ANTHROPOMETRIC PROFILE AND FOOD CONSUMPTION PATTERNS OF AN EMERGING MIDDLE INCOME COMMUNITY IN UMLAZI

Dissertation submitted in fulfilment of the requirements of 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

By

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

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DEDICATION TO:

Umhlangano wentsha yothando lukaKristo enenjongo yokusebenza- kwisifundaPrieste saseSt. Alphonse esiyingini: UMlazi Deanery ngaphansi kwesiFundaBhishobhi: Marianhill Diocese. Siqhutshwa uthando lukaKristo!

“Konke enikwenzayo makwenziwe ngothando” - KwabaseKorinte 16:14

ABSTRACT

ANTHROPOMETRIC PROFILE AND FOOD CONSUMPTION PATTERNS OF AN EMERGING MIDDLE INCOME COMMUNITY IN UMLAZI

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Introduction: The nutrition transition is a global phenomenon affected by developing economic prosperity. 'Nutrition transition' may be defined as changes in dietary patterns and nutrient intakes occurring in individuals, families, groups of people or whole populations when the food environment and other circumstances change. Post-1994 democratic elections in South Africa, economic laws called for the de-racialization of the economy. As a result of the annulment of the apartheid laws in the 1990s entrepreneurial opportunities became available for black people.

Based on the 2011 Census, the middle class constituted 8.3 million (17%) out of the 51 million population in South Africa. Blacks made up 51%, whites 34%, coloureds 9% and Indians 6%. This is a vast difference from two decades prior to this when blacks made up only 3.3% of the population, with coloureds making up 9.1% and Indians 18.5%.

In a number of Sub-Saharan African studies obesity has been shown to have a significant link to socio-economic status determined by access to water and electricity, smaller numbers of members residing in one household and increased amounts of money spent on food among other factors, which all promote a tendency to leading a more Westernised lifestyle. The main objective of the study was to determine the anthropometric status and analyse the food consumption of a community of emerging middle income status in Umlazi Township (Ward 84) outside Durban in the province of KwaZulu-Natal.

Methods: This study had a sample size of n=250 adult men (n=56) and women (n=194) who were heads of households or primary caregivers above the age of 19 years old with households receiving a total household income of more than R100 000.00 per annum/ more than R8000.00 per month. The study was quantitative and descriptive in nature with different tools used to measure the sample population. These included waist circumference and height and weight measurement to determine BMI and WHtR. A socio-demographic questionnaire was

completed where the multi-dimensional poverty index (MPI) was established; a food frequency questionnaire (FFQ) and three 24-hour food recall were also administered to all participants; one weekend day recall and two weekday recalls. Data were analysed on SPSS and nutrient analysis done through Food Finder Version 3 Software and compared to the World Health Organisation standards recommendations for optimal health.

Results: The mean age of the group was 52 years old. Slightly more than half (51.6%; n=129) of the population was unemployed. Retired participants made up 27.2% (n=68) of the population. The majority (80%) of the households indicated that between one to three members contributed to the total household income. The MPI of the Ward 84 community amounted to 9.09. The prevalence of obesity was 37.59% (n=21) among men and 76.80% (n=149) for women. Women had a higher prevalence of risk factors linked to non-communicable diseases than men. Mineral and fat soluble vitamin intake was deficient; however protein and carbohydrates were consumed in excess with means of 187.70% and 111.43% respectively. Top 20 foods consumed lists indicated that little fruit or vegetables were consumed. The average food variety score was medium indicating the consumption of between >30 but <60 different foods across the total population. A positive relationship of statistical significance was found between food variety score and income (p=0.007).

Conclusion: The Ward 84 community consisted of an ageing population with households mostly supported by another member's income from within or outside the household. The adults had sufficient education to have secured promotions in the employment arena and could afford a lifestyle similar to that of those who had always been more privileged. Although the Umlazi residents benefited from good housing and infrastructure and appeared to have averted poverty, the prevalence of overnutrition malnutrition was high and linked with an excessive intake of macronutrients.

Majority (70%) of the community of Ward 84 is 'food secure' as indicated by the number of participants' households indicating never having a shortage of money to buy food. This correlates negatively with the high prevalence of overweight and obesity (BMI) (p=-0.029). According to literature a persistent issue in black communities is the acceptance of an overweight body image being perceived as 'healthy' and an indicator of affluence.

This community appears to be in the 4th stage/ pattern of the nutrition transition. It appears that a 'westernised diet' and lifestyle is more accessible and is embraced by this urban community as described in various literature and seen in the top 20 foods lists compiled from the 24 hour

recalls. There is some oversight regarding the nutrient quality of a varied diet and achieving energy balance with macronutrient intake linked to informed nutritional choices. Suggested interventions could include the dissemination of information regarding nutrition and practical suggestions to achieve energy balance. In addition, future research could investigate the prospects of introducing participation in urban agriculture, investigate the issue of physical activity, and foster an environment for more physical activity and increase availability and access to micronutrient dense foods and investigate the development of a body mass index specifically for the black African population.

