD (kg)	Mean BMI ±SD
Whole group	48.99±16.349	1.61±0.096	78.81±21.550	30.44±8.261
Women (n= 122)	50.58±16.285	1.58±0.072	78.67±21.789	31.46 ±8.474*
Men (n= 28)	42.04±42.036	1.74±0.079	79.42±20.847	26.00±5.445*

* p<0.01

4.3.2 BMI classification table for women and men

The results in Table 4.13 below indicate the BMI classification for both women and men in the study. Only 3.3% (n=4) of the women and 3.6% of the men were underweight; 18.8% (n=23) of the women and 46.4% (n=13) of the men were of a normal weight. The overweight category revealed that 26.2% (n=32) of the women were overweight. Conversely a large percentage (46.4%; n=13) of the men were of normal weight, only 25% (n=7) of the men were overweight. Twenty three percent (n=28) of the women and 25% (n=7) of the men were obese category one. None of the men were obese category two and three. However, 17.2% (n=21) and 11.5% (n=14) of the women were obese category two and three respectively.

Table 4.13: Nutritional Status of women and men according to BMI classification

Parameter Index	Classification	% of Women n= 122	% of Men n= 28
Body Mass Index (BMI)	Under weight (<18.5)	(4) 3.3%	(1) 3.6%
	Normal weight (>18.5-24.99)	(23)18.8%	(13) 46.4%
	Overweight (>25.00-29.99)	(32) 26.2%	(7) 25.0%
	Obese 1 (>30.00-34.99)	(28) 23.0%	(7) 25.0%
	Obese 2 (>35.00-39.99)	(21)17.2% — 51.7%	0%
	Obese 3 (≥40)	(14) 11.5%	0%

4.4 FOOD SECURITY AND COPING STRATEGIES

This segment reports on the food security and coping strategies implemented by the Kenneth Gardens community (n=150) in order to gain access to food; it also measures incidences of not having enough money to buy food over the last 30 days. The maximum food security score that could be generated was 113, which indicated severe food insecurity, with the minimum as zero, indicating food security. The higher the score, the greater the prevalence of food insecurity, and the lower the score, the less food insecure were the households. The individual coping strategies employed by this community in time of hunger and severity weight was determined in a focus group, and the coping strategies questionnaire developed is presented in Table 4.14.

Table 4.14: Coping strategies index questionnaire for Kenneth Gardens community

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	All the time? Every day	Pretty often? 3-6 */week	Once in a while? 1-2 */week	Hardly at all? <1*/week	Never	Raw score	Severity weight	Score = Relative Frequency x weight
Relative frequency score	**7**	**4.5**	**1.5**	**0.5**	**0**			
a. Ask for food from neighbours?							1	
b. Rely on less expensive and less preferred food?							1	
c. Gather wild food?							3	
e. Send household members to beg?							4	
f. Limit portion sizes?							2	
g. Reduce the number of meals eaten in a day?							4	
h. Skip entire days without eating?							4	
i. Restrict consumption by adults in order for small children to eat?							3	
j. Sell some belongings in order to get money to buy food?							4	
k. Steal vegetables from other people's vegetable gardens to eat?							4	
l. Go to the local soup kitchen for a meal?							4	
m. Ask for food from welfare or church organisations?							4	
n. Do piece work for food/money?							4	
o. Contribute to food stokvel in order to ensure food over a scarce period?							4	
TOTAL HOUSEHOLD SCORE								

Severity weight: 1=least severe; 4=most severe

The individual coping strategies, the mean cumulative food security index and standard deviation (±SD) was determined for each of the coping strategies. The results are presented in Table 4.15. The cumulative score ranges from 0 to 113 with a mean score of 25.73.

The most used food security coping strategy was 'Rely on less expensive and preferred food' with the mean score of 4.56 (±SD2.771). 'Reduce the number of meals eaten in a day' was the second most used coping strategy with the mean score of 3.85 (±8.163). Other food security coping strategies include 'Contribute to food stokvel in order to guarantee food over a scarce

period' 3.31(±7.505), 'Limit portion sizes' 3.15 (±SD 4.740), 'Restrict consumption by adults in order for small children to eat" 3.85(±8.163), 'Go to the local soup kitchen for a meal" 1.99 (±SD 4.637), 'Do piece work for food/money' 1.63 (±SD 5.451), 'Skip entire days without eating' 1.45(±SD 4.931), 'Sell some belongings in order to get money to buy food' 1.25 (±SD 4.424), 'Gather wild food' 1.06 (±SD 2.684), 'Ask for food from welfare or church organisations' 0.63 (±SD 3.178), 'Ask for food from neighbours' 0.42 (±SD 0.967), 'Steal vegetables from other people's vegetable gardens to eat' 0.16 (±SD 1.493). 'Send household members to beg' was the least used coping strategy with the mean score of 0.04 (±0.28).

Table 4.15: Individual coping strategies (mean ±SD) and the cumulative food security index (n=150)

Participants (n=150)	Ask for food from neighbours	Rely on less expensive and preferred food	Gather wild food	Send household members to beg	Limit portion sizes	Reduce the number of meals eaten in a day	Skip entire days without eating	Restrict consumption by adults in order for small children to eat	Sell some belongings in order to get money to buy food	Steal vegetables from other people's vegetable gardens to eat	Go to the local soup kitchen for a meal	Ask for food from welfare or church organisations	Do piece work for food/money	Contribute to food stokvel in order to ensure food over a scarce period?	Cumulative Index
	Frequency x severity														**(min-max)**
	(0-7) ~x1° (max score 7)	**(07) ~x1° (max score 7)**	**(0-7) ~x3° (max score 21)**	**(0-7) ~x4° (max score 28)**	**(0-7) ~x2° (max score 14)**	**(0-7) ~x4° (max Score 28)**	**(0-7) ~x4° (max Score 28)**	**(0-7) ~x3° (max Score 21)**	**(0-7) ~x4° (max Score 28)**	**(0-7) ~x4° (max Score 28)**	**(0-7) ~x4° (max Score 28)**	**(0-7) ~x4° (max Score 28)**	**(0-7) ~x4° (max Score 28)**	**(0-7) ~x4° (max Score 28)**	**0-113.0**
Mean food security score	**0.42**	**4.56**	**1.06**	**0.04**	**3.15**	**3.85**	**1.45**	**2.24**	**1.25**	**0.16**	**1.99**	**0.63**	**1.63**	**3.31**	**25.73**
±Standard deviation	**±0.967**	**±2.772**	**±2.684**	**±0.281**	**±4.740**	**±8.163**	**±4.931**	**±5.333**	**±4.424**	**±1.493**	**±4.637**	**±3.178**	**±5.451**	**±7.505**	**±25.475**

~Frequency scoring: 0 never (Zero times per week); 0.5 Hardly at all (<1*/week); 1.5 Once in a while (1-2*/week); 4.5 (Pretty often 3-6 */week); 7 (All the time/ every day)

° **Severity weight**: Based on ordinal ranking by focus group respondents (1 least severe and 4 most severe)

4.5 FOOD VARIETY SCORE, DIETARY DIVERSITY SCORE AND NUTRIENT ADEQUACY

The Food Variety Score (FVS) consisted of a count of single foods within the FAO nine nutrition food groups (FAO 2010c). The Food Group Diversity Score (FGDS) indicates the number of food groups consumed over a period of 7 days as measured by the FFQ summarised in Table 4.16. In total, individuals consumed 74 varieties of food items during the seven day data collection period, and the range of individual foods consumed by an particular was between 1-72 foods (refer to Table 4.16).

The results in Table 4.16 above show the food group variety consumed by the Kenneth Gardens community. Different food groups comprised of a varying number of food types in that group. It is indicated that 19% (n=29) of the participants consumed four different types of meats, 7.3% (n=11) had seven and 2.7% (n=4) consumed nine different types of meats. The dairy group consisted of nine different types of dairy, 29.3% (n=44) consumed two types, 4% (n=6) did not consume any dairy items. Seventy six percent (n=114) of the participants consumed eggs. Ten different cereals were available for consumption in this group but 26% (n=39) consumed only six types and one participant had one type of cereal. At least five different legume types were consumed by the group.

The fruit group had the most variety (n=15). Sixty six percent of the participants (n=99) consumed six different types of fruits, 21.3% (n=32) had three types of fruits. Eleven people (7.3%) had no fruit items at all. Only 21.3% (n=32) of the participants consumed three different fruits within the seven day period. The fats group had eight food items and was the fourth (30%; n=45) most consumed food group. The Vitamin A rich food group also included some fruit, increasing the fruit intake even more, and had a total of eight different food items and 24% (n=36) consumed three different types from this group, while 15% (n=22) had one food item and 3% (n=4) had none.

The vegetable group comprised of the second most variety in food type (n=12). Seventeen percent (n=25) of the participants ate six different types of vegetables and only 1.3% (n=2) did not consumer any vegetables.

Table 4.16: Household food access as measured by food variety within the food consumed over a period of seven days (n=150)

Meat group (n=9)	Egg group (n=1)	Dairy group (n=7)	Cereal group (n=10)	Legumes group (n=5)	Vitamin A group (n=8)	Fruit group (n=15)	Vegetable group (n=12)	Fats group (n=7)	Total individual items eaten from all groups (n=74)
0=5 1=6 2=15 3=28 4=29 5=28 6=20 7=11 8=4 9=4	0=36 1=114	0=6 1=18 2=44 3=35 4=16 5=14 6=12 7=5	1=1 2=3 3=14 4=26 5=21 6=39 7=19 8=13 9=9 10=5	0=45 1=47 2=29 3=16 4=10 5=3	0=4 1=22 2=27 3=36 4=23 5=23 6=9 7=3 8=3	0=11 1=37 2=27 3=32 4=10 5=11 6=9 7=3 8=2 9=3 11=2 12=1 13=1 14=1 15=1	0=2 1=1 2=7 3=7 4=12 5=19 6=25 7=23 8=15 9=14 10=11 11=8 12=6	0=3 1=4 2=19 3=37 4=45 5=34 6=6 7=2	0-16=7 17-22=15 23-27=35 28-32=30 33-37=23 37-43=20 44-50=11 51-57=6 59-72=3

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

Table 4.17: Summary of Food Variety Score within the Food Groups (n=150)

Food group	Mean	±SD	Range of Score
Meat group	4.42	1.840	0-9
Eggs	1.00	0.000	0-1
Dairy	3.14	1.616	0-7
Cereal, roots and tubers	5.73	1.913	1-10
Legumes and Nuts	1.98	1.118	0-5
Vitamin A Rich Fruits and Vegetables	3.36	1.693	0-8
Other fruits	3.33	2.658	0-15
Other vegetables	6.79	2.577	0-12
Oils and fats	3.76	1.218	0-7
Total food items	31.91	10.573	3-72

Low= <30 individual foods; **Medium** = 30-60 individual foods; **High**= >60 individual food.

Table 4.18 shows the summary of the food group diversity. The results reveal that the FGDS for the total group indicated a high FGD as majority of the participants 98% (n=147) consumed food from 6-9 different food groups and 52% (n=78) of the participants consumed food from all nine food groups, followed by a medium dietary diversity score with 2% (n=3) of the participants consuming from 4-5 food groups. None of the participants had a low diversity score or consumed from 0-3 food groups.

Table 4.18: Summary of Food Groups Diversity Score (FGDS) (n=150)

Number of Food Groups Consumer (n= 9)	Frequency	Percentage
1-3	0	0.0
4	1	0.7
5	2	1.3
6	6	4.0
7	18	12.0
8	45	30.0
9	78	52.0
Total	**150**	**100.0**

Low = 0-3 food groups; **Medium** = 4-5 food groups; **High** = 6-9 food groups.

4.6 DIETARY INTAKE NUTRIENT ANALYSIS AND TOP 20 FOOD ITEMS

4.6.1 Nutrient intake

Table 4.19 reflects the mean of the three 24-hour recall nutrient analyses for both men (age 19-50 and >50) and women (age 19-50 and >50). Deficiencies in various nutrients are evident for both the men and the women. The whole group (100%) did not meet the Estimated Energy Requirement (EER). The men and women (19-50 years) had a mean energy intake of 5460.49EER±2355.251 and 4578.83EER±1423.027 and men and women (>50 years) 4390.95EER±SD690.148 and 4421.09EER±1480.284 respectively. The Daily Recommended Intake (DRI) for energy for women was 10 093kJ and 12 881kJ for men. The carbohydrate intake for men and women collectively was higher than the Estimated Average Requirement (EAR). Men (19-50, >50) and women (19-50, >50) consumed 151.74g±62.686, 4390.95g±690.148, 124.05g±40.129, and 123.21g±38.063 respectively, however 35.42% of the women 19-50 years, 22.97% of the women >50 years and 26.31% of the men 19-50 years did not meet the DRIs for carbohydrates. The DRIs for protein was only met by 4.17% by the 19-50 year old and 6.76% the older than 50 year old women.

All the men did not meet the RDAs for protein, where the mean intake for men 19-50 years was 54.69g±25.140 and 41.83g±16.522 for men older than 50. Only 10.53% of men 19-50 years and 22.22% >50 years consumed <100% of the DRI. Women >50 had a protein intake of 42.80g±16.140 and did not meet the 56g RDA, though women 19-50 years 46.55g±17.385 consumed sufficient protein to meet the recommended daily allowance.

The dietary fibre Adequate Intake (AI) for men 19-50 required is 38g and only 11.13g±8.733 was consumed and for men >50 30g is a requirements with only 9.52g±3.85 consumed. The

results indicate a low intake in dietary fibre for men as none of the men met the AI. The women's 19-50 years of age dietary fibre intake was 9.57g ±3.873, women >50 years intake was 10.09g±3.738 and also did not meet the AI (25g and 21g respectively) for dietary fibre. Calcium deficiency appears in both men aged 19-50, (306.48mg±226.299 and men older than 50 224.68mg±143.356, and women 19-50 years, 260.44mg±153.901 and women >50 years of age, 279.40mg±189.856. The <100% DRIs for fibre was consumed by 18.75% (19-50 years), 6.76% (>50 years) women and 84.21% (19- 50 years), 33.33% (>50 years) men respectively.