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LIST OF ABBREVIATIONS

ADA	American Dietetic Association
AfDB	African Development Bank
AI	Adequate Intake
AIDS	acquired immune deficiency syndrome
AMDR	acceptable macronutrient distribution range
ARC	Agricultural Research Council
ASPEN	American Society of Parenteral and Enteral Nutrition
AU	African Union
AVRDC	Asian Vegetable Research and Development Centre
BBE	Black Business Empowerment
BEE	Black Economic Empowerment
BMI	Body Mass Index
BRICS	Brazil- Russia- India- China- South Africa
CDC	Centers for Disease Control and Prevention
CDE	Centre for Development and Enterprise
CHD	coronary heart disease
CHO	carbohydrates
CIA	Central Intelligence Agency
COGTA	Department of Co- Operative Governance and Traditional Affairs
CRIBSA	Cardiovascular Risk in Black South Africans
CVD	cardiovascular disease
DD	dietary diversity

DDI	dietary diversity index
DDS	dietary diversity score
DDSP	diversity score with portions
DEA	Department of Environmental Affairs
DHP	Directorate of Health Promotion
DIRCO	Department of International Relations and Cooperation
DOH	Department of Health
DOSD	Department of Social Development
DRI	Dietary Reference Intake
DUT	Durban University of Technology
EAR	Estimated average requirement
EER	Estimated energy requirement
FAO	Food and Agriculture Organisation
FBDG	Food Based Dietary Guidelines
FET	Further education and training
FFQ	Food Frequency Questionnaire
FGDS	food group diversity score
FINUT	Ibero- American Nutrition Foundation
FNSS	Food and Nutrition Security Strategy
FVS	food variety score
GDP	gross domestic product
GII	Gender Inequality Index
GMC	Global Middle Class
HDI	Human Development Index

HDL- C	high density lipoprotein- cholesterol
HH	household
HIV	human immunodeficiency virus
HPF	Health Policy Framework
HSRC	Human Sciences Research Council
ICT	information and communications technology
IDD	iodine deficiency disease
IFPRI	International Food Policy Research Institute
IFSNP	Integrated Food Security and Nutrition Programme
IHDI	Inequality-adjusted Human Development Index
IMR	infant mortality rate
INFORMAS	International Network for Food and Obesity/NCDs Research, Monitoring and Action Support
IoM	Institute of Medicine
IREC	Institutional Research Ethics Committee
IUNA	Irish Universities Nutrition Alliance
KZN	KwaZulu- Natal
LDL- C	low density lipoprotein- cholesterol
LMC	Local Middle Class
LMIC	low and middle income countries
MDG	millennium development goals
MI	Micronutrient Initiative
MPI	Multi-dimensional Poverty Index
NAMC	National Agricultural Marketing Council
NAR	nutrient adequacy ratio

NCD	non-communicable disease
NGO	non- government organisation
NICUS	Nutrition Information Centre of the University of Stellenbosch
NPC	National Planning Commission
NR- CDL	nutrition related- chronic diseases of lifestyle
OECD	Organisation for Economic Co-operation and Development
OVCY	Orphans, Vulnerable Children and Youth
PAL	Physical activity level
PICT	Pacific Island Countries Trade
PICTA	Pacific Island Countries Trade Agreement
PPP	purchasing power parity
PPS	Portable Physician Scale
QFFQ	Quantitative Food Frequency Questionnaire
RAP	Regional Agricultural Policy
RDA	recommended dietary allowance
SA	South Africa
SADC	Southern African Development Community
SAIIA	South African Institute of International Relations
SAMPI	South African Multi- dimensional poverty index
SAMRC	South African Medical Research Council
SANHANES-1	South African National Health and Nutrition Examination Survey-1
SDG	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
StatsSA	Statistics South Africa

TAG	triacylglycerol
TC	total cholesterol
TNC	transnational corporations
TV	television
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organisation
UNISA	University of South Africa
US(A)	United States of America
WC	waist circumference
WHO	World Health Organisation
WHO FCTC	World Health Organisation Framework Convention on Tobacco Control
WHtR	Waist to height ratio
WTO	World Trade Organisation
ZA	South Africa

LIST OF SYMBOLS

%	- Percent
>	- Greater than
≥	- Greater than or Equal to
<	- Less than
≤	- Less than or Equal to
®	- Registered sign
µg	- Microgram
$	- US Dollar
cm	- centimetres
n	- sample size number
g	- Grams
kg	- Kilograms
kJ	- Kilojoule
l	- litre
m	- metre/s
mg	- milligram
mmol	- millimole
CI	- Confidence Interval
P	- Percentage
R	- Rand
SD	- Standard Deviation
Z	- Z value

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CHAPTER 1: THE PROBLEM AND ITS SETTING

1.1 INTRODUCTION

The Food and Agriculture Organisation (FAO) (2014a: 1) states that the world is continuously still challenged with achieving food security. Food security is not an issue that can be said simply stands on its own. There is an overlap of factors that are interlinked; however, they are different from one another namely: hunger, nutrition insecurity, undernutrition and food insecurity. Most commonly, food insecurity is the product of poverty and inequality hence affecting the human right to food that is sufficient and nutritious. Popkin, Adair and Ng (2012: 2) reported that there are few studies detailing obesity trends in low and middle income countries. In addition, of the studies conducted little is known regarding intra-state trends linked to urban-rural or income/wealth variances. The escalation of demographic, social and economic changes occurring in many developing countries have yielded a rise in urbanisation and modifications in food systems causing a global nutrition transition (FAO 2014a: 3).

South Africa being a middle income country experiences varied living conditions. The landscape encompasses the opulent suburbs, deprived peri-urban areas, rural homesteads and under-developed rural locations. Health patterns and the diets of South Africans have evolved due to the social, political and economic changes resulting from the growth in urbanisation (Steyn, Bradshaw, Norman, Schneider and Steyn. 2006: 1). Burger, Louw, Pegado and Van der Berg (2015) cite former president Thabo Mbeki saying that, ‘after two decades of democracy a large portion of the population is still outside of the labour market and mainstream economy’. As much as unemployment continues to be a major problem together with poor service delivery, within the same climate in the last 20 years there has been a rapid growth in black affluence, making markets and society more accessible and vibrant. South Africa’s conversion to democracy in 1994 pledged the start of a non-prejudiced multi-ethnic administration (Visage 2011: 1) that would facilitate efforts to achieving equality for all.