There were also deficiencies in the following macro and micro nutrients in men (19-50): magnesium (169.50mg±98.064), zinc (8.06mg±3.868), selenium (25.72µg±19.014), iodine (28.59µg±17.443), vitamin A (433.20µg±484.981), riboflavin (0.96mg±0.700), folate (208.30µg±137.171), pantothenate (4.70mg±3.400), biotin (21.22µg ±11.816), vitamin C (37.35mg±64.969), vitamin D (4.01µg±4.564), vitamin E (7.85µg±5.147) and vitamin K (20.60mcg±31.625). Men over the age of 50 years also had deficiencies in the following nutrients: magnesium (161.15mg±46.130), phosphorus (782.69mg±416.066), zinc (8.04mg±3.290), selenium (17.71µg±10.385), iodine (19.39µg±10.733), vitamin A (355.18µg±171.209), thiamine (0.61mg±0.226), riboflavin (0.96mg±0.700), folate (205.05µg±124.959), pantothenate (2.33mg±1.297), biotin (16.99µg±5.859), vitamin C (14.80mg±10.308), vitamin D (2.16µg±1.977), vitamin E (4.66mg±3.085) and vitamin K (19.00mcg±19.467). One hundred percent of the participants did not meet the DRIs for magnesium, phosphorus, iodine and folate.

There were no deficiencies for calcium, iron, zinc, thiamine, riboflavin, niacin, vitamin B6, vitamin B12, pantothenate and vitamin E in men (19-50 years); however there was 100% deficiency in the DRIs for magnesium, phosphorus, iodine and folate. Only 42.10% (19-50 years), 66.66% (>50% years) consumed selenium; 15.79% (19-50 years), 11.11% (>50 years) biotin; 89.47% (19-50 years) vitamin C; 10.53% (19-50 years) and 55.55% (>50 years) vitamin D.

Women (19-50 years) lacked the following macro and micro nutrients in the diet: magnesium (134.90mg±47.993), selenium (21.83µg±12.589), iodine (27.68µg±17.107), vitamin A (404.96µg±573.794), thiamine (0.82mg±0.407), riboflavin (0.80mg±0.607), folate (177.44µg±92.325), pantothenate (3.31mg±1.445), biotin (18.79µg±9.901), vitamin C (27.18mg±32.879), vitamin D (2.71µg±2.296), vitamin E (6.59mg±3.543) and vitamin K (30.10mcg±49.164). There were no deficiencies for calcium, iron, zinc, thiamine, riboflavin,

niacin, vitamin B6, vitamin B12, pantothenate and vitamin E for women (19-50 years). The NARs indicated that 43.75% consumed selenium, 97.92% vitamin A, 8.33% biotin, 83.3 vitamin C, 2.08% vitamin D and 91.67% vitamin K.

Women over 50 years had deficiencies in the following nutrients: magnesium (139.31mg±47.330), phosphorus (578.17mg±214.014), selenium (22.10µg±16.551), iodine (25.20µg±17.327), vitamin A (422.91µg±570.169), thiamine (0.79mg±0.346), riboflavin (0.70mg±0.397), folate (179.29µg±82.954), pantothenate (3.32mg±1.985), Biotin (19.75µg±12.412), vitamin C (32.79mg±38.590), vitamin D (2.33µg±2.146), vitamin E (7.26mg±4.041) and vitamin K (48.52mcg±109.199). There was no deficiency for calcium, iron, zinc, thiamine, riboflavin, niacin, vitamin B6, vitamin B12, pantothenate and vitamin E <100% for women >50 years). The NARs indicated that 54.05% consumed selenium, 98.65% vitamin A, 5.4% biotin, 79.73% vitamin C, 28.38% vitamin D and 12.16% vitamin K.

None of the participants had an iron deficiency; iron intake for men (19- >50 years) was (13.15mg±9.884), (8.48mg±3.143) and (11.01mg±8.242), and (10.16mg±7.064) for women (19-50, >50 years) respectively. The following groups had an adequate or recommended intake of the following nutrients: phosphorus 782.69mg±416.066, 578.70mg±177.480 (men 19- >50 years), 597.09mg±219.073 (Women 19-50 years); zinc 7.38mg±2.888 (women 19-50 years), 7.38±3.077 (women >50 years); thiamine 1.03mg±0.626 (men 19-50 years); niacin 20.98mg±11.071 (men 19-50), 16.24mg±7.173 (men >50 years), 15.28mg±6.397 (women 19-50 years), 14.50mg±5.748 (women >50 years); vitamin B6 2.48mg±1.465 (men 19-50), 2.68mg±1.698 (men >50), 2.06mg±1.142 (women 19-50 years), 1.94mg±0.979 (women >50 years) and vitamin B12 3.35mg±2.690 (men 19-50 years), 2.45mg ±1.859 (men >50 years), 3.59mg± 5.710 (women 19-50 years), 2.97mg±5.993 (women >50 years).

Table 4.19: Mean daily nutrient intake analysis of the Men (n=28) and Women (n=122) as measured by three 24-hour recalls

Nutrients p/day	Women 19-50yrs Mean ±SD	Women >50yrs Mean ±SD	NARs% Women 19-50yrs <100% of DRIs	NARs% Women >50yrs <100% of DRIs	Men 19-50yrs Mean ±SD	Men >50yrs Mean ±SD	NARs% Men 19-50yrs <100% of DRI	NARs% Men >50yrs <100% of DRI	DRI'S
Energy (kJ)	4578.83 ±1423.027	4421.09 ±1480.284	100.00	100.00	5460.49 ±251	4390.95 ±690.148	100.00	100.00	♀10 093EER ♂12 881EER
Total Fat (g)	40.97 ±15.889	38.58 ±16.750			47.62 ±20.908	35.68 ±12.914			
Carbohydrate (g)	124.05 ±40.129	123.21 ±38.063	35.42	22.97	151.74 ±62.686	129.28 ±31.193	26.31	0.00	♀♂100EAR
Total protein (g)	46.55 ±17.385	42.80 ±16.140	4.17	6.76	54.69 ±25.140	41.83 ±16.522	10.53	22.22	♀46 RDA ♂56 RDA
Total dietary fibre (g)	9.57 ±3.873	10.09 ±3.738	18.75	6.76	11.13 ±8.733	9.52 ±3.847	84.21	33.33	*♀25 AI, #♀21 AI *♂38AI, #♂30 AI
Calcium (mg)	260.44 ±153.901	279.40 ±189.856	100.00	100.00	306.48 ±226.299	224.68 ±143.356	100.00	100.00	*♀♂1000 AI *♀♂1200 AI
Iron (mg)	11.01 ±8.242	10.16 ±7.064	0.00	0.00	13.15 ±9.884	8.48 ±3.143	0.00	0.00	*♀8.1 EAR, #♀5.0EAR *#♂6.0 EAR
Magnesium (mg)	134.90 ±47.993	139.31 ±47.330	100.00	100.00	169.50 ±98.064	161.15 ±46.130	100.00	100.00	♀265 EAR ♂350 EAR
Phosphorus (mg)	597.09 ±219.073	578.17 ±214.014	100.00	100.00	782.69 ±416.066	578.70 ±177.480	100.00	100.00	♀♂ 580 EAR
Zinc (mg)	7.38±2.888	7.38±3.077	0.00	0.00	8.06±3.868	8.04±3.290	0.00	0.00	♀6.8 EAR ♂9.4 EAR
Selenium (µg)	21.83 ±12.589	22.10 ±16.551	43.75	54.05	25.72 ±19.014	17.71 ±10.385	42.10	66.66	♀♂45 EAR
Iodine (µg)	27.68 ±17.107	25.20 ±17.327	100.00	100.00	28.59 ±17.443	19.39 ±10.733	100.00	100.00	♀♂ 95 EAR
Vitamin A RE (µg)	404.96 ±573.794	422.91 ±570.169	97.92	98.65	433.20 ±484.981	355.18 ±171.209	100.00	100.00	♀500 EAR ♂625 EAR
Thiamine (mg)	0.82±0.407	0.79±0.346	0.00	0.00	1.03±0.626	0.91±0.321	0.00	0.00	♀ 0.9 EAR ♂1.0 EAR
Riboflavin (mg)	0.80±0.607	0.70±0.397	0.00	0.00	0.96±0.700	0.61±0.226	0.00	0.00	♀ 0.9 EAR ♂1.1 EAR
Niacin (mg)	15.28 ±6.397	14.50 ±5.748	0.00	0.00	20.98 ±11.071	16.24 ±7.173	0.00	0.00	♀11 EAR ♂12 EAR
Vitamin B6 (mg)	2.06 ± 1.142	1.94 ±0.979	0.00	0.00	2.48 ±1.465	2.68 ±1.698	0.00	0.00	*♀1.1 EAR , #♀ 1.3 EAR *♂1.1 EAR, #♂1.4EAR
Folate (µg)	177.44 ±92.325	179.29 ±82.954	100.00	100.00	208.30 ±137.171	205.05 ±124.959	100.00	100.00	♀♂ 320 EAR

Vitamin B12 (µg)	3.59 ± 5.710	2.97 ±5.993	0.00	0.00	3.35 ±2.690	2.45 ±1.859	5.26	0.00	♀♂2.0 EAR
Pantothenate (mg)	3.31 ±1.445	3.32 ±1.985	0.00	0.00	4.70 ±3.400	2.33 ±1.297	0.00	0.00	♀♂ 5.0 AI
Biotin (µg/day)	18.79 ±9.901	19.75 ±12.412	8.33	5.41	21.22 ±11.816	16.99 ±5.859	15.79	11.11	♀♂ 30 AI
Vitamin C (mg)	27.18 ±32.879	32.79 ±38.590	83.33	79.73	37.35 ±64.969	14.80 ±10.308	89.47	100.00	♀ 60 EAR ♂ 75 EAR
Vitamin E (mg)	6.59 ±3.543	7.26 ±4.041	0.00	0.00	7.85 ±5.147	4.66 ±3.085	5.26	0.00	♀♂12 EAR
Vitamin K (µg)	30.10 ±49.164	48.52 ±109.199	91.67	12.16	20.60 ±31.625	19.00 ±19.467	100.00	100.00	♀ 90 AI ♂ 120 AI

♀ = Female; ♂= Male; *=19-50 yrs; # = >50 yrs
EER: Estimated Energy Requirements (Institute of medicine, 2003)
AI - Adequate Intake used where EAR (Estimated Average Requirement) is not available
EAR - Estimated Average Requirement
RDA - Recommended Daily Allowance
NAR - Nutrient Adequacy Ratio in %

4.6.2 Top 20 food intake

The Top 20 most frequently consumed foods are presented for the group of women (n=122) aged 19-50, >50 years and men (n=28) aged 19-50, >50 years. The Top 20 foods consumed by the group was the average food intake over three days including the frequency (the number of times the food item was consumed by the group), mean intake and per capita intake (average portion size per person if everyone in the group consumed the food item). The main source of food amongst all the participants was from the carbohydrates and fats groups. The most popular food item was bread across all ages and both genders except for women above the age of 50 years who consumed milk as the number one food item. The following Tables 4.20, 4.21, 4.22 and 4.23 present the Top 20 most consumed food items and the average daily intake consumed over two weekdays and one weekend day included in the 24-hour recall by all the groups.

Table 4.20: The mean Top 20 food items consumed by women 19-50 years old (n=48) over three days ranked by frequency consumed and measured by three 24-hour recalls

Food items		Total intake (g)	Mean intake (g)	Frequency consumed	Mean intake for per frequency	Per capita intake over 1 day
1	Bread	9 940	3 313.33	35	94.67	69.03
2	Sugar	826	275.33	23	11.97	5.74
3	Milk	5 115	1 705.00	23	74.13	35.52
4	Rice	9 550	3 183.33	23	138.41	66.32
5	Diluted squash cold drink	12 640	4 213.33	20	210,67	87.78
6	Carbonated cold drink	15 010	5 003.33	17	294.31	104.24
7	Maize meal porridge	6 470	2 156.67	13	165.90	44.93
8	Margarine	532	177.33	12	14.78	3.69
9	Tea	7 805	2 601.67	11	236.52	54.20
10	Chicken Curry	3 640	1 213.33	11	110.30	25.28
11	Coffee	5 560	1 853.33	8	231.67	38.61
12	Potato chips	2 210	736.67	6	122.78	15.35
13	Sausage/ Boerewors	1 943	647.67	6	107.95	13.49
14	Beef curry	2 310	770.00	6	128.33	16.04
15	Fried egg	1 375	458.33	6	76.39	9.55
16	Fried chicken	1 560	520.00	5	104.00	10.83
17	Cheese, Cheddar	571	190.33	5	38.07	3.97
18	Beef, mince	1 345	448.33	4	112.08	9.34
19	Mixed vegetables	640	213.33	4	53.33	4.44
20	Chicken, roasted	950	316.67	4	79.17	6.60

Table 4.20 reveals the Top 20 most frequently consumed food items and the average daily intake consumed by women between the ages of 19 and 50 years. The consumption of carbohydrates and fats was very high in this group. The most consumed food was bread (3 313.33g) consumed 35 times by the group, followed by sugar (275.33g) consumed 23 times and at number four was rice (3 183.33g) consumed 23 times, maize meal (2 156.67 g) appears at number seven on the list and was consumed 23 times, potato chips (736.67g) came 12th and were consumed six times and contributed to the high intake of carbohydrates in this group. The drinks included carbonated cold drinks (5 003.33g) at number six, tea was number nine, coffee number 11. Diluted squash cold drink (4 213.33g) ranked fifth which indicates a preferred beverage by this group and was consumed 20 times. The only vegetables consumed on their own were mixed boiled vegetables at number 19, consumed four times. In the dairy group milk was number three (3 183.33g) and consumed 23 times, cheese (190.33g) was consumed 5 times

by the group and appears at number 17 on the list. Animal protein sources included chicken curry or stew (1 213.33g) 10th, sausage/ boerewors (647.67g) at number 13, fried chicken (458.33g) 16th, beef mince (448.33 g) 18th and roasted chicken (316.67g) 20th. No fruits were consumed by this group.

Table 4.21: The mean Top 20 food items consumed by women 50+ years old (n=74) over three days ranked by frequency consumed and measured by three 24-hour recalls

	Food items	Total intake (g)	Mean intake (g)	Frequency	Mean intake for per frequency	Per capita intake over 1 day
1	Milk	14 515	4 838.33	76	63.66	65.38
2	Bread	15 350	5 116.67	66	77.53	69.14
3	Sugar	2 370	790.00	66	11.97	10.68
4	Tea	26 640	8 880.00	37	240.00	120.00
5	Rice, white	14 135	4 711.67	35	134.62	63.67
6	Margarine	979	326.33	25	13.05	4.41
7	Coffee	17 650	5 883.33	21	280.16	79.50
8	Maize meal porridge	11 050	3 683.33	18	204.63	49.77
9	Tea, Rooibos	12 030	4 010.00	17	235.88	54.19
10	Chicken curry	5025	1 675.00	15	111.67	22.64
11	Carbonated cold drink	12 980	4 326.67	14	309.05	58.47
12	Cheese, Cheddar	1 160	386.67	14	27.62	5.23
13	Diluted squash cold drink	9 190	3 063.33	14	218.81	41.40
14	Fried egg	1 925	641.67	10	64.17	8.67
15	Tomato	440	146.67	9	16.30	1.98
16	Chicken, roasted	2 395	798.33	8	99.79	10.79
17	Salad: mixed fresh vegetables	1 280	426.67	8	53.33	5.77
18	Peanut butter	625	208.33	7	29.76	2.82
19	Vegetable curry	1135	378.33	7	54.05	5.11
20	Mutton curry	2 800	933.33	7	133.33	12.61

Table 4.21 indicates the Top 20 most frequently consumed food items and the average daily intake consumed by women above 50 years. The most consumed food item in the group was milk (4 838.33g) with a 65g per capita intake, consumed 76 times. The other dairy item included in this Top 20 survey was cheese (386.67g) as number 12 consumed 14 times. This group showed a high consumption from the carbohydrates, fats and sugars groups. Bread (5 116.67g) was number two, consumed 66 times, sugar (5 116.67g) was third and consumed 66 times, rice (4 711.67g) fifth, consumed 35 times and at number 11 was carbonated cold drink

(4 326.67g) consumed 14 times. Margarine (326.33g) was consumed 25 times and was at number six, peanut butter (208.33g) at number 18, consumed seven times adding to the high fat intake. Tea (8 880.00g) was the preferred beverage consumed 37 times and was number seven on the list. Other beverages were coffee (5 883.33g) consumed 21 times and diluted squash drink (3 063.33g) consumed 14 times at number seven and number 13 respectively. Chicken appeared as the first and most popular protein source. Chicken curry (1 675.00g), roasted chicken (798.33g) at number 10 and 16 respectively was eaten nine times by the group. Mutton curry (933.33g) was the last food item on the list, and was consumed seven times. There were no fruits consumed, however there was an incorporation of vegetables in the vegetable curry (933.33g) at number 19 consumed 22 times by the group and salad at number 17 on the list consumed 23 times.

Table 4.22: The mean Top 20 food items consumed by men 19-50 years old (n=19) over three days ranked by frequency consumed and measured by three 24-hour recalls

Food items		Total intake (g)	Mean intake (g)	Frequency	Mean intake per frequency	Per capita intake over 1 day
1	Bread	4805	1601.67	14	114.41	84.30
2	Sugar	471	157.00	13	12.08	8.26
3	Milk	2490	830.00	11	75.45	43.68
4	Rice	3766.25	1 255.42	8	156.93	66.07
5	Margarine	315	105.00	7	15.00	5.53
6	Carbonated cold drink	5940	1 980.00	5	396.00	104.21
7	Tomato	240	80.00	5	16.00	4.21
8	Diluted squash cold drink	3170	1 056.67	4	264.17	55.61
9	Chicken curry/ stew	1770	590.00	4	147.50	31.05
10	Tea	2280	760.00	3	253.33	40.00
11	Tea, Rooibos	2000	666.67	3	222.22	35.09
12	Maize meal porridge	2490	830.00	3	276.67	43.68
13	Chicken, roasted	680	226.67	2	11334	11.93
14	Macaroni/spaghetti,	1050	350.00	2	175.00	18.42
15	Potato chips, fried	740	246.67	2	123.34	12.98
16	Beef curry	1130	376.67	2	188.34	19.82
17	Beer	16470	5 490.00	2	2745.00	288.95
18	Pronutro	735	245.00	2	122.50	12.89
19	Coffee	1450	483.33	2	241.67	25.44
20	Fried egg	605	201.67	2	100.84	10.61

Table 4.22 reveals the Top 20 most frequently consumed food items and the average daily intake consumed by men between the age of 19 and 50 years. Similar to the other groups, carbohydrate intake was very high in this group as well, bread (1601.67g) was consumed 14 times and was the most consumed food in this group, followed by sugar intake (157.00g), which was consumed 13 times, rice (1 255.42g) eight times, carbonated drinks (1 980.00g) five times, maize meal (830.00g) three times, macaroni (350.00g) twice, potato chips (246.67) twice, Pronutro cereal (245.00g) twice and this information all appears in number one, two, four, six, 12, 14, 15 and 18 on the table respectively. There were no fruits consumed, but raw tomatoes (80.00g) appears in number seven spot and was consumed five times. Only milk (830.00g) from the dairy group was consumed; it was consumed 11 times and it was number three on the list. Diluted squash cold drink (1 056.67g), tea (760.00g), beer (5 490.00g) and coffee (483.33g) appear at number eight, 10, 17 and19 respectively. From the protein group chicken curry (590.00g), roasted chicken (226.67g) and beef curry (376.67g) appeared at number nine, 13 and 16 respectively. Margarine was number five from the fats and oil group.

Table 4.23: The mean Top 20 food items consumed by men 51+ years old (n=9) over three days ranked by frequency consumed as measured by three 24-hour recalls

	Food items	Total intake (g)	Mean intake (g)	Frequency	Mean intake for 1 day per frequency	Per capita intake over 1 Day
1	Bread	3160	1 053.33	11	95.76	117.04
2	Sugar	367	122.33	9	13.59	13.59
3	Milk	1330	443.33	9	49.26	49.26
4	Tea	4800	1 600.00	7	228.57	177.78
5	Margarine	195	65.00	3	21.67	7.22
6	Carbonated cold drink	1400	466.67	2	233.34	51.85
7	Rice, white	1100	366.67	2	183.34	40.74
8	Peanut butter	235	78.33	2	39.17	8.70
9	Diluted squash cold drink,	840	280.00	2	140.00	31.11
10	Beef, mince	400	133.33	1	133.33	14.81
11	Butter	30	10.00	1	10.00	1.11
12	Maize meal porridge	1170	390.00	1	390.00	43.33
13	Beef curry	330	110.00	1	110.00	12.22
14	Cookies/ biscuits	100	33.33	1	33.33	3.70
15	Mixed vegetables, boiled	170	56.67	1	56.67	6.30
16	Beef – roasted	400	133.33	1	133.33	14.81
17	Weetbix	100	33.33	1	33.33	3.70
18	Cheese, Cheddar	130	43.33	1	43.33	4.81
19	Chicken curry	170	56.67	1	56.67	6.30
20	Chicken, roasted	175	58.33	1	58.33	6.48

Table 4.22 reveals the Top 20 most frequently consumed food items and the average daily intake consumed by men above 50 years. Bread (1 053.33g) consumed 11 times and sugar (122.33g) consumed nine times were the top two mostly consumed foods followed by carbonated cold drinks (466.67g) at number six, consumed twice; rice (366.67g) was number seven, consumed twice; maize meal (390.00g) was number 12, consumed once; biscuits (33.33g) were consumed once and Weetbix (33.33g) was number 17, consumed once. Beef mince (133.33g), beef (133.33g) and chicken (58.33g) were the only meats in the protein group and appear at number 10, 13 and 16 respectively and were all consumed once. Milk (443.33g) at number three, consumed nine times was the only dairy product consumed. Margarine (65.00g), peanut butter (78.33g) and butter (10.00g) from the fats and oil group appear at number five, eight and 11 with a per capita intake of 7.22g, 8.70g and 1.11g respectively. Tea

(1600.00g) was fourth and was consumed seven times and diluted squash cold drink (280.00g) was ninth on the list and was consumed twice. Mixed vegetables (56.67g) at number 15 were the only vegetables and were consumed once.

Table 4.24: Acceptable macronutrient distribution ranges (AMDRs) and fruit and vegetable intake based on the 24-hour Recalls (WHO, 2003).

Dietary factor (food nutrient)	Mean ±SD	Mean % Energy contribution	WHO Goal
Women 19-50 years of age (n=48)			
Total fat (g)	40.97±15.889	33.11	15-30%
Protein (g)	46.55±17.385	17.28	10-15%
Carbohydrates (g) & fibre (g)	124.05±40.129	49.61	55-75%
Fruit and vegetable g/day	71.84		>400g
Women >50 of age (n=74)			
Total fat (g)	38.58±16.750	32.29	15-30%
Protein (g)	42.80±16.140	16.46	10-15%
Carbohydrates (g) & fibre (g)	123.21±38.063	51.26	55-75%
Fruit and vegetable g/day	76.61		>400g
Men 19-50 years of age (n=19)			
Total fat (g)	47.62±20.908	32.27	15-30%
Protein (g)	54.69±25.140	17.03	10-15%
Carbohydrates (g) & fibre (g)	151.74±62.686	50.70	55-75%
Fruit and vegetable g/day	60.35		>400g
Men >50 years of age (n=9)			
Total fat (g)	35.68±12.914	30.06	15-30%
Protein (g)	41.83±16.522	16.19	10-15%
Carbohydrates (g) & fibre (g)	129.28±31.193	53.74	55-75%
Fruit and vegetable g/day	62.03		>400g

Table 4.24 presents the results of the AMDRs from the average of the three 24 hour recalls according to the World Health Organisation's (WHO) dietary factor goals (2003), excluding fruit and vegetable intake. The AMDR for fat for this group surpassed the recommended goal by the WHO of 15-30%. The results show an AMDR of 33.11% in women aged 19-50 years and 32.29% in women older than 50 years exceeded the dietary factor goal by 3.11% and 2.29% respectively. Men aged 19-50 years and older than 50 years similarly exceeded the dietary factor goal for fat by 2.27% and 0.6% respectively. The AMDR for protein exceeded the WHO recommendations for women 19-50 years at 17.28% and women >50 years at 16.46%. The AMDR for men aged 19-50 years was 17.03% and for men 50 years and older it was 16.19%.

The AMDRs for carbohydrates for women were within the recommended 55-75%; however men both aged 19-50 years (50.70%) and >50 years (53.74%) did not meet the recommended intake.

Fruit and vegetable intake was very low in comparison to the minimum recommended intake of >400g. Men age 19-50 years had the lowest intake of 60.35g in the whole group, with a mean of 67.71g for all men and women. In the recall of the Top 20 foods no fruits were consumed and very few vegetables were consumed on their own across all groups. The results indicate an imbalanced diet with regard to the macronutrient contribution to energy. The diet lacked numerous vital nutrients and this could be due to the insufficient intake of fruit and vegetables.

4.6.3 Nutrients adequacy

The following section illustrates the relationship between the Food Group Diversity Score (FGDS) and the Nutrient Adequacy Ratio (NAR) values for energy, protein and selected minerals and vitamins. The mean NARs (%) of energy and nutrients expressed at different levels of FGDS. Data was not adjusted for variance; the full database was used to draw correlations.

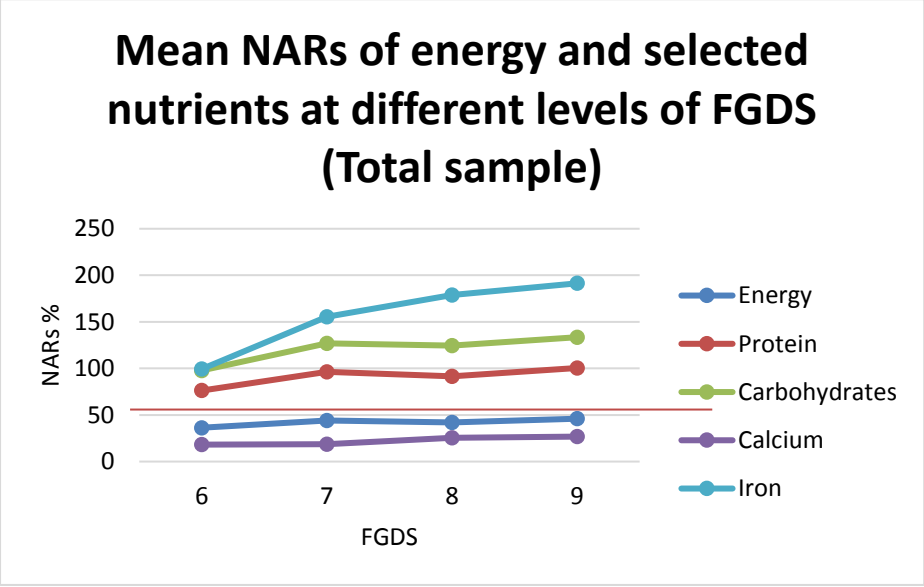


Figure 4.2: Mean nutrient adequacy ratio (NAR) expressed as % of energy and nutrients at different levels of diversity score for the total group.

Figure 4.2 reflects the relationship between dietary diversity score and NARs of energy, protein, carbohydrates, calcium and iron. The results show a slight increase in NARs for all

nutrients as dietary diversity scores increase from six to nine food groups, in other words the greater the variety of food groups consumed, the higher the nutrient intake. Consuming from different food groups certainly increases the overall nutrient intake of individuals. An increase in total protein, carbohydrates (>100%), iron (>100%), and calcium was observed through the number of food groups consumed.

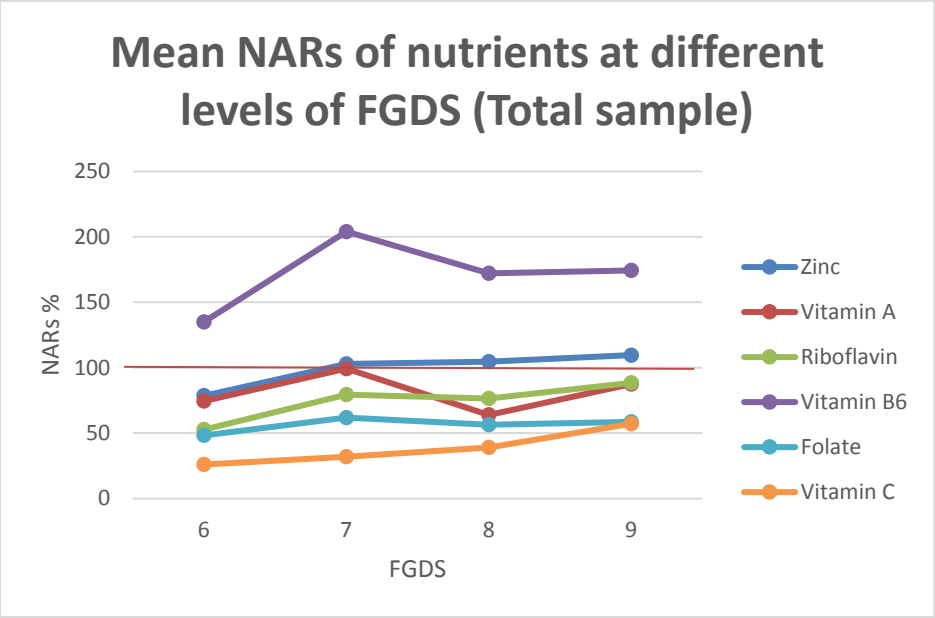


Figure 4.3: Mean nutrient adequacy ratio (NAR expressed as %) of nutrients at different levels of diversity score for the total group.