Pre-1994 democratic elections

It has been suggested that the black middle class dates back to the 19th century. The notion is that it was created in the Cape and Natal colonies. With the discovery of precious minerals there was a demand for cheap labour that saw the migration of people from rural areas to more urban areas. Officials are said to have advanced a special black class distinct from the rest of

the native citizens by way of educational status, dress code and standard of living. This group was hired to work in the then developing colonial regions and its secondary missionary enterprise as teachers and priests, dressed up in a western clothing, welcoming English ethos, with a sense of pride for knowing the English language and its literature (Ndletyana 2014: 5 and Southall 2014: 3).

This new 'middle class' of black people was educated to serve as an intermediary between resistant groups and the bureaucratic order and hence began to adopt a political role. In the 1850s literate black people were allowed to vote and buy property. In the 1890s, however, it was legislated that the number of black voters be limited. By 1936, after almost a decade and a half after the creation of the Union of South Africa, the black people's franchise was completely shut down because of the racial foundations of the union. Blacks were driven to labour for wages, given substandard education, refused higher secondary and tertiary schooling, prohibited from working in particular occupations and paid minimal wages. These regulations became the foundation of the apartheid economy and government (Ndletyana 2014: 6).

These developments led to a lack of growth of the black middle class. Basically, the black middle class ended up with no assets and consequently applying for loans was impossible if one had no asset. A large number of black people became blue-collar workers and manual labourers. The teachers, nurses, court interpreters and clerks, however, were able to remain as a middle class in the communities. Even the homelands were unviable as the budgets for these areas were controlled by the apartheid government. Amidst these homelands, however, was where the black middle class flourished, some finding employment in government service and others becoming traders. The homelands governments provided financial support for prospective business people (Ndletyana 2014: 7). However, the homelands middle class was relatively conservative – they owed their existence to the apartheid state and were protective of the homelands system and avoided anti-apartheid movements. Similarly, Southall (2014: 2) states that capitalism and white monopoly was designed to stop the growth of the black middle class until there were shortages in skilled white labour which would entail providing education and housing for black labourers.

On the other hand, the urban middle class suffered the brutality of the apartheid government and became part of the broader anti-apartheid movement. After the founding of the African National Congress in 1912 the black middle-class made up a large part of its constituency up

to the 1950s when the party evolved into a mass movement (Ndletyana 2014: 7). Political repression made it possible to implement social engineering which apartheid had embraced in the 1950s; for example, Bantu education effectively closed down private schooling for the black population. The average educational attainment among people born in 1940 was: four, six, eight and eleven years for blacks, coloureds, Asians and whites respectively (Fedderke and Simkins 2012: 180).

Visagie (2011: 1-2) and Ndletyana (2014: 6) stated that under apartheid black South Africans were also denied business opportunities, dispossessed of property and forcibly relocated. The government denied the black population permanent residence in urban areas which effectively meant no housing in the cities for black South Africans who were furthermore barred from occupational advancement.

Post-1994 democratic elections

According to Visagie (2011: 2) after the attainment of political liberation, economic laws called for the de-racialization of the economy. Escusa (2013: 6) stated that during the repeal of the apartheid laws in the 1990s opportunities arose for many generations of black people. Transformation was an imperative and so the answer to this was the implementation of affirmative action policies and black economic empowerment initiatives. The eradication of apartheid also saw that the 90% of the population that was previously not allowed to open bank accounts became a market for private banks to reach (Escusa 2013: 18).

The Employment Equity Act of 1998 regulated that employers devise plans to achieve racial equity in the workplace. The broad-based Black Economic Empowerment Act of 2003 encouraged the growth and establishment of black business by the favoured awarding of government and parastatal contracts to 'BEE (Black Business Empowerment)-compliant enterprises' (Visagie 2011: 2). It is these policies, among others, that allowed for the growth of the black middle class. The present day measure towards racial redress has consequently grown the black middle class (a previously disadvantaged population) (Ndletyana 2014: 8). The legislation of this policy allowed for great moves in black social mobility. However, it is also important to note that the policies don't only include blacks, but coloureds and Indians too.

The growth of the SA black middle class is a post-1994 phenomenon. Based on the 2011 Census, the middle class constituted 8.3 million (17%) out of the population of 51 million in South Africa. Blacks made up 51%, whites 34%, coloureds 9% and Indians 6%, which is vastly

different from two decades earlier when the black population made up only 3.3%, coloureds 9.1% and Indians 18.5%. (Ndletyana 2014: 5). The Centre for Development and Enterprise (CDE) (2014: 2) suggested that the South African rising middle class varied in many ways from the middle classes of the early- commercialised countries in Europe and North America. It is probable that the new middle class is made up of workers in the low level public sector or service sector employment or who are self-employed.

In the article 'Who are the middle class in South Africa? What are the Implications for Policy?' Visagie (2013: 36) highlights that the middle class in South Africa has also been defined as persons receiving between $3 and $9 per person per day (which is bordering on poverty).

Visagie and Posel (2011: 2) state that being middle class may refer to having attained a certain absolute level of affluence or particular lifestyle; it also could refer to the economic position of the average citizen in society. Studies which use the individual to identify class status typically use individual income (sometimes filtered by occupation) to identify class status and economically active adults hence housewives, students and pensioners are excluded. At the individual level classification may also be made according to the individuals in one household that share the same resources and lifestyle. Commonly, identification of the middle class is done in terms of the household's well-being. Therefore a person can be identified as middle class based on total household income or per capita household income lying within a certain range.