Figure 4.3 demonstrates the relation between the FGDS and NARs of vitamin A, vitamin B6, vitamin C, zinc, folate and riboflavin for both men and women. There was an observable increase in vitamin C, riboflavin and vitamin B6 as the food group diversity score increased; however vitamin A was unstable as the food group diversity score increased and remained below the required 100% DRIs. Folate and vitamin B6 fluctuated between food group diversity scores.

4.7 Correlations

Correlations were drawn using the Pearson statistical test. Pearson's correlation r=0, indicates no association, while negative correlations are indicated by r=-1 and positive associations are indicated by r=1.The *p* value is the probability of obtaining a test statistic at least as extreme as the one that was actually observed, assuming that the null hypothesis is true. The rejection of the null hypothesis occurs when the *p* value is less than 0.05 or 0.01 when the null hypothesis is rejected, the results are said to be statistically significant.

Table 4.25 below shows correlations between income and FVS, income and coping strategy, and number of people in the household and frequency of meals. Various variables were analysed to determine a statistical significance (refer to chapter three, Table 3.2) but the results were statistically not significant. There was a statistical significance (p=0.005) between income and FVS. A statistically significant relationship was observed between income and coping strategy with a p=0.001. The number of people in the household and the frequency of meals were statistically significant with p=0.007.

Table 4.25: Relationship between variables with statistical significance (p<0.05)

Variables	Relationship (r value)	Significance (p value)	Correlation level (2- tailed)
Total population			
Income and FVS	0.230	0.005	0.01 level
Income and coping strategy index	0.271	0.001	0.01 level
Number of people in the household and frequency of meals	0.219	0.007	0.01 level

4.8 Discussion

All data collected is presented and analysed in this chapter. The interpretation of results clearly indicates a compromise in health, lack of nutrition education, inappropriate eating patterns and high levels of obesity. Income inadequacy, unemployment rates and the coping strategies utilised prove some level of food insecurity. Poor nutrition status as a result of the variables mentioned deteriorates the health status of any individual and consequently prohibits a healthy and productive lifestyle.

The socio demographic questionnaire provides vital data of different variables that paints a clear picture of the community. The Kenneth Gardens community consists of blocks of flats located in a formal urban settlement area. According to the South African classification statistics, urban areas are classified according to predominant settlement type and land use. This includes cities, towns, townships and suburbs. Any area outside this classification is classified as urban informal settlement or rural (Labadarios *et al*. 2011: 894).

The majority (81%; n=122) of the participants in this study were females and the other 19% (n=28) were males. The mean age for the females was 50.58 years and 42.04 years for the males. According to Statistics SA (2015) there are more females 51% (28.07 million) than males 49% (26.87 million) in South Africa with an estimated 30.2% of the South African population younger than 15 years and only 8% is older than 60 years. This is also reflected in the sample included in the study.

The world population is projected to grow by 83 million in the next 15 years, with Africa being the fastest growing area. Urban migration increases simultaneously with the world's population growth, while rural population remains stagnant and declines in certain areas. In the next two decades Africa is projected to be predominantly urban. South Africa only amounts to 51.8 million of the 7.4 billion people in the world as of 2016 (UN 2016; SSA 2015). Future urban population growth raises major concerns around food security, poverty and the high percentage of migration as the world is already struggling to feed the masses. Urban poverty, malnutrition and hunger simultaneously increase with migration (Crush and Frayne 2014: 110).

Approximately over 54% of the world's population lives in urban areas and the figures are expected to rise to 66% by 2050 (UN 2014). Peyton, Moseley and Batters (2015: 38) stated that over 60% of South Africans live in urban areas and these numbers may increase up to 80% by the year 2050. Rapid urban migration is one of the most challenging developments facing

the world today. Failure to manage the increase in migration poses challenges in the areas of infrastructure, housing, transportation, energy, employment and most definitely education and health care (UN 2014). Erwin, Marks and Couchman (2013: 3) expressed the view that Kenneth Gardens is faced with a wide range of social and health problems such as domestic violence, drug abuse, unemployment and limited access to education.

There were 150 (100%) participants representing 150 households in this study. According to Erwin, Marks and Couchman (2013: 3) Kenneth Gardens is the largest municipal housing estate in the city of Durban; it accommodates roughly 1500 to 1800 people over 286 units in 28 blocks of four-room flats. Accommodation in Kenneth Gardens still remains in high demand, corresponding to all other South African government subsidised housing complexes since 1994. Bearing in mind the country's current economic status, tension and conflicts are inevitable as people attach emotional and economic wellbeing to securing free or subsidised accommodation. Corruption around government housing delivery further evokes tension as the waiting list system is inefficient. A large percentage of people who receive Government housing are implicated in illegal transfers (Department of Justice and Constitutional Development (DOJCD) 2013: 7). Issues of corruption and fraud around public housing are not unique to South Africa. Rose-Ackerman (2013) indicated that the source of American housing problems was bribery and corruption. In addition some of the people implicated in the scandals were officials from the government department of Housing and Urban Development (HUD).

Basic municipal services such as electricity, running water, toilet facilities and waste removal were available (100%) in Kenneth Gardens. In South Africa gas, paraffin and candles are predominantly utilised in urban informal residents as an alternative source for cooking and lighting whereas electricity is not available or affordable. Drimie, Faber, Vearey and Nunez (2013: 3) further stated that Sub-Saharan Africa still lacks proper infrastructure with limited access to electricity and safe water. According to a study conducted in Johannesburg on formal and informal residents by Ozor, Umunnakwe and Acheampong (2013: 408) disparities exist between formal and informal urban residents in respect of municipal services. Formal urban residents had better access to water, electricity, waste management and flush toilets and this is also reflected in this study. Statistics SA (2015) reported that a high percentage of inhabitants of informal settlements still did not have access to adequate toilet facilities and thus relieved themselves in bushes, and dumped rubbish outside their yards or on dumpsites and sometimes in the streets.

Although the flats in Kenneth Gardens had proper facilities, a large proportion of participants were dissatisfied with the condition of the flats. Forty six percent reported problems with damaged doors and windows, leaking roofs, damaged floors, dull and chipped paint, broken taps and malfunctioning toilets. Drimie and McLachlan (2013: 218) reiterated that poor service delivery was the fundamental reason why many rights in South Africa are unrealised across different sectors. The quality of public housing for urban populations has improved over the years; however deficient housing still remains an issue in respect of certain public housing projects. Schwartz (2014: 28) indicates that approximately 2.1 million people resided in moderate to severe deficient housing in the United States. The majority of the deficiencies were physical such as plumbing, heating, hallway lighting, water leaks, roof leaks, defective windows and doors, holes in the floor, peeling paint and electrical problems which is quite similar to the Kenneth Gardens community. The results in this study also reveal that the majority of the participants (87.3%) had lived in the community for over 5 years, while 12.6% had lived there for less than 5 years. Only 6.7% had more than 6 permanent family members living in the house with 71.3% having between three and six members, which is similar to a study by Oldewage-Theron and Kruger (2008: 110) who found in an urban study conducted in Sharpeville, Vaal region, S.A that the average household size was 4.9 people and 44.3% lived in a house with two to four rooms.

Overcrowding in subsidised housing projects can be anticipated; however the nature of overcrowding varies in different contexts. A decrease in family size among South African native born households can be seen as opposed to the overcrowding of foreign migrants' households. Crowding can be measured according to the number of people occupying the rooms. According to Schwartz (2014: 32) when more than one person occupies a room, it is considered as crowding. Analysing the Kenneth Gardens two bedroom flats with an average of 6 members (38.7%) living in the household, it is apparent that some of the households are overcrowded. Statistically, a significant relationship exists between the number of people in the household and the frequency of meals.

As a result of poor maintenance and poor service delivery in low income communities, particularly from government subsidised housing, pest infestations are a major problem. Pest management assists to improve living conditions, health and quality of life (Lu, Adamkiewicz, Attfield, Kapp, Spengler, Tao and Xie 2013: 2018). Pests in the households were reported by the majority of the participants in the Kenneth Gardens community. Predominant pests were

cockroaches and ants. Geckos, mosquitoes, fleas and rats were some of the other pests reported by the participants.

Fifty eight percent of the caregivers were the mother in the family, which is a customary trait amongst many African communities where the dynamics of a household expects the male figure to seek employment while women stay at home to take care of the home and children. Most of the households (52.7%) in this study were headed by women, which was parallel to the findings of the study done by Drimie, Faber, Vearey and Nunez (2013: 1) on formal and informal residents in Johannesburg South Africa and who further stated that households headed by females are more vulnerable to food insecurity than male-headed households. In support Crush and Caesar (2014: 165) indicated that female-headed households have high unemployment rates and low income levels. In rural areas women were most susceptible to hunger: roughly 68% of the women in rural Sub-Saharan Africa were likely to be malnourished compared with urban dwellers (Drimie and McLachlan 2013: 221).

During times of food scarcity people are forced to adopt drastic measures to cope. However, these measures are often at the expense of one's health. The focus has always been on rural food insecurity in the past decades, disregarding the incidence of rising urban food insecurity. Modern research raises huge concerns around rapidly increasing urban food insecurity. Urban communities face a greater challenge as their food insecurity is based on access to food, rather than availability. Furthermore, there is limited land access and farming opportunities, and in addition, current weather conditions are no longer favourable to produce sufficient food to sustain livelihood and strengthen income through selling produce (Meacham 2014: 14; Pereira *et al*. 2014: 342; Drimie and McLachlan 2013: 220).

Though the majority (60.7%) of the Kenneth Gardens participants consumed three meals a day, there was a statistically significant relationship between the number of people in the household and the frequency of meals. Kenneth Gardens had an average of six members living in each household but only one (38%) to two members (42.7%) contributed towards purchasing food. This explains some of the most severe food coping strategies such as 'Skip entire days without eating', 'Limit portion sizes'; 'Sell some belongings in order to get money to buy food'; 'Ask for food from neighbours' and 'Send household members to beg' being utilised. Furthermore, the majority of participants indicated insufficient funds to purchase food. Pereira *et al*. (2014: 348) adds that the situation is worse for poorer households since there are usually more family members. Severity weight was based on ordinal ranking from one being least severe to four

being most severe. In regard to the development of coping strategies as an indicator of food insecurity, Maxwell (1996: 294) suggested that the coping strategy with a higher security score or severity are indicative of high levels of food insecurity and therefore should be avoided.

According to Crush and Frayne (2014: 110) urban food insecurity stems from high unemployment, household poverty and limited income-generating opportunities. The results in this study revealed that only 26.7% of the participants were employed and 36% were unemployed. The unemployment rate in Kenneth Gardens mirrors the national and global picture. South Africa has a very high unemployment rate and income inequality. According to the latest South African statistics the national unemployment rate in 2016 was 26.4%, the highest since 2005 (SSA 2015). What raises more concern about the employment rate in this study is that of the 26.7% of the participants who were employed, only 10% had permanent positions and the other 6.7% were employed either on a part time or contract basis. Unfortunately, contract employment increases job insecurity and vulnerability of households to poverty. Regrettably, hunger and poverty are rooted in unemployment and low household incomes. The results in this study were not far off the African Food Security Urban Network (AFSUN) baseline survey that quantified 21% of the adults were employed full time, with 18% working part-time or casually in South Africa. The unemployment rate in the AFSUN survey showed that 61% of the participants were unemployed, 35% were looking for work and 26% were not seeking employment at all (Crush and Caesar 2014: 165). Oldewage-Theron, Kruger and Egal (2014: 519) confirmed high unemployment rates of 78% in the Vaal region in South Africa, where only 14.7% of people were on pension and only 7.3% were employed. The Kenneth Gardens results indicated that 26% of the participants were currently looking for employment. Households with unemployed members seeking employment can indicate high levels of food insecurity (Crush and Frayne 2014: 122).

The household income and the money spent on food depend on the overall household earnings. Correlations in the Kenneth Gardens study were drawn between income and coping strategies and the results were statistically significant (p=0.001). Food insecurity can be anticipated in low income communities as there is a strong association between the two variables. Additionally, the level of household food security increases with the level of household income. This association is also statistically significant ($p<0.001$). When Zimbabwe's economy collapsed strong associations were observed between poor levels of real income and household insecurity.

According to Labadarios *et al.* (2011: 891) many South Africans have insufficient income to meet household needs. Low income households indicate the highest levels of food insecurity and over 50% of food secure households belong to the high income bracket (Crush and Frayne 2014: 122). According to Statistics South Africa (SSA 2011) a great percentage of the income of a household contributes towards housing, water, electricity, gas and other fuels. The average monthly income in Kenneth Gardens was R4429.20 which when divided by 5 (the average number of household members), and then divided by 30 days equals an average amount of R6.00 available per person for food per day in each household. Similar results were observed by Oldewage-Theron and Kruger (2008: 110) in Sharpeville where only R5.80 per day was available per person towards food; however average income was between R500 to R1000 monthly for the majority of the households. Another crucial factor that increases vulnerability to food insecurity among the members of the Kenneth Gardens community was that 17.3% of the participants were pensioners and the maximum amount for the old age pension in South Africa is R1 420 monthly and R1 440 for pensioners above 75 years. Taking into account that the monthly rent in Kenneth Gardens is R900.00 per month, it was predictable that the pensioners had insufficient income for food and household expenses including water and electricity. Crush and Frayne (2014: 121) stated that hard cash is an important aspect in the lives of South African people to purchase food.

Oldewage-Theron, Kruger and Egal (2014: 519) reported that the situation could be worse in other households. In the Vaal Region in South Africa, 722 women between the age of 19 and 90 years in the indicated that the monthly average household income for the majority of the households was R885.00, and a substantial number of people depended on the government pension and for certain households this was the only contributor, or source, of income. Convergent results confirm that household income differs quite substantially across regions (Oldewage-Theron *et al*. 2014: 519) . The majority of households from urban formal (28%), urban informal (38%) and rural formal (42%) in the SANHANES-1 study had no formal income. Approximately 36% earned between R802.00 and R1600.00, while 17% earned between R 1600.00 and R3200.00 a month, reflecting the true image of income inequality and inadequacy. KwaZulu-Natal was amongst the three provinces that derived income mainly from pension funds, UIF and grants (Hoosain, Dwane and Reddy 2013: 3). Ozor, Umunnakwe and Acheampong (2013: 404) explain that a large income proportion of the poor of approximately 50-75% is spent on food.

Food expenditure results in the current study stipulated that 4% of participants spent less than R500.00 per month on food, 92.7% spent more than R500.00 and 56.6% confirmed lack of money to purchase food. Only 43.3% responded to have never had a shortage of money to purchase food. These variables certainly drive food insecurity and force participants to adopt certain coping strategies. This challenge is not unique to Kenneth Gardens as the SANHANES-1 findings reported that over 40% of people in SA lacked enough money to purchase food (Hoosain *et al*. 2013: 3). The most used coping strategy in Kenneth Gardens was to 'Rely on less expensive and preferred food' and Ozor, Umunnakwe and Acheampong (2013: 404) stipulate that as a result of high food prices one out of four people lacks adequate food to live a healthy and active life. Healthy foods are perceived as a luxury, therefore staple foods take first priority as these are more easily accessible. It is estimated that 50% to 75% of the African community's income is spent on staple foods parallel to Drimie and McLachlan's (2013: 220) findings that indicated that 49.6% of total expenditure was spent on food. Furthermore, current results revealed that 38% of households had only one person who contributed to purchasing food and 42.7% of households had at least two people. Bearing in mind household expenses and that the limited number of participants contributing to purchasing food inevitably propels the level of food insecurity, it is apparent that some of the households are overcrowded. The uMsunduzi study confirmed that a large proportion of residents had no income and depended solely on the head of the household. Unfortunately a major determinant of urban food security is employment and income (Crush and Caesar 2014: 167). Correlations between money spent on food and coping strategies were drawn from the Kenneth Gardens data but no statistical significance could be found (p=0.207). However, Crush and Frayne (2014: 122) believe there is a strong relationship between the work status of household members and household food security. In South Africa a large proportion of people confirm they have a lack of money to meet household needs including money to purchase food. Furthermore, high food prices prevent people from purchasing food to ensure an adequate diet thereby exacerbating the level of food insecurity. Urban communities are susceptible to sudden price increases (Meacham 2014: 26; Drimie and McLachlan 2013: 218). The high food price could contribute to the coping strategy of 'Reduce the number of meals eaten in a day'' as the second most used coping strategy in the Kenneth Gardens community. Skipping meals is common among food insecure communities.

Drimie and McLachlan (2013: 220) indicated that over 51.6% of rural households experience hunger and one out of three was at risk. A study conducted by the South African Food Security Urban Network (SAFSUN) in eleven cities disclosed that 76% of households were moderate or severely food insecure. The study also revealed that hunger and poverty in South Africa is more pervasive in Limpopo, Northern Cape and the Eastern Cape. In addition, hunger and food insecurity was more prevalent among blacks followed by coloureds and Indians; however it was observed that white people were food secure. The final finding of the SANHANES-1 observed that 45.6% of the overall population were food secure, 26.0% were food insecure and 28.3% were at risk of hunger. A large proportion of the food insecure and at risk population were in both urban informal and rural formal areas which is also reflected in the current study where this urban community can be classified as food insecure (Hoosain *et al*. 2013: 10).

Only 7.3% of the participants in the Kenneth Gardens study had no education. Nonetheless, the education level in this study is reasonable as the majority of the participants had matric (47.3%) and 7.3% had tertiary education. The education level indicates that half of the community had basic education which assists in increasing job prospects. Although researchers differ about the significance of education in alleviating food security, education is undoubtedly one of the most effective interventions in improving the living conditions of households or communities. Lack of emphasis on the importance of education disadvantages many people. Drimie and McLachlan (2013: 22) agree with the positive correlation between education and food security; however they argue that it can assist in improving food security. Trefry, Parkins and Cundill (2014: 556) indicated that culture can sometimes play down the importance of education. Most African cultures create education limitations especially for women.

According to the WHO, a BMI greater or equal to 25 is regarded as overweight and a BMI greater or equal to 30 is regarded as obesity. The anthropometric results in this study showed that the females had a mean weight of 78.67 kg with a mean BMI of 31.46, which was higher than the males with a mean weight of 79.42 kg and a mean BMI of 26.00. Females generally carry more weight than males and this is a common finding throughout various parts of the world. The results from SANHANES-1 were similar with 65.1% of the females overweight and obese compared to 31.2% of the males. Hoosain *et al*. (2013: 9) stated that BMI increases with age despite gender. However, it decreases later on in life among females 65 years and older.

In this study, only 3.3% of the females and 3.6% of the males were underweight. It was also found that none of the males were obese, while 51.7% of the females were obese across all categories. Correlation between the BMI, or weight, of males and females was done and there was no statistical significance between the two groups. Obesity is one of the major global development burdens. The rising number of overweight and obese people in the past three decades has reached unacceptable heights. The WHO fact sheet declared that worldwide 1.9 billion adults were either overweight or obese. The South African Medical Research Council (SAMRC) reported that currently over 61% of South Africans were overweight or obese. The proliferation in overweight and obesity in South Africa was primarily due to a decrease in or a lack of exercise and an unhealthy diet (Baleta and Mitchell 2014: 687; Hoosain *et al*. 2013: 9). In a study by Oldewage-Theron and Kruger (2008: 109), 87% of the participants were overweight and obese and this was a common finding amongst many South African studies. The HSRC's first South African Health and Nutrition Examination Survey (SANHANES-1) conducted in 2012 found that over 40% of females were obese in S.A and approximately a third of adults were overweight or obese. Even though the results indicate high levels of overweight and obesity, 18.9% of women and 53.6% of men were of normal weight. The overweight and obesity epidemic affects both adults and children. It was estimated than 42 million children under the age of five were overweight and obese in 2013 (WHO 2015a; WHO 2015b).

A diet of staple food (potatoes, sugar, maize etc.) is the primary cause of overweight and obesity (Drimie and McLachlan 2013: 220). This could explain the prevalence of overweight and obesity in Kenneth Gardens. No statistically significant relationship was found between BMI and income, nonetheless there is a strong correlation between income and dietary intake.

The incorrect eating patterns as reflected in the Top 20 food intake contribute to the obesity levels of >50% in women and >25% in men. The main source of food intake was carbohydrates, fats and sugar in this study. The top five foods from the 24-hour recall of women aged 19-50 years included bread, sugar, milk, rice and diluted squash drink respectively. Consumption of fruits and vegetables was number 19 on the list. There were also a number of fried items namely, fried potato chips, fried egg and fried chicken which contributed to the fat intake. Although maize meal porridge is number seven on the list, it was consumed 13 times and had a 165.90g mean daily intake per frequency per day. Similar findings came from women over the age of 50 where the top 5 foods consisted of milk, bread, tea and rice respectively. A limited number of vegetables were observed, consumed as a salad at number 17, only eight times and in a vegetable curry at number 19, consumed seven times.

The first five items consumed by the men 19-50 years included bread, sugar, milk, rice and margarine and exactly the same list applied to men over 50 years except that tea appears as number four on the list. No fruits and vegetables were eaten by men age 19-50 years, however mixed vegetables at number 15 were consumed by men over 50 years. Similar results were found by Oldewage-Theron and Kruger (2008: 116) who indicated a high carbohydrate intake with the top five foods being; tea, maize meal, stiff porridge, bread rolls and milk. The only vegetables consumed were cabbage at number 19 and spinach at number 20 with low frequency and portion size, although the frequency (1) and mean intake per frequency (56.67g) was very low. Food is mainly accessed commercially or through cash in Sub-Saharan Africa including South Africa. The majority of the participants in the group, or 95.3%, purchased food from a supermarket. The expansion of the retail sector in food business has caused shifts in dietary patterns from a more traditional African diet to a western diet, which tends to be less healthy, and rich in sugar, carbohydrates and fats. The consequences are severe as the majority of South Africans cannot afford a healthy diet (Pereira *et al*. 2014: 341). The health concern is the shift in the dietary patterns associated with the increase of obesity and non-communicable diseases (Pereira *et al*. 2014: 341; Drimie and McLachlan 2013: 220; Ronquest-Ross *et al*. 2015: 1). Baleta and Mitchell (2014: 687) stated that more than 2 million South Africans had diabetes and predicted a potentially enormous increase in this statistic.

The food system control of urban communities is dependent on supermarkets. Trends indicate that supermarkets provide easy access to a variety of foods at competitive prices. A study conducted in Cape Town on the implications of supermarket expansion results showed an increase in supermarket expansion and utilisation particularly in urban areas. Peyton, Moseley and Battersby (2015: 37) stated that supermarket growth has been significantly successful as it is able to penetrate low income communities; however they fail to meet food needs for low income communities. Furthermore, supermarkets are influenced by market based factors to maximise on profit gains. Location of supermarkets can sometimes be inaccessible to certain communities, therefore people are forced to resort to alternative markets that are often costly with low quality foods and fewer healthy options (Crush and Caesar 2014: 172). Healthy foods might be available at the supermarket but the lack of resources also limits consumers and as a result influence shifts in diet as cheaper foods are more favourable (Peyton, Moseley and Battersby 2015: 37; Crush and Caesar 2014: 165).

Food choices are influenced by household income, season, education, urbanisation, culture, religion and globalisation. In a review of the top 20 food items consumed among males and females in this study, inadequate dietary trends were observed. Frequently consumed foods were observed among the same groups namely, carbohydrate, sugar and fat. Similar findings are apparent throughout food insecure and low income communities. Approximate 58.6% of the participants in Sharpeville consumed three meals a day; however these meals were carbohydrate-based and nutrient deficient (Oldewage-Theron and Kruger 2008: 116). Ronquest-Ross *et al*. (2015: 1) stated that the high consumption of carbohydrates, sugars and fats in South Africa was caused by numerous factors such as socio-economic advances, food insecurity, and shifting to more westernised diets. Socio-economic factors such as a low monthly income, insufficient money to spend on food and unemployment drive household food insecurity and the results from this study revealed that all these deficiencies exist in the Kenneth Gardens community. Drimie and McLachlan (2013: 893) stated that households with higher levels of income consumed more and a wider variety of food items than households with a low income. An average of 15.7 different food items was consumed by households with a high level of income (Drimie, Faber, Vearey and Nunez (2013: 3). According to Oldewage-Theron and Kruger (2008: 125), the key component to dietary adequacy is the consumption of a wide variety of foods; however healthy foods cost 69% more than a staple diet and the majority of South Africans can't afford it (Ronquest-Ross *et al*. 2015: 1).

The results in this study reveal that 76.7% of the participants were women who were responsible for purchasing food and 68% purchased food once a month. According to Ronquest-Ross *et al.* (2015: 1) grocery shopping was mostly done by women in South Africa and the price of food was the determining factor when making food choices. Taste, healthiness, nutrient content, safety and hygiene of the food item and ease of preparation in that descending order are considered after the price. Even though 98.7% of participants had refrigerators, 19.3% purchased food once a week and 6% on a daily basis. The majority (68%) of the participants purchased food once a month. Purchasing food in bulk for the entire month might work out cheaper but may compromise quality, especially for perishable foods. Undoubtedly, diets consumed are dependent on household income (Ronquest-Ross *et al.* 2015: 1).

Most (56.6%) of the participants in this study reported a lack of money to purchase food and relied on less expensive and less preferred food. The FVS with a mean score of 31.91 (±10.573) in this study indicated a medium FVS.

According to Labadarios *et al.* (2011: 896), to maintain a healthy well-balanced diet, households need to have at least 17 different items of food; however it was discovered that poor households stocked an average of eight food items in the grocery cupboard. Fifty three percent of households in a low income community in Msunduzi consumed less than six food items a week (Crush and Caesar 2014: 167).

Most studies have focused more on nutrition insecurity in rural areas, not paying much attention to urban nutrition insecurity which is evidently rising in developing communities (Drimie, Faber, Vearey and Nunez 2013: 2). In South Africa, poor dietary diversity is prevalent especially in the Limpopo, Eastern Cape, North-West and KwaZulu-Natal provinces. In the North-West province, where over 58% of households had insufficient money to purchase food, the diets are monotonous, mainly consisting of starches. The food groups most commonly consumed are cereals; meat; dairy and vegetables (other than vitamin A rich vegetables) (Hoosain *et al*. 2013: 3). Low food variety and dietary diversity is dependent on household income. Households with higher income [(high living standard measure (high LSM)] consume more food items than low income (low LSM) households, namely an average of 15.7 different foods. The 1999 NFCS indicated that food secure households consumed an average of 16 different foods, which was double the amount compared to a food insecure household (low LSM) that consumed less than eight different food items (Drimie, Faber, Vearey and Nunez 2013: 7).

The total FGDS indicated that 52% of the participants consumed food from all nine food groups. A high FGDS was observed as the majority (98%) of the participants consumed between 6–9 different food groups. Food insecure urban communities find it a major challenge to diversify diets due to income constraints. There is an observable dietary difference between formal urban communities and informal urban communities. Formal urban communities consume a far better quality and diverse diet than informal and rural communities (Oldewage-Theron, Kruger and Egal 2014: 515). The South African National Health and Nutrition Examination Survey (SANHANES-1) study indicated that the national dietary diversity score was 4.2 which is very close to the cut-off level of 4.0 for dietary adequacy. In terms of geographic areas, different studies showed that urban areas had better dietary diversity scores compared to rural areas.

The FGDS showed that the vegetable group (6.79 ±2.57) had the highest score followed by the cereal group (5.73±1.913) and the meat group (4.42±1.840) contrary to the Sharpeville study where the cereal group (2.01±0.81) was the most consumed, followed by the dairy group (0.62±0.53) and meat group (0.40±0.53). A total of 17% of the participants consumed six different types of vegetables and only a small percent (1.3%) did not consume any. The WHO (2003) population nutrient goals clearly state that a minimum of 400g of fruits and vegetables should be consumed every day, in line with the South African FBDG on the significance of eating plenty of fruits and vegetables every day. Even though the food group 'vegetables' had the most individual different food items and was the most consumed food group, the dietary (food nutrient) intake based on the 24-hour recall indicated that none of the participants met the WHO nutrient ≥400g of fruits and vegetable goal due to small portion sizes. The 24-hour data recall revealed a lack of fruits and vegetables intake by both men and women. Women consumed mixed vegetable (53.33g), salad (53.33g) and vegetable curry (54.05g). A small quantity of mixed vegetables (56.7g) was consumed by men over 50 years. Poor nutrient intake could thus be anticipated since all vegetables were consumed in small quantities and appear in the last five of the top 20 foods. There were hardly any vegetables consumed on their own; vegetables were either incorporated in a dish or served as a side dish. No data of fruit consumption in the Top 20 foods consumed was evident. An unhealthy diet accompanied by physical inactivity and substance abuse result not only in micronutrient deficiencies but chronic diseases as well (Oldewage-Theron, Kruger and Egal 2014: 515).