According to Escusa (2013: 14) a study entitled the Black Diamonds Study showed that 12 000 households moved from the townships to the suburban areas every month in the year 2007 and middle class consumers spent more on durable consumer goods or residential property (Kotzé, du Toit, Khunou, Steenkamp, Burger, Van der Berg, Zoch and Krige 2013). Van der Berg (2014) suggests that the black middle class should be classified according to two groups: 1) an emerging middle class that has a large asset-deficit compared to its (white) counterparts and 2) the established middle class that would grow as members from the emergent group acquired assets. It is the expansion of an education of quality that will allow more people to move away from being poor and create active communities within growing middle classes, alludes the CDE (2014: 7). In agreement with this Kotze *et al* (2013) stated that meagre education is the major restriction to more rapid growth of the black middle class. A study conducted by the Human Sciences Research Council (HSRC) used occupation as a measure of middle class and found that the middle class in SA grew to 11.9% from 8.8% within six years of the democratic

liberation. It is suggested that the growth was due to the increased number of the black population in high-level occupations – particularly professionals (Visagie and Posel 2011: 2).

What and how much people eat is affected by the availability of food, if it is accessible and the kind of food available (Ronquest-Ross, Vink and Sigge 2015: 64). According to Escusa (2013: 7) the first expense for the average South African household is dedicated to food at 26.4% of the monthly expense. It is foreseen that the rise in urbanisation will cause an increase in the demand for high-value foods like dairy, meat, fresh fruits, vegetables, and processed, packaged and prepared foods. It was found that between 1994 and 2012 the consumption of eggs, fish, fruit, tomatoes, onions, beans, dairy, sugar and sweeteners used in confectionary, bakery products and soft drinks, spices and brown bread had seen some slight to significant increases. A decrease in consumption was observed in vegetables, maize meal, millet, sorghum, sweet potato, raw sugar and sweeteners (Ronquest-Ross, Vink and Sigge 2015: 72). The lower middle class homes in Johannesburg and Soweto may be among the first of their family's generation to access mass consumption. This refers to the access to shop in the main town and having an increased choice of new products to choose from. As households are in the middle of transition it was found that traditional meals are still maintained with the addition of more new products and tastes to the diet. The relationship between the black middle class and consumption is identified through the significance held by affordability in its link to sufficiency and dignity of people (Escusa 2013: 16). Two vital concepts are defined in order to provide further understanding and contextualise the study.

Middle income and middle class

Ndletyana (2014: 2) explained that the reality of the middle class comes from the earnings based on skill set and expertise. It is made up of white-collar professionals, managers and traders. Occupational status is not the only distinguishing factor, however, as behaviour, lifestyle and world view are also factors. Basically, it is not just about occupation and income but a subjective phenomenon offering two benefits, namely, economic development and democratic stability. Middle class is predisposed to democratic politics and equality across the board because of level of education (Ndletyana 2014: 3); whereas the working class is more concerned with the economy (financial interests) rather than politics. In the analysis provided by Ndletyana (2014: 4) the African Development Bank (AfDB) situates the middle-class income at anything above $2 per day in comparison to another study suggesting the middle class earn an income of between R1500 and R10 000 per month. This poses a challenge because

this would now include a considerable number of blue-collar workers who may not meet the educational level nor the typical world-view common to the middle class.

Escusa (2013: 11-12) explains that the Global Middle Class (GMC) is a term of the World Bank and the Organisation for Economic Co-operation and Development (OECD) to designate a middle range of incomes in emerging countries in terms of purchasing power parity (PPP) dollars between $4000 and $17000 per year. This definition is characterised by a professional or corporate executive owning a stand-alone house in an upmarket suburb and a car and having children attend private schools. And a more sociologically charged criteria is the Local Middle Class (LMC) which has a daily spending level of more than $2 (above the poverty line) and is distinguished by its behaviours, preferences and expectations in terms of consumption and lifestyle. The LMC involves factors of new emergence from poverty for a first generation of upwardly-mobile individuals. In an article provided by Visagie (2011: 2) the middle class is analysed in two ways. Firstly, with the perspective that the middle class are the affluent of society, focus is placed on how the size and racial make-up of the affluent class has transformed since 1994. The second perspective is that the middle class is made up of the average, or regular, South African. The emphasis here is placed on the growth of income and changes in access to basic resources and public services. According to CDE (2014: 2) the 'literal middle' income-households in the middle of the income distribution are defined as households with per monthly capita of US$190 to US$570. 'Relatively affluent middle' can be found in higher, more typically middle class income brackets by global standards of between US$700 per monthly capita and US$4000 per monthly capita. Statistics South Africa (StatsSA) (2009: 3) defines a middle class standard of living as follows: living in formal housing, water tap in dwelling, flush toilet in dwelling, electricity as main light source, electricity or gas being the main cooking source and having a landline phone or a household member owning a cell phone. For the purposes of the study, the terms middle income and middle class are both used interchangeably in reference to the community in question. Both factors defining the two terms apply to the methodology and benchmarking of the position of the emerging middle income community in Umlazi.

Township transformation

During the apartheid era the word township was used usually for an area segregated for non-white populations to reside in. Nowadays, when referring to townships in surveys, a local authority would label a location as 'township' through profiling a particular land use distinctive

to urban functions (StatsSA 2007). According to Escusa (2013: 14), based on a study conducted in Johannesburg, a township is made up of public housing schemes which used to be reserved for non-whites characterised by huge numbers of houses that all look the same. A buffer area was used to segregate the township from the city centre. The author says that the township was built for economic and security purposes to facilitate the implementation of the ideology of separate development and a migrant workforce. But in the present day it has become a standard of culture identification.

The Department of Co-Operative Governance and Traditional Affairs (COGTA) provided a depiction of how townships arose and the transformation undergone from the 1900s to 2009.