There was a poor nutrient intake with the DRIs not being met for the mean intakes of all required nutrients. The whole group average consumption of fruit and vegetables was 80 g per day hence the following vitamins, vitamin A, vitamin C, vitamin D, vitamin E, vitamin K, magnesium, zinc, selenium, iodine, riboflavin, folate, pantothenate, and Biotin micronutrient deficiency found in the total group. The nutrient deficiencies varied between different age and gender groups. Oldewage-Theron, Kruger and Egal (2014: 515) reported similar findings of poor nutrient intake among women aged 19 to 90 years. Carbohydrates, phosphorus, and vitamin B12 were the only nutrients met in this study. Inadequate nutrient intake is more common among black South Africans. Hoosain *et al*. (2013: 12) stated that the black population had a low diversity score with the highest number of participants (44.9%) who consumed a low dietary diversity. Nonetheless the NARs % <100% of DRIs for energy, calcium, magnesium, phosphorus, iodine and folate were met.

Even though the SAFBDG recommends daily consumption of fruit, low fruit and vegetable intakes among South Africans are common. It was estimated that an average of two or less fruits and vegetables are consumed daily. Low consumption of fruits and vegetables are not only a local problem, these finding are observed on an international scale as well. Low fruit and vegetable intake of women was observed by Oldewage-Theron, Kruger and Egal (2014: 525) in the Vaal region, South Africa. The low intake was linked to the cost and availability of fruits and vegetables in the area and contributed to the poor nutrition status of the participants (Ronquest-Ross *et al*. 2015: 4; DOH 2013).

Twenty six percent of the participants consumed six different types of cereals and 12% consumed only one to three types. Carbohydrates and fibre for women were within the recommended requirements according to the acceptable macronutrient distribution ranges (AMDRs) by WHO (2003). Meat consumption was at the bottom of the Top 20 list. Beef and chicken were commonly consumed meats. The SAFBDG recommends consumption of lean meat daily. Approximately 51% of the participants consumed four to six different meats and 12.7% consumed seven to nine different meats in the seven days and all participants met the WHO dietary factor goal of 10-15% for protein. Meat has always been an important part of South African diets but unfortunately has become unaffordable. Ronquest-Ross *et al*. (2015: 2) indicate protein can be eaten daily and meat is a central part of meals in developing countries. Ronquest-Ross *et al*. (2015: 2) indicated that the average South African consumes 18 kg of meat per year. In addition, meat and legumes boost the iron and zinc intake, though results showed that only 19.3% of the participants ate three to five different legumes. Fruits, vitamin A-rich fruits and vegetables, dairy and legumes and the nuts and egg group were the least consumed food group. Ronquest-Ross *et al*. (2015: 1) further stated that dairy and vegetables other than vitamin A-rich vegetables, eggs, legumes, and vitamin A-rich fruit and vegetables were the least consumed foods in South Africa.

Although results confirmed a diversified diet, the majority (60.7%) of the participants consumed three meals a day, mostly (96.7%) at home, and the top five mostly consumed foods were bread, sugar and milk, rice and diluted drinks, tea and margarine. Oldewage-Theron and Kruger (2008: 126) found in Sharpeville and Botswana that the most consumed foods were non-nutritious and tea, maize meal and bread were the most popular foods amongst this group. The study further compared the finding to the study of the elderly population of the United States of America and revealed the core foods were tea, milk, orange juice and eggs, similar to the Top 20 consumed foods by participants over 50 years in this study (Oldewage-Theron and

Kruger 2008: 126). The South African 1999 food consumption survey results showed that South Africans mainly consumed maize, wheat, vegetables, milk, potatoes and sugar (Labadarios *et al*. 2005: 253). The results of this study reiterate this finding as most of the foods mentioned above are in the top ten. The dietary surveys undertaken after the food consumption survey in South Africa to determine usual food consumption of the population determined that the most consumed foods by adults were maize, sugar, tea, bread, non-dairy creamer, brick margarine, chicken meat, full-cream milk and green leafy vegetables. The most consumed food groups were from the cereal, root, meat and fish, dairy and vegetables, other than vitamin A-rich vegetables, groups. Eggs, legumes, and vitamin A-rich fruit and vegetables were least consumed. An urban study in Msunduzi, KZN had similar findings with regard to the food group's consumption whereby 96% of household consumed cereal/ maize, 80% sugar, 61% fats and oils and 53% roots and tubers, mainly potatoes (Ronquest-Ross *et al*. 2015: 1; Drimie and McLachlan 2013: 222; Crush and Caesar 2014:171). It is quite clear that poor dietary intake was linked to low income which was rooted in poverty (Oldewage-Theron, Kruger and Egal 2014: 525).

Consumption of dairy products including milk and sour cream have increased in South Africa in the past decade and the results of this study revealed there was no calcium shortage in the diet due to the high consumption of dairy, particularly milk. Women under 50 years consumed milk 23 times and women over 50 years consumed milk 76 times in 24-hours (Ronquest-Ross *et al*. 2015: 4). The majority of the Top 20 foods contributed to a high carbohydrate and fat intake. Soft or carbonated drinks are the second most purchased street food item in the world. Urban areas lead in the consumption of soft and carbonated beverages. Excessive intake has become a global concern as mortality rates due to cardiovascular disease and obesity are closely linked to the increase in consumption of soft or carbonated drinks. This could also be a contributing factor to the obesity levels in this study. Tea was one of the most commonly consumed drinks in the study. According to Ronquest-Ross *et al*. (2015: 4), tea is the most consumed beverage in the world, other than water. There has been a significant increase in the consumption of tea and coffee in South Africa, Rooibos being the preferred choice of tea. Recent studies observed an astronomical intake of fats across the globe but more so in developing nations, showing approximately a 28.5% increase in fat intake. The increase was primarily due to an increase in vegetable oils and oil crop consumption. WHO (2015) suggested that fat intake should be less than thirty percent of the overall energy intake while avoiding and eliminating saturated and industrial trans-fat to avoid unnecessary weight gain.

Fats far exceeded the recommended daily allowance by 8.27%. Fats should be used sparingly. The FBDG recommends using vegetable oils rather than hard fats. Oldewage-Theron *et al.* (2014: 515) stated that the higher fat intake in South Africans was a result of dietary changes which had an increased total fat and saturated fat content from consuming more animal-derived products. Furthermore, fat intake was higher in urban formal areas. Unhealthy cooking methods such as frying were found to be common practice in this study which might have contributed to the high fat intake. Margarine and butter were mostly consumed three to 25 times, with an average portion size of 15 g (Ronquest-Ross *et al*. (2015: 5).

4.8 CONCLUSION

Drastic dietary patterns in South Africa are more likely to continue to change as a result of a significant growth in affordable supermarkets, increasing urbanisation, westernization of food consumption patterns and growing per capita incomes that increase demand for high value foods. Although these factors mentioned influence dietary patterns the concept of healthy eating remains the same, regardless of people's needs, preferences and level of physical activity. Furthermore, diets will continue to change and influences by several factors in years to come (WHO 2015c; Meacham 2014: 22; Crush and Caesar 2014: 170).

The total food expenditure for maize and wheat flour has declined and substantially increased for fruits, vegetables and processed foods such as spaghetti and oven-ready meals. Since income plays a significant part of South Africans' access to food, unemployment and income inequality drives people to eat inappropriate diets. Moreover, the lack of agricultural space limits the opportunity to plant own food and therefore inhibits a diversified diet without having to rely on income. A high income has shown to mitigate the impact of household food insecurity. There are several factors besides economic limitations that may contribute to unhealthy dietary intake such as physical access to food, taste and convenience (Meacham 2014: 22; Crush and Caesar 2014: 170).

Most studies in South Africa reiterated that the most vital or crucial factor is affordability. No matter how accurate and effective the FBDGs are, the fact is that their success is constrained by the cost of food. It is evident that low calorie and healthy foods are expensive. Moving forward the focus should be on promoting access to quality foods that are diverse and affordable (Drimie, Faber,Vearey and Nunez 2013: 9; Beydoun, Fanelli-Kuczmarski, Allen, Beydoun, Popkin, Evans and Zonderman 2015: 6). WHO (2015) noted that eating practices

start at early age and maintaining healthy habits with incorporation of physical activities prevents non communicable diseases and all forms malnutrition.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The main aim of the study was to determine food security status, coping strategies, food intake and the nutrition status of the Kenneth Gardens community, located in an urban area in KwaZulu-Natal. All the results were presented in tables and graphs, analysed and discussed in Chapter 4 and supported by a literature review in Chapter 2. The results were obtained by utilising the socio-demographic questionnaire, anthropometric measurements, food security questionnaire, food frequency questionnaire and a 24-hour recall questionnaire. The questionnaires were instrumental in providing a clear picture of the food intake and nutrition status of the Kenneth Gardens community. In this chapter, results, findings and limitations are discussed and possible recommendations are made based on the findings.

Poverty is one of the underlying causes of food insecurity globally and locally that results in major concerns about the development of malnutrition. Global warming, unemployment, income inequality and lack of education are factors associated with poverty. Furthermore, food security has been identified as the most critical and important factor. The dietary intake and dietary diversity of any individual or community is determined by the accessibility and affordability of food. Therefore, if an individual or community has neither access to food nor adequate resources to secure the food, they are at risk of developing malnutrition.

5.2 LIMITATIONS OF THE STUDY

Data collection took longer than expected due to a number of residents who refused to participate for several reasons. The high crime rate and visible drug use in the area has resulted in fear among residents and they are reluctant to open their doors to strangers. In addition, empty promises from municipal departments have caused despondency. There was also a fear that the research was an undercover investigation directed by the municipality. Due to the nature of this study, under and over reporting could been possible and could have impacted the results.

5.3 MAIN FINDINGS

South Africa experiences a double burden malnutrition where both undernutrition and overnutrition co-exist. The double burden of malnutrition is not unique to South Africa; it has been reported in other parts of the world although it has been shown to have a high prevalence

in developing nations. Although underweight prevalence in adults exists in SA, the majority of South Africans are overweight or obese. Underweight occurs as a result of an insufficient or unsuitable diet and overweight occurs due to overnutrition. A significant correlation exists between overweight, poverty, education, unemployment and income.

Nutrition plays an important role in the development of non-communicable diseases such as diabetes, hypertension and cancer. Together with the HIV epidemic, poverty-related infectious disease and violence-related trauma, these non-communicable diseases contribute considerably to the burden of disease that South Africa is experiencing.

Literature highlights the fact that poverty rates remain high with approximately 45.5% of South Africans living below the poverty line. The majority (52%) belong to the black African population group, and more women than men are impoverished. Unemployment and poverty cause many households to become food insecure. In the last few years, the cost of food and the cost of living has escalated. Coupled with the high unemployment rate in the country this causes more people to dip below the poverty line and are they are unable to secure an adequate supply of healthy foods. This subsequently leads to a high consumption of unhealthy and undiversified foods. Unemployment can lead to people migrating either from one country to another or from rural to urban areas in search of work. This is a concern as migration is often accompanied by nutrition transition whereby a more traditional diet is replaced by carbohydrate-, salt-, sugar- and fats-rich foods, and there is a change in consumption patterns and a decrease in physical activity. Currently 25% of South Africans experience hunger and another 25% are at risk of hunger. Food security should be one of the government's main priorities to assist in improving availability and access to food and also to develop a food security task team that deals with short, medium and long term interventions. The complexity of food insecurity is interdependent on globalisation, international trade, climate change and poor storage or distribution of food and thus is a huge challenge to eradicate. Instability in these areas threatens and affects food security both locally and internationally. Other threats to food security, other than the challenges of availability, access and utilisation, include economic, political, cultural and religious, demographic, physical, biology, chemical and technological threats.

A socio-demographic questionnaire incorporates essential aspects of family composition, accommodation and socio-economic status. Findings from the socio-demographic questionnaire used in this study revealed that the Kenneth Gardens community was an

ethnically diverse community; the five South African languages spoken included English, Zulu, Afrikaans, Xhosa and Sotho. The results also indicated that the majority of households were headed by women though the responsibility of being a caregiver was shared equally by both men and women. There was a high unemployment rate which is one of the contributing factors to food insecurity; only 26.7% of the sample population were employed. The high unemployment rate affected the level of income and the amount of money available to purchase food. A large proportion (56.6%) of participants confirmed a shortage of money to buy food. Municipal services were evident but most of the flats required maintenance. Overcrowding is problem in this community with an average of six household members living in a two bedroom unit and a limited amount of money available per household member per day.

Education is one of the most important tools to eradicate hunger and poverty, thus investment in education is vital. The highest level of education attained by only a small number of participants was tertiary level, with the majority of participants only having a school leaving certificate. The study results reflect the South African education context where relatively few people obtain a tertiary education and a high number of people have only primary and high school level education. Generally it is the older population group over 55 years of age who have a low level of education as a result of limited education opportunity in the past.

The anthropometric results indicated that the prevalence of obesity was high (76.7%) in this community. The prevalence of obesity among women was almost double that of men. More than half of the participants were categorized as being overweight and this was distributed similarly between women and men. The high prevalence of overweight and obesity could be correlated with the participants' level of income. Participants consumed more energy-dense foods that could be a contributory factor to their poor nutrition status. Only 3.3% of the women and 3.6% of the men were underweight. Even though physical activity was not observed in the Kenneth Gardens community, the latest survey in South Africa revealed almost a third of men and one half of women do not participate in physical activity and are thus unfit.

The results of the study reveal that the total range of individual food items consumed by all participants during the seven day data collection period was 30–60 foods. The diversity score for the total group was medium diversity. The majority of the participants, 98% (n=147), consumed between 6-9 different food groups. However, the diets were high in carbohydrates and sugars and lacked fruits and vegetables, thus contributing to the poor nutrition status of either being overweight or obese.

This was also verified by the food security coping strategy questionnaire, where the majority of the participants relied on less expensive and preferred food, limited portion sizes and reduced number of meals eaten in a day. This coping mechanism is highly unlikely to meet the recommended daily intake of essential nutrients. The low food variety resulted in participants lacking vital nutrients and not meeting the DRI's of vital nutrients. Nutrient deficiency is evident in both men and women from the 24-hour recall analysis (nutrient adequacy ratio). The whole group (100%) did not meet the EER for energy. There was also a deficient intake of the following nutrients: protein, dietary fibre, calcium, vitamin A, zinc, vitamin D, vitamin E, vitamin K, zinc, magnesium, phosphorus, selenium and thiamine. Low income means that people cannot secure nutritionally adequate diets and will only eat what is affordable. This is usually cheap food, high in starch, sugar and fat. The carbohydrate group was the main source of food and the diets lacked other foods, especially fruits and vegetables. Food group diversity boosts nutrient adequacy. Low nutrient adequacy is common locally and internationally where there is low frequency and small portion consumption of food. Most of the nutrient deficiencies were a result of low vegetable intake. There was 100% deficiency in DRIs in magnesium, phosphorus, iodine and folate among the men aged 19-50 years. Poor dietary diversity and dietary intake impacts micronutrient intake adversely.

The Kenneth Gardens community have to use severe coping strategies to cope on various levels and to assist with food intake. The consequences of utilising certain coping strategies are severe and they can negatively affect nutrient adequacy. The dietary diversity score, food variety score, the Top 20 frequently consumed foods, including household income, and money spent on food are true determinants of food insecurity and confirm the presence of household food insecurity in this community. Malnutrition and compromised health status emerge as a result of food insecurity. A poor diet elevates overweight and obesity which can then generate non-communicable disease. This is an expected outcome as, generally, low income communities reduce expenditure on food to compensate for shortage of money hence poor quality diets are more pervasive. This can be an expected outcome and is similar to other findings that food expenditure is generally reduced in low income communities or households to compensate for lack of available money. Hence poor diets are found in such households.

5.4 CONCLUSION

The study findings suggest that there was a high prevalence of food insecurity among the participants in the Kenneth Gardens study. Most of the participants had low education, were unemployed, had a low income and were thus vulnerable to food insecurity and malnutrition. More than half of the participants were overweight or obese. Diet influenced anthropometric outcomes. Malnutrition and micro-nutrient deficiency was observed and was believed to be the contributing factor to the poor health status of the participants. An inadequate diet not only results in a poor health status but also compromises the body's immune system making it vulnerable to disease. Food insecurity and a lack of resources force people to make unhealthy food choices. Significant consideration needs to be given to improving dietary intake and this can only be done when nutritious food is available and easily accessible and people can make good food choices. The average South African diet is energy dense and micronutrient deficient. Nutrition intervention and education that promotes knowledge about micronutrient deficiencies and supplementation are paramount.

5.5 RECOMMENDATIONS

5.5.1 Recommendations to Government

5.5.1.1 Employment and income distribution

The low employment rate in this community is one of the aspects impacting on food insecurity, the high unemployment rate results in people falling deeper below the poverty line. The government and private sector needs to come together and develop an alternative source of income through creating employment opportunities for disadvantaged communities and also invest in the development of small businesses. Income distribution programmes could be incorporated into policies to assist people to cope better when unemployed.

5.5.1.2 Increase in human capacity

As many of the people in this community are not employed various empowerment workshops and training can be planned during working hours. The importance of education is paramount for any individual or community as education and skills development can improve employment possibilities. The South African government does have nutrition education programmes in place but they often do not reach the intended audience. The South African food and nutrition policy has different programmes including nutrition safety nets, nutrition education,

agricultural investment, market participation and risk management that can assist in uplifting communities. However; the policy needs improved implementation, co-ordination and monitoring of these programmes to ensure its effectiveness. Programmes should target disadvantaged communities and government sponsored accommodation. Instead of government employees coming into the community to educate and improve skills in different sectors, individuals from the community should rather be selected to be the pioneers of the initiatives thereby facilitating community ownership of the program and subsequent access to the resources. Enhanced knowledge and skills can result from higher education, and in-service learning should be integrated into every learning institution facility in order to benefit communities. Each faculty has something to contribute to communities, and by signing a memorandum of understanding (MOU) it ensures that the communities have access to free education and knowledge all the time.

The increasing overweight and obesity epidemic in the country and also in this community is a challenge and requires urgent intervention. In the workplace, issues around physical activity could easily be addressed by introducing worker-friendly policies that promote physical and recreational activities. Obesity in school children can be addressed by reintroducing physical education (PE) and making it compulsory, and banning or taxing the sale of unhealthy foods in school and nearby tuck-shops. Recreational parks for local communities have proven to be an effective tool in encouraging physical activity.

5.5.1.3 Food-based distribution programmes

Food insecurity exists in this urban community but food-based distribution programmes only target rural communities. For example, school feeding programmes normally target schools in rural areas as opposed to urban areas, understandably so since poverty and food insecurity is more prevalent in rural areas. However, the strategic goal of the National Food and Nutrition Security Policy is to ensure the availability, accessibility and affordability of safe and nutritious food at national and household levels for all. No human being deserves to be hungry and any food distribution programme from school feeding to emergency feeding should be needs-based.

5.5.1.4 Agricultural production

Even though there are challenges in agricultural production due to climate change, investment in agricultural input is very important to ensure there are sufficient food supplies to feed the world. Urban communities often lack land to plant crops. Nevertheless, there are innovative

home gardening interventions that can be integrated in a household as this community specifically has access to some land on the estate. The government needs to develop skills to assist communities to grow and harvest own foods, from vegetables to herbs. This can assist in income generation through people selling their produce. Household food security can be improved by using home-grown vegetables instead of buying them and saved income can be used for other food essentials, however agricultural interventions such as home gardens should only be encouraged in settings where the feasibility and sustainability of such an activity have been established. Due to theft in Kenneth Gardens this intervention failed, however secure greenhouses could work, with the participation of the whole community.

5.5.2 Recommendation to the community

As the Kenneth Gardens community do have some access to land and a large number of the community is unemployed various projects can be initiated and executed by themselves. Communities should not wait for the government to alleviate the problem of food insecurity. People need to take responsibility and action to improve their livelihoods. Government initiatives often fail due to a lack of coordination and monitoring. Nutrition education is vital and is needed to provide consumers with essential information and assist with better food management, improved meal planning and healthier eating patterns. Nutrition information is freely available at any government clinic or hospital and can assist the community in planning nutritious, healthy meals within their limited budgets. Nutrition education will also assist in improving the health status of individuals as the majority of the participants in this study are obese. The Kenneth Gardens community is fortunate to have weekly access to a clinic that provides medical care and nutrition education. All the community members should be made aware and encouraged to make use of this facility.

5.6 RECOMMENDATIONS FOR FUTURE RESEARCH

The fast-growing world population presents a number of challenges and poses a number of threats. Global warming together with the prevalence of poverty, food insecurity and malnutrition in the world indicate the urgent need for introspection and this can only be done through investment in education and research. A different approach is required to change and develop new policies to deal with these challenges. Policies need to be implemented and institutionalised across all sectors in order to ensure consistency in the protection and promotion of human health. These policies need to work in conjunction with one another, and this means that the programmes and policies of the government sector such as agriculture,

forestry and fisheries should be in line with the Department of Health's programmes and policies which will overall have the same aim of promoting public health through improved food security policies that reduce poverty and hunger and guarantee the production of a variety of nutritious foods.

The complex problem of food insecurity needs to be addressed by means of interrelated policy mechanisms that will boost small farmer agricultural productivity, strengthen nutrition, build community resilience and promote empowerment in marginalised groups. Though contradictions exist about the significance of urban agricultural investment, further studies in urban home gardening to address issues of food insecurity are extremely vital and could assist by providing sustainable coping strategies. Investigation into nutrition education on balanced diets, healthier methods of preparing food and physical activity is required. Research in physical studies should include food intake and BMI to provide a more significant outcom

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Annexure A: Study approval and ethical clearance

DURBAN UNIVERSITY of TECHNOLOGY

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC)

17 July 2013

IREC Reference Number: **REC 37/13**

Mr A Mtolo
23 Cathcart Road
Woodlands
Durban
4004

Dear Mr Mtolo

Food security and coping strategies of an urban community in Durban

I am pleased to inform you that Full Approval has been granted to your proposal REC 37/13.

The Proposal has been allocated the following Ethical Clearance number IREC 055/13. Please use this number in all communication with this office.

Approval has been granted for a period of one year, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's. In addition, you will be responsible to ensure gatekeeper permission.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely

[redacted]

Prof J K Adam
Chairperson: IREC

Annexure B: Letter of permission to conduct the study

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

13 September 2012

Prof M Marks 91783
School of Social Work and Community Development
College of Humanities
Howard College Campus

Dear Prof Marks

Protocol reference number: HSS/0870/012
Project title: Kenneth Gardens Community Development Project

EXPEDITED APPROVAL

I wish to inform you that your application has been granted Full Approval through an expedited review process.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

[redacted]

Professor Steven Collings (Chair)

/pm

cc Supervisor/Project Leader: Thokozani Xaba & Kira Erwin
cc Academic Leader: Professor Franco Frescura
cc School Admin: Ms Priya Konan

Professor S Collings (Chair)
Humanities & Social Sc Research Ethics Committee
Westville Campus, Govan Mbeki Building
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Telephone: +27 (0)31 260 3587/8350 **Facsimile:** +27 (0)31 260 4609 **Email:** ximbap@ukzn.ac.za / snymanm@ukzn.ac.za
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

Annexure C: Letter of information and consent form

LETTER OF INFORMATION

Dear Kenneth Gardens resident

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

The title of my study is "Food security and coping strategies of an urban community in Durban"

Principal Investigator/s/researcher:

I Andile Mtolo, (B. Tech: Consumer Sciences Food and Nutrition) will be main researcher and I am supervised by Professor Carin Napier (D Tech Food Service Management).

It is important to do this study because many South Africans are food insecure plagued by poverty and unemployment and most access food through cash. This means if you are unemployed and don't have enough cash to buy food, your food intake is compromised resulting in poor diets which cause malnutrition and diseases (Labadarios *et al* 2011: 891 and Sharafkhani *et al* 2011: 31-34). Further more difficult times can force households to sell the means by which they earn a living such as animals and tools, sometimes request for a loan. These activities will leave households impoverished and indebted for a long period of time and basic essentials such as education and health are compromised and become expensive luxuries (Dewbre 2010: 22-23). We also know that food intake information in SA is very limited and is important to the Government to know what people eat so that they can use this information to assist people that are underweight or overweight.

This research aims to investigate food security status, food security coping strategies, nutritional status and food consumption patterns of the Kenneth Gardens community. An investigation of the association between the socio-economic factors, food intake and nutritional status of the adults in Kenneth Gardens will provide insight in to the nutritional challenges that face this community.

We need 150 households in Kenneth Gardens to be included in this study. This will help in the development of guidelines to educate this community in bettering food security and habits.

What will it involve?

- UKZ and Kenneth Gardens committee has been contacted for the study to be undertaken.
- I will need you to sign a consent form to indicate that you agree to participate in the study after I explained all the procedures to you
- If you agree you will be asked to complete 4 questionnaires in an interview situation it could take up to 1 hour.
  The questionnaires will include:

- Food security coping strategies

- A Socio- demographic questionnaire
- Three 24-hour food recall questionnaires.
- A Food Frequency Questionnaire to determine the food variety and dietary diversity.
- We will also weigh and measure your height and weight at the clinic and in your home at an agreed time, we will not ask you to remove your clothing except for shoes and jerseys
- Participation is voluntary and you can withdraw at any time with no penalty.

You will not feel any discomfort. All measurements and weighing will be done at the clinic and in your own home. You will be asked to remove shoes and jackets and jerseys only and you will not have to undress.

The results of the study will be shared with UKZN and Kenneth Gardens committee after the study has been concluded but your name will not be mentioned, with the hope that interventions can be planned in the community for any identified problems. If you have any personal nutrition questions or concerns we are prepared to come back to you after the data collection to assist you.

Please note the following:

- Participation is voluntary and you can withdraw at any time with no penalty.
- No pay will be given to any of the participants.
- It won't cost you anything to participate in this study.
- You will be given a participant number so no names will be used in the study.

Research-related Injury:

For any questions or concerns please feel free to contact my supervisor or our Ethics committee

Your participation will be greatly appreciated and thank you for allowing us to explain this study to you.

Kind regards

Andile Mtolo

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

Supervisor: Prof. Carin Napier

Researcher: Andile Mtolo 0786581965

Supervisor contact: 031 373 2326 carinn@dut.ac.za

The Institutional Research Ethics administrator: 031 373 2900.

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

DUT DURBAN UNIVERSITY OF TECHNOLOGY

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

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

Annexure D: Field worker Training Manual

DURBAN UNIVERSITY of TECHNOLOGY

FACULTY: APPLIED SCIENCES

DEPARTMENT OF FOOD AND NUTRITION CONSUMER SCIENCES

NATIONAL DIPLOMA: CONSUMER SCIENCES FOOD AND NUTRITION

Fieldworker Guide

CONTENTS **PAGE**

1. INTRODUCTION

Welcome to Fieldwork, this is a stimulating opportunity to work with the Department of Food and Nutrition researchers and their communities around Durban. Research fieldwork in communities cannot be conducted without the assistance of fieldworkers.

Fieldworkers are the key to the success of community studies. They act as interviewers, collect physical measurements or observe features in the participants. Often in community studies fieldworkers can also enter people's homes and interview them there. Data collection in the community is often hard work; if people are not available repeat visits need to be made. Fieldworkers should be well trained in the survey methods being used in a specific study, to ensure reliable data. As part of Work Integrated Learning all 3rd year Food and Nutrition Consumer Sciences students must take part in data gathering of one or more research project in the department.

What is a Field Worker?

The field worker is an extremely important person in this project. In fact, this research would not be possible without the field workers. The field workers are the individuals who must interview the subjects (the people chosen to take part in the research) and get correct and accurate information from them. The subjects must feel at ease with the field worker so that they will not feel threatened or intimidated and will willingly answer the questions to the best of his or her ability.

2. ENQUIRIES

The following staff members are concerned with field work:

Senior Lecturer/Researcher : Prof C. Napier
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3. FIELDWORK REQUIREMENTS

- All 3rd year students will be expected to attend a fieldworker training course separately or as part of Nutrition 3.
- Each student must complete at least 10hours of fieldwork in one or more of the current research projects in the department of Food and Nutrition Consumer Sciences, a time sheet will be signed by the researcher in charge of the project to control the hours worked.
- Fieldworkers will **NOT** be remunerated for the 10 hours of fieldwork completed; any fieldwork completed by a fieldworker over and above the10 hours will be paid at a rate per hour.
- The researcher in charge of the project will complete an assessment sheet for mark allocation for this part of the Work Integrated Learning (WIL) Module.
- Fieldwork marks adds up to **10%** of the final mark for **WIL**.

- Students can be expected to do any of the following tasks as part of their 10 hours:

- Fieldwork in a community
- Data capturing
- Participating in a community upliftment project
- Assisting with other research activities, e.g. Departmental Research Day

Details regarding the logistics will be discussed at the training session and each researcher will inform participating students of dates, times and venues.