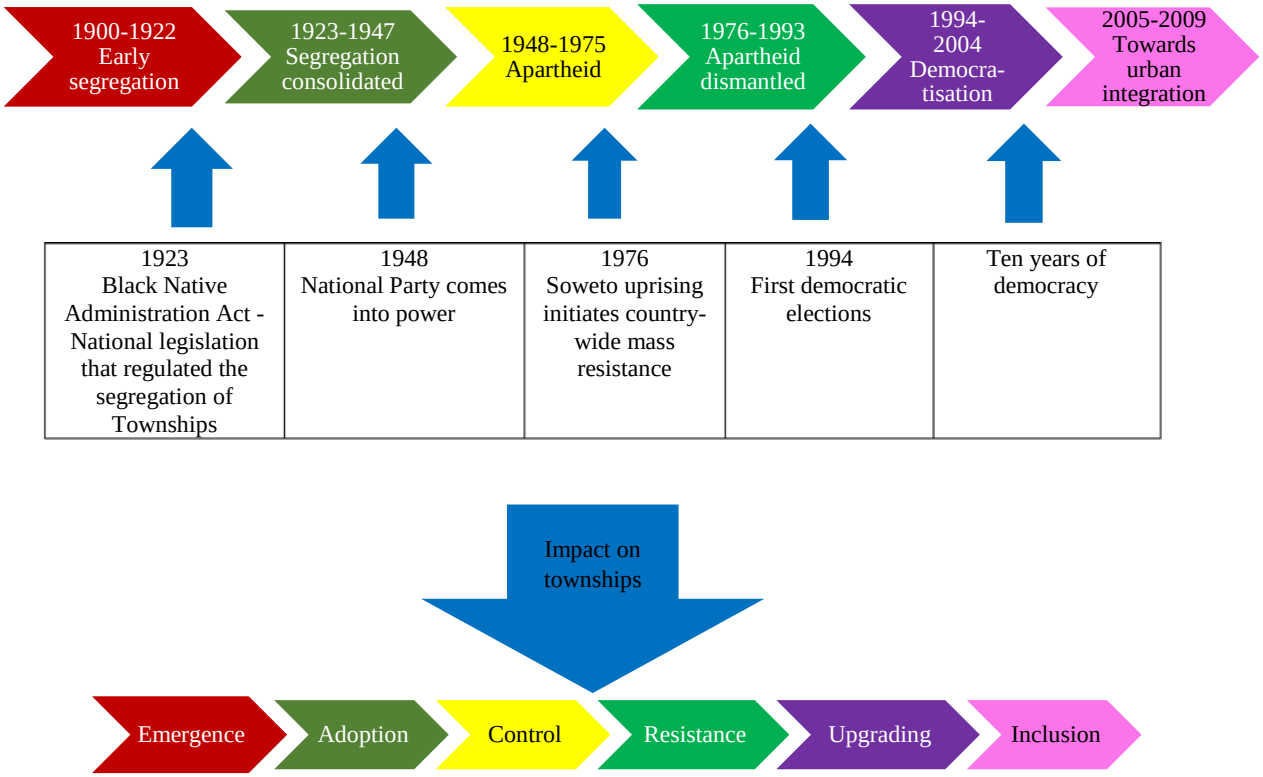

Figure1.1: Township Transformation time periods showing key triggers and overview

COGTA (2009: 13) explains that during the early segregation stage 'locations' (the first townships) emerged in towns but later on the outskirts of towns. The government permitted residents of these areas to work in urban areas however, limiting investment to the peoples' development. The living conditions were dire and the blacks were not included in political and land rights.

With the increased labour demands in urban areas township residents became significant as the workforce between 1923 and 1947. The government was unable to control the rise in urbanisation while trying to develop the townships. The white officials in the townships developed an impersonalized bureaucracy and administration of housing and welfare was handed over to be controlled by the blacks. As a result informal settlements sprouted, living conditions did not improve and forced removals were applied. Resistance initiatives increased through petitioning and deputations of the civil society (COGTA 2009: 13 and Southall 2014: 13).

Most large townships were built (or grew) after 1950 by the apartheid government. All non-white urban races were forced to live in townships through the implementation of the Group Areas Act of 1950 (Pernegger and Godehart 2007: 7). Intensified development of the townships did not, however, eradicate the over-crowding in townships. From 1960 the focus then moved to homeland upgrading. The more isolated the townships became, the more poverty grew and the more communities took on militancy in addition to international sanctions and boycotts being instituted (COGTA 2009: 13). Southall (2014: 14) cites that politics in the townships had transitioned from co-operation to resistance.

During the 'resistance' period 1976 to 1993 moves were made to dismantle the apartheid government. It was accepted that blacks would occupy urban areas more permanently and not only live in townships, and funds to build property were increased. However, the country was left with cities designed by apartheid.

The transformation of townships began after the 1994 democratisation. Programmes were introduced to upgrade township communities; however, the locations remained separate and marginalized leaving South Africa with two very different economies in one. There persisted a population of the very wealthy and another of the extremely impoverished. Post-apartheid development policies led to the construction of townships filled with government housing and limited access to some social services (COGTA 2009: 14 and Alam 2014).

The new government tried further to uplift the township areas. It was said that the private sector would also play a big role in the development of the townships. The main aim during the period of 10 years after democracy was to integrate townships with towns and cities; however, uncertainty remained about the implications this would have on township enterprise interests (COGTA 2009: 14).

1.2 THE NUTRITION TRANSITION

The nutrition transition is a phenomenon affecting developing countries the world over and the world acquires food in excess (at a rate of almost one third more) of what is needed (FAO 2014b: 56), meaning that there is a portion of people that regularly get and consume more than the required amount of food to meet individual energy needs (FAO 2014b: 242). The nutrition transition may be presented as a score according to a number of factors. The nutrition transition scoring system was founded on the tendencies linked with the progression of the nutrition transition. As described by Abrahams, Mchiza and Steyn (2011: 8- 9) if a country was in the top quartile of the range for energy, percentage of energy from fat and overweight/obesity, a score of 1 was allocated. Should a country fall in the bottom quartile ranges of the purchasing power parity (PPP), infant mortality rate (IMR) and stunting indicators, it would also receive a score of 1 for each indicator. All indicators that did not receive a score of 1 automatically receive a score of zero (0). The highest possible score was six and the lowest was zero. A score of six is representative of a country in the last phase of the nutrition transition while zero indicates a country in very early stages of transition. A score close to zero would encapsulate the famine stage and would typically be a country with a low per capita energy intake, high IMR, high prevalence of stunting and low prevalence of obesity. A score close to six, on the other hand, would reflect a high energy intake, low IMR and stunting and a high prevalence of obesity.'

According to Abrahams, Mchiza and Steyn (2011: 4) a change in food consumption, nutrient intake, disease occurrence and life expectancy has transpired and within a single country there may be areas undergoing different stages of the nutrition transition. As more women are now working, less time is available for growing and producing food, shopping for items to cook and preparing energy intensive staples of the traditional diet. Many families now rely on processed foods which increases the chances of obesity. The World Health Organisation (WHO) (2015a) defines obesity as the accumulation of fat in excess amounts in the body. Obesity may be equated to having a Body Mass Index (BMI) of 30 kg/m^2 and above (Bender 2005: 376).

The occurrence of obesity is propelled by sedentary activities linked with urban employment and more access to television and computers (Abrahams, Mchiza and Steyn 2011: 5). The nutrition transition has several implications for non-communicable diseases (NCDs). Non-communicable diseases are defined as chronic diseases and not passed on from one person to

the next; the diseases usually progress and last a long time (WHO 2015b). Both undernutrition and overnutrition are considered as malnutrition (WHO 2005: 1). Malnutrition is basically the consumption of not enough food, excessive food intake or consumption of incorrect food (nutritionally and proportionally). Malnutrition is two-faceted in that an individual could experience overnutrition or undernutrition. The most prevalent undernutrition is protein energy malnutrition and micronutrient deficiency due to inadequate food intake and consequently the lack of vitamins and minerals required by the body (Bender 2005: 428). Overnutrition is a condition induced by over-consumption of energy and macronutrients over a period of time (WHO 2006: 1). The South African Medical Research Council (SAMRC) (2006: iv) states that lifestyle diseases have similar risk contributors that occur due to prolonged exposure to unhealthy diets, smoking, lack of exercise and possible stress. Hypertension, high blood cholesterol, diabetes and obesity are factors that may lead to strokes, heart attacks, emphysema and chronic bronchitis. It is also most likely that type 2 diabetes is related to other health conditions present simultaneously within an individual (Temple and Steyn 2012: 128, 130).

The rising occurrence of non-communicable diseases is impacting on health systems. Healthcare expenditure is approximately 75% of global healthcare spending. In low and middle income countries NCDs are claiming lives at younger ages than in high income countries (United Nations Development Programme (UNDP) 2013: 14, 11). The implication of this is that these countries are unable to optimise the large and healthy (younger) population that is of working age (UNDP 2013: 12).

It is apparent that there is an expanding perception that there are several drivers of the nutrition transition that countries, including South Africa, need to consider in planning for the country and improving the livelihood of the population.

The following section will provide a broad overview of the context of the study in terms of the global, continental, national and local matters pertaining to the nutrition transition and the community being investigated.

1.3 BACKGROUND TO THE PROBLEM: GLOBAL PERSPECTIVE

The world population was at 7, 243, 700 billion people in 2014 (FAO 2014b: 56). The majority (74.37%) of the world population is made up of ‘adults’ (age 15 years and older) (Central

Intelligence Agency (CIA) 2015). There are several societal, technological, political, individual, family and transformation implications that arise from the worldwide nutrition transition. . The issue of health system implications, economic and social influences, increment of the prevalence of NCDs, food intake and solutions to the mounting nutrition transition situation need to be discussed. Nordin, Boyle and Kemmer (2013: 582) also state that the high occurrence of nutrition insufficiency puts significance on addressing diet quality and the daily life environment. Underwriting the above issues is the dearth of micronutrients, inadequate hygiene and healthcare as well as poverty. The four main NCDs are cardio-vascular disease, diabetes, cancer and chronic respiratory diseases. Table 1 provides definitions for these conditions.

Table 1.1: Definitions of types of NCDs

DISEASE	DEFINITION
Cardiovascular disease	A group of illnesses of the heart and blood vessels e.g. coronary heart disease, rheumatic heart disease, cerebrovascular disease etc. (WHO 2015c).
Diabetes (mellitus)	A metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs (WHO 2015d).
Cancer	A generic term for a large group of diseases that can affect any part of the body. Other terms used are malignant tumours and neoplasms. One defining feature of cancer is the rapid creation of abnormal cells that grow beyond their usual boundaries, and which can then invade adjoining parts of the body and spread to other organs; the latter process is referred to as metastasizing (WHO 2015e).
Chronic respiratory diseases	Chronic respiratory diseases are chronic diseases of the airways and other structures of the lung e.g.: asthma, pulmonary hypertension, chronic obstructive pulmonary disease etc. (WHO 2015f).

In 2013 all NCDs accounted for nearly two thirds (35 million) of the 53 million deaths in the world. This statistic is a bigger burden on the low and middle income countries (LMICs). The LMIC accounts for the majority (80%) of all NCD deaths and 90% of NCD deaths before the age of 60 years old. As these countries possess less ability to respond to health issues the tendency to have to deal with an increasing risk of a double burden of diseases rises over and above that of the rate of communicable diseases. The WHO estimates that by the year 2020, deaths ascribed to NCDs will have risen by 15% globally with over 20% anticipated in the WHO regions of Africa, South-East Asia and Eastern Mediterranean (UNDP) 2013: 12).

Globally the dietary energy supply is 2881 kcal (12 054.10 kJ)/ capita/ day (FAO 2014b: 56). According to the 2014 World Health Statistics Report (WHO 2014a: 127), of the adults above the age of 20 years old in 2008 there were 10.0% of men and 14.0% of women that were obese in the world. However, there is also an issue of a double burden of malnutrition that the world is faced with. This can be described as the coexistence of undernutrition and overnutrition in the same population. In comparison to the rest of the world the prevalence of this has increased three times more in the LMICs over the last two decades (Raiten, Raghavan and Kraemer 2013: 72).

The relationship between the finances and social aspects of a population is impacted by NCDs. At the household level poverty and inequality may be worsened, whereby the burden falls on the women and girls of a society to become caregivers. Due to illness, disability or death there is a possibility of lost productivity and this causes a shift in the economic growth. It is possible, too, that household financial projections may have to be amended to accommodate the demands for healthcare. In the year 2011, 58.8% of governments' (globally) expenditures went towards the total expenditure on health (WHO 2014a: 150). India spent 39% on total health expenditure in 2004 of which 15.6% was spent on cardiovascular disease (CVD). Thailand in 2007 used 21% of total healthcare expenditure on in-patient curative health expenditure and in Mexico, 6.7% of total health expenditure in 2006 was for CVD, diabetes and obesity (UNDP 2013: 14). The UNDP highlights a few programmes that have been implemented across the world to aid in the fight against NCDs. Four examples are highlighted in table 1.2.

Table 1.2: International state/ country programmes implemented to curb non-communicable diseases (UNDP 2013).

STATE/ COUNTRY	PURPOSE OF THE PROGRAMME	INTERVENTION ACTIVITY
India	Reducing the risk of CVD	Worksite intervention programme on cardiovascular risk factors
Nauru and French Polynesia	To discourage excessive consumption of sugar	Tax on sugary beverages
Columbia	Creating environments to allow for active recreation	Urban interventions and physical activity promotion by creating exclusive access for pedestrians, cyclists, skaters and others for

Zambia	Limit intake of cheaply available alcohol	Ban on strong liquor sachets of tujilijili (containing a high percentage of alcohol)

It was reported by Mattei, Malik, Wedick, Campos, Spiegelman, Willet and Hu (2012: 1326) that the issue of the consumption of drinks that are made with sugar in developing countries is related to economic growth and adds to the global superfluous energy intake. It was for this reason that Naura and French Polynesia implemented taxes on sugary beverages in 2007 (UNDP 2013: 49).

Urbanisation is a major influence on the growth of NCDs, developing simultaneously and as fast as economic growth. Urbanisation has sparked the transformation of the amount of activity that people embark on, diet and also social structures in China (Gong, Liang, Carlton, Jiang, Wu, Wang and Remais 2012: 844). A programme similar to that implemented in 2010 in Columbia (see Table 1.1) could provide a possible means to counteract the effects of urbanisation. The implementation of the physical activity programme matches well with the WHO global target on NCDs. The WHO aimed at reducing physical inactivity by ten percent by the year 2025 (WHO 2014b: 33).

According to the WHO (2014b: 23) there seems to be a link between the excessive consumption of alcohol and deaths related to CVD, malignancy and ailments of the liver. Of all the fatalities globally in 2012, 5.9% were accredited to the intake of alcohol. A ban on tujilijili (strong liquor 'sachets', or small plastic containers, typically containing a high percentage of alcohol) was implemented to attempt to curb this burden in Zambia (UNDP 2013).

One of the global targets for non-communicable diseases is to diminish deaths from the four main NCDs by approximately one quarter by 2025 (WHO 2014b: 9). India ran its own intervention programme on CVD at job sites from 2003 to 2007 which yielded positive favourable results of biological and behavioural risk factors studied — weight, waist circumference, blood pressure, plasma glucose, total cholesterol, tobacco use and extra salt use in the intervention population (UNDP 2013: 47).

A more recent approach to promoting a healthier lifestyle was the development of the Ibero-American Nutrition Foundation (FINUT) Food Pyramid. According to Gil, Ruiz-Lopez, Fernandez-Gonzalez and de Victoria (2014: 364S) the tetrahedron pyramid is new and reaches

deeper into what has been required of guides promoting healthy lifestyles. The three dimensional FINUT pyramid aims to reduce the burden of NCDs around the world and especially in Latin America and includes: food and nutrition, physical activity and rest as well as education and hygiene facets.

Figure 1.2: FINUT pyramid food and nutrition dimension

The food and nutrition facet displays food-based guidelines and healthy eating habits including what should be consumed weekly or daily and occasionally. The recommendations are depicted in ascending order. The base of the triangle on the right hand side is concerned with hydration of the body. The second level depicts the recommended cereals for consumption. The third to seventh level shows fruit and vegetables; milk and dairy; olive oil and other oils; poultry, seafood, plant-based protein-rich foods; and cakes, sweets, red meat and animal fats respectively. The consumption of wine is not included because the pyramid is also directed at teenagers. The left hand side of the food and nutrition facet emphasizes good food habits and behaviour that favours environmental sustainability and healthy living. This may be achieved through practices within the home, buying choices and agricultural practices (Gil *et al* 2014: 361S).

Figure 1.3: FINUT pyramid education and hygiene dimension

Hygiene and education were included as factors that impact on healthy lifestyles. The right half of the triangle shows the importance of personal cleanliness of the body and home and the maintenance of food safety. These factors include ventilation, safe cooking, and playing and how room design can affect incidence of domestic accidents. Moreover there is a focus on reducing environmental pollution. It is essential also to protect children and make a commitment towards their education that would also help enhance social interactions leading to healthy behaviours. Road safety is also vital in preventing deaths as well as the availability of safe drinking water is a health issue. On the left side of the triangle emphasis is placed on people's contribution to the sustainability of the environment. Responsible use of water and energy resources is promoted. This encompasses transportation, carbon emissions and recycling of waste products (Gil *et al* 2014: 364S).

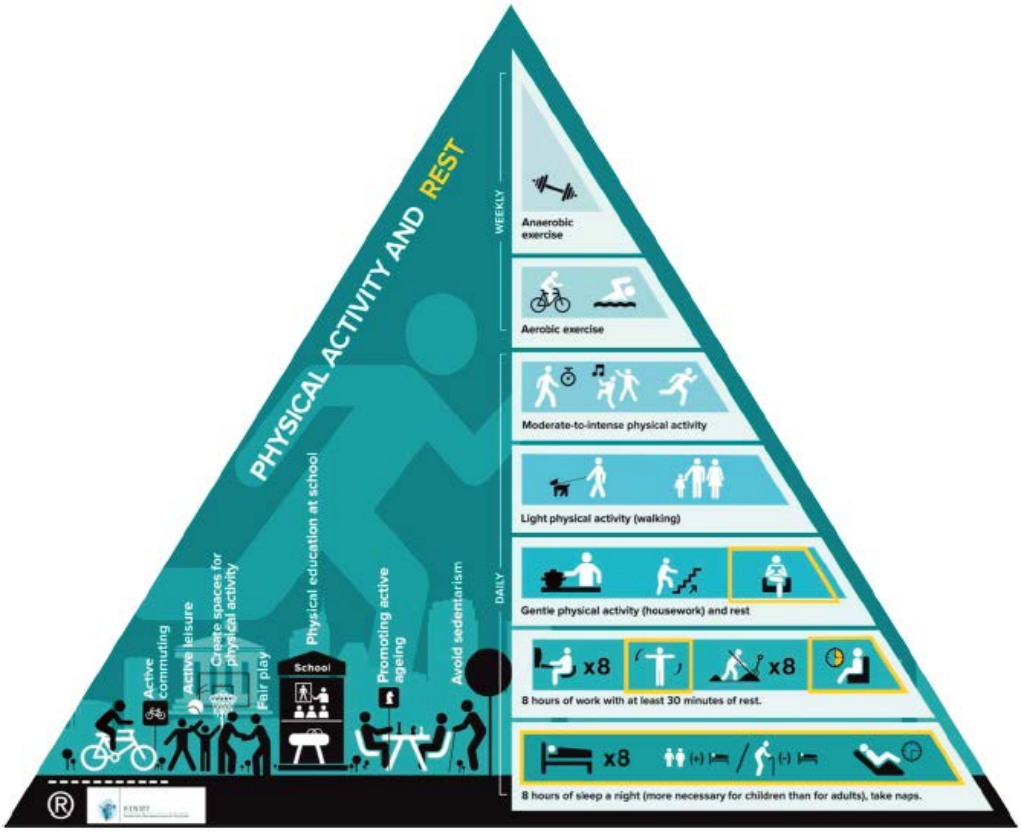

Figure 1.4: FINUT pyramid physical activity and rest dimension

Gil *et al* (2014: 363) illustrate rest and physical activity relation to a healthy lifestyle. On the right half of this triangle recommendations for frequency, duration and intensity are made. Factors of rest and physical activity included are sleep, rest periods, professional work, stretching, household activities and leisure periods. At the higher levels more intense activities are encouraged such as brisk walking, dancing and jogging. Higher up, sporting activity is incorporated and encouraged to be engaged in weekly. On the left hand side of the triangle, different environments conducive for various activities are depicted. The environments speak to the design of spaces for social interactions of any physical activity that may be sustained.

The FINUT pyramid is suited for everyone from adolescents to old age and includes a side of sustainability and environmentalism giving gauges that may assist in averting NCDs. The provision and instilling of sustainable diets is very important in light of the fact that the world population is expected to reach 9 billion by 2050. This has implications for the rising need for food to be accessible and reach everyone (Buttriss and Riley 2013: 402).

The WHO (2014b: 3) released the 'Global Status Report on Non-communicable Diseases' regarding the nine global NCD targets. The targets encompass the lessening of problems

pertaining to NCDs, alcohol consumption, lack of physical activity, salt/ sodium intake, diabetes and obesity and treatment. The purpose of the global NCD strategy is to prioritise the deterrence of NCDs in all regions from the national to the household level and enhance the ability of nations to deal with and respond accordingly and efficiently to the prevention and regulation of NCDs. The action plan aims to: decrease the number of modifiable lifestyle patterns that may threaten well-being, reinforce health systems, encourage and back the capability of countries to conduct worthy investigations and progress, and observe and evaluate changes and elements of NCDs. Similarly, the UNDP (2013: 18) suggests that there are NCD sensitive and NCD specific platforms to overcome the challenges of NCDs. Political dedication may assist the population's health issues and the development of policies through government. Responsible arrangements are required to monitor these policies and hold them to account. Divisions external to health such as schools and job sites also influence NCDs and can be utilised to enable realisation of the policies.

Trade policies also have major implications for developing countries much like the Pacific Islands nations. As much as barriers imposed on trade are not primarily focused on the health agenda, it is seen that trade agreements can allow access to a varied number of unhealthy products (Snowdon and Thow 2013: 151).

Friel, Hattersley, Snowdon, Thow, Lobstein, Sanders, Barquera, Mohan, Hawkes, Kelly, Kumanyika, L'Abbe, Lee, Ma, Macmullan, Monteiro, Neal, Rayner, Sacks, Swinburn, Vandevijvere and Walker (2013: 121) state that the nutritional status of a population can reap positive benefits through trade, cultivating the availability of food, access to it and the ability to buy it at affordable prices. It is also of significance to mention the impact that nutrition transition has on the environment. Also in light of the FINUT pyramid that emphasises the importance of sustainable environments in addressing NCDs. Furthermore, using the commodity (food) supply sheets of the FAO, Gill, Feliciano, Macdiarmid and Smith (2015: 3) explore dietary modifications of the nutrition transition