4. **ASSESMENT CRITERIA**

DEPARTMENT OF FOOD AND NUTRITION CONSUMER SCIENCES

SUBJECT: Work-integrated Learning

LECTURER/RESEARCHER ASSESSMENT: Academic Service Learning component

Student name: _____

Student number: _____

ASSESSMENT CRITERIA	Very good 10 - 9	Good 8 - 6	OK 5	Poor 4 - 3	Unacceptable 2 - 0	Your mark
Arrived timeously						
Professional appearance						
Approached task in an organised manner						
Worked effectively as a team member						
Patience and respect shown towards subjects						
Anthropometrical measurements were correctly applied (if applicable)						
Accurate and detailed recording of information						
All details included in completion of forms						
Followed the task through to the end						

Number of hours completed: _____

General comments:

_____

_____

_____

Researcher Signature: _____ Date: _____

Print name: _____

5. FIELDWORKER CODE OF CONDUCT

5.1 BEHAVIOUR

In order to be a successful interviewer, a field worker must have (or develop) the following characteristics:

1. **Friendliness**: the field worker must be able to make each subject feel relaxed and not threatened in any way. The subject must feel that the field worker sees him or her as a person, not just another number that must be dealt with.

2. **Respect**: the subject must be treated with respect at all times. For example, he must be greeted politely, thanked for his time and co-operation; he must not be forced to answer a question that he is not willing to answer. The field worker must never show if she disagrees with something the subject has said.

3. **Patience**: each subject has to be asked the same questions in the same way. This means that the field worker must ask the same questions over and over, which can be very tiring and irritating. However, the field worker may never show that she is impatient or irritated even when the subjects are slow to answer or when they do not understand the questions. She must be able to control her own feelings and hide them when necessary.

4. **Reliability**: the field worker must be reliable, she/he must pay attention to detail, record all answers accurately, not skip over questions or make up answers.

5. **Enthusiastic and Motivated**: the field worker must be enthusiastic about the research. She should be doing it because she really wants to and not just because it's just a job.

6. **Flexible**: a good field worker is able to adapt to circumstances. She is aware that things do not always work out as planned and sometimes she will have to work under difficult and uncomfortable conditions.

8. **Neat Appearance**: the field worker must always look neat and well groomed, but never overdressed. The following guidelines for dress should be followed:
   - wear neat, simple and comfortable clothes
   - do not wear badges or emblems of organisations, churches, etc. as these may influence the way subjects answer.
   - dress so that the subject will concentrate on the interview and not on the way you are dressed.

5.2 CONDUCTING THE INTERVIEW

If the subjects in a project are children, the parents and/or caregivers will need to be involved in the interview process to verify information that is needed for the questionnaires. If the subjects are adolescents they can usually remember what they ate and can answer their own questions. If the questions need to be translated the interviewers must be careful not to change the focus of the question.

1. How do I begin?

- ✗ Greet the subject politely and introduce yourself.
- ✗ Ask what language the subject would prefer to speak.
- ✗ Explain what the interview is about. Let the subject ask questions about the research. Reassure the subject that the answers are confidential and that neither the subject nor his or her address will be identified.
- ✗ Put the subject at ease. Be flexible and sensitive to the subject. Some subjects may be tense or apprehensive. In such cases, talking about something general, e.g. the weather may put the subject at ease.

2. How do I conduct the interview?

- During the interview direct the questions to the subject, but if it is a child and he or she cannot answer, ask the parent/caregiver for the information needed.

- Ask the questions exactly as they are written on the questionnaire. Try even to keep your tone of voice the same for each subject so as not to lead the subject or to give him an idea of how you want him to answer. You may have to explain a question or use different wording if the subject cannot understand it.

- Ask the questions in the order that they appear on the questionnaire. If the subject refuses to answer the question, record the lack of response and go on to the next question.

- Follow the instructions on the questionnaire. Sometimes it may seem that a subject has already answered a question when he answered a previous one, but the interviewer must still answer the question. For example, the questions about polony and atchaar. Start the question: "We have already mentioned this, but…".

- Do not lead the respondents. Do not try to influence the way the subject answers. Keep your facial expression friendly, but neutral. Never show surprise or shock or approval to the subject's answers. Try to avoid unconscious reactions such as nodding the head, frowning, raising the eyebrows. Never give your own opinions.

- Keep the tone of the interview conversational. Be friendly and courteous. Do not make the subject feel as if he or she is taking an examination or is on trial be familiar with the

questionnaire so that you can ask questions conversationally rather than reading them stiffly. The questionnaire is designed to keep the amount of writing to a minimum. However, if a subject gives a long response to an 'other' question, say, 'excuse me while I write that down'. Don't make the subject feel as though you have forgotten he is there.

- Keep control of the interview. Do not let the subject go off into irrelevant conversation. If he or she does, bring him or her gently back to the interview.

- Allow the subject time to think; do not hurry him to answer. However, if he is silent for too long, repeat the question, or 'prompt' him. For example, say 'you have told me how you cook cabbage; now please tell me how you cook pumpkin.

- Follow the instructions on the questionnaire for recording the responses. Record all responses, including negative responses or refusals to answer.

- **Make sure that you have written in the subject's number.**

3. How do I end the interview?

- Tell the subject that you have finished the interview.
- Reassure him that everything he has told you is confidential.
- Thank him for his time and cooperation. Direct him to the next stage. Greet him.

6. INTERVIEW EXAMPLE

24-HOUR FOOD RECALL QUESTIONNAIRE

The 24-hour recall is a questionnaire on what the subject has eaten the day before over a 24 hour period. Often the 24-hour recall is used to establish whether the QFFQ is valid or not. It is important to think of the 24-hour recall questionnaire as being a totally separate questionnaire and not a cross-reference to the QFFQ. Therefore, the answers to the questionnaire need to be very detailed. You will need to ask what is eaten and drunk, what type of food or drink is consumed, the brand name, the preparation method and the quantity consumed. Remember to include spreads, sugar and milk to tea / coffee, snacks, sweets, juices, sauces, salts and other condiments.

Example: The subject is asked what she has in the morning on waking up.

I: What do you have in the morning when you wake up?

S: I drink tea and then have porridge.
I: How do you take your tea?
S: With 2 sugars and a little milk.
I: How big is the spoon and is it level or heaped? (*Showing the teaspoon*).
S: It is like that spoon and I also have it heaped.
I: What type of porridge did you eat and how much did you have? (*Showing a bowl or cup*).
S: I had soft mealie meal porridge and I had about 2 of those cups to the fill in a bowl.
I: Do you put anything else in the porridge?

S: Yes, 2 spoons of sugar, like my tea, and a little margarine about 1 spoon.
I: At about what time was this meal?
S: At 6 am.
I: Where did you have this meal?
S: 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)
From waking up to going to work, or starting day's activities					
6 am	**Home**	**Tea, rooibos**	**1 cup/mug**		
		With milk, full cream	**little milk – 2 tablespoons**		
		And sugar, white	**2 heaped tsp**		
		Soft mealie meal porridge	**2 cups**		
		With sugar, white	**2 heaped tsp**		
		And margarine, hard brick	**1 tsp**		

7. PORTION SIZES

FOOD	Smaller than smallest	Between small and medium	Between medium and large	Between large and very large	Larger than large/very large
Stiff porridge	125 g	275 g	425 g	600 g	800 g
Soft porridge	125 g	275 g	425 g		575 g
Samp and beans	100 g	200 g	375 g	600 g	800 g
Rice	70 g	105 g	190 g		310 g
French fries	30 g	90 g	185 g		340 g
Fried beef	15 g	45 g	80 g		120 g

FOOD	Smaller than smallest	Between small and medium	Between medium and large	Between large and very large	Larger than large/very large
Beef with bone	45 g	75 g	120 g		180 g
Meat stew	55 g	165 g	275 g		385 g
Sausage/ Wors	20 g	50 g	90 g		135 g
Offal	20 g	60 g	100 g		140 g
Pilchards	15 g	45 g	90 g		150 g
Mashed pilchards	15 g	45 g	90 g		240 g
Fried fish	50 g	70 g	105 g		155 g
Cabbage, potato and onion	15 g	45 g	75 g		105 g
Spinach, potato	15 g	45 g	75 g		105 g
Tomato and onion gravy	10 g	30 g	60 g		100 g
Pumpkin	15 g	35 g	60 g		80 g
Carrots, potato	45 g	65 g	80 g		95 g
Green mealie	50 g	110 g	180 g		260 g
Beetroot salad	10 g	30 g	65 g		85 g
Fat cake	20 g	50 g	70 g		90 g
Bread	15 g	45 g	80 g		120 g
Margarine	2,5 g	7,5 g	12,5 g		17,5 g
Dumpling	20 g	70 g	125 g		175 g
Apple	70 g	130 g	195 g		265 g
Banana	40 g	60 g	95 g		130 g

FOOD	Smaller than smallest	Between small and medium	Between medium and large	Between large and very large	Larger than large/very large
Canned peaches	30 + 10 g	70 + 15 g	110 + 25 g		150 +35 g
Custard	5 g	20 g	35 g		65 g
Atjar	10 g	45 g	80 g		120 g
Polony	5 g	15 g	30 g		45 g
Peanuts	5 g	20 g	60 g		105 g
Cheese curls	6 g	18 g	38 g		62 g

8. Other Questionnaires

The researcher may also use any of the following questionnaires:

- Food Frequency Questionnaire
- Socio-demographic questionnaire
- Nutrition knowledge questionnaires
- Health questionnaires
- Smaller questionnaires drawn up by each individual researcher e.g. lunch box content of school children.

Annexure E: Field worker consent form

FIED WORKER CONSENT FORM

Statement of Agreement to assist conduct Research Study:

I hereby confirm that I have been trained by the researcher, _____ (name of researcher) to assist conduct full research on food security study.

I, _____ (name of researcher assistant) herewith confirm that have been fully informed about the nature, conduct and risks of the above study.

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

Annexure F: Anthropometric Questionnaire

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	/	/

Annexure G: Coping strategies Questionnaire

FOOD AND NUTRITION CONSUMER SCIENCES

COPING STRATEGIES FOR KENNETH GARDENS

Subject number: _____ Date: _____

Interviewer: _____

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	All the time? Every day	Pretty often? 3-6 */week	Once in a while? 1-2 */week	Hardly at all? <1* /week	Never	Raw score	Severity weight	Score = Relative Frequency x weight
Relative frequency score	**7**	**4.5**	**1.5**	**0.5**	**0**			
a. Ask for food from neighbours?							1	
b. Rely on less expensive and preferred food?							1	
c. Gather wild food?							3	
e. Send household members to beg?							4	
f. Limit portion sizes?							2	
g. Reduce the number of meals eaten in a day?							4	
h. Skip entire days without eating?							4	
i. Restrict consumption by adults in order for small children to eat?							3	
j. Sell some belongings in order to get money to buy food?							4	
k. Steal vegetables from other people's vegetable gardens to eat?							4	
l. Go to the local soup kitchen for a meal?							4	
m. Ask for food from welfare or church organisations?							4	
n. Do small pieces of work for food/money?							4	
o. Contribute to food stokvel in order to ensure food over a scarce period?							4	
TOTAL HOUSEHOLD SCORE								

Severity weight: 1=least severe; 4=most severe

Annexure H: Food Frequency Questionnaire

FOOD AND NUTRITION CONSUMER SCIENCES

FFQ LIST OF FOODS AND FOOD GROUPS DIVERSITY

Subject number: _____ Interviewer: _____

Date: _____

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 (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		
Yogurt		
Buttermilk		
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)		
Potatoes		
GROUP 5: Legumes and Nuts	**Y**	**N**
All Beans dried including bean sprouts		
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 – includes fresh herbs		
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		
Green beans (fresh)		
Peas (fresh)		
Cauliflower		
Chili (red/green)		
Lettuce		
Green\ Yellow\ Red Pepper		
Frozen Vegetables (Mixed)		
Ginger & Garlic (Fresh)		
Gem squash		
GROUP 9: Oils and Fats Diversity	**Y**	**N**
Butter		
Sunflower oil		
Olive oil		
Margarine		
Lard (animal fat)		
Salad dressing/oil - mayonnaise		
Potato Crisps		
Coffee Creamer (Cremora, Ellis Brown)		

Annexure I: **24 Hour Recall Questionnaire**

24 – HOURS RECALL

Subject ID number: _____ Interviewer: _____

Name: _____ Date: _____ / _____/ _____

Address: _____

Tick what the day was yesterday:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

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					

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)					

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)
After dinner, before going to sleep					
* Do you take any vitamins (tablets or syrup)		Yes	1	No	2 X
Give the brand name and dose of the vitamin/tonic:					

Annexure J: **Socio demographic questionnaire**

Food and Nutrition Consumer Sciences

SOCIO-DEMOGRAPHIC QUESTIONNAIRE: AFRICAN COMMUNITY

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:……..…….

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?

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	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 In what type of house are you staying?

Brick	Clay	Grass	Wood	Zinc/shack

3.8 How many rooms does your house have?

< 2 rooms	3-4 rooms	> 4 rooms

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

Yes	No

3.10 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…….	

3.11 Do you have the following facilities at home?

3.11.1 Water

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

3.11.2 Toilet facilities

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

3.11.3

Waste removal	Yes	No

3.11.4

Tarred road in front of house	Yes	No

3.11.5

Gravel road in front of house	Yes	No

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

……
……

3.13. Do you have problems with the following?

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

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 week ends 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?

<	R501-R1000	R1001-R1500	R1501-	R2001-R2500	> R2500

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…….

6. ASSETS

Tick one block for every question:	Self	Father	Mother	Sibling	Grandma	Grandpa	Aunt	Uncle	Cousin	Friend	Other
6.1 Who is mainly responsible for food preparation in the house?											
6.2 Who decides on what type of food is bought for the household?											
6.3 Who is mainly responsible for feeding/serving the child?											
6.4 Who is the head of this household?											
6.5 Who decides how much is spent on food?											

6.6 How many meals do you eat per day?

0	1	2	3	> 3

6.7 Where do you eat most of your meals?

Home	Friends	Work	School	Other, specify…….

6.8 Where do your children eat most of their meals?

Home	Friends	School	Other, specify……

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

	Yes	**No**	**Quantity**
Electrical stove			
Gas stove			
Primus or paraffin stove			
Microwave			
Hot plate			
Radio			
Television			
Refrigerator			
Freezer			
Bed with mattress			
Mattress only			
Lounge suite			

	Yes	No	Quantity
Dining room suite			
Electrical iron			
Electrical, kettle			

6.10What type of fuel do you usually use for food preparation?

Wood fire	Paraffin	Electricity	Gas	Coal	Other, specify……

6.11What 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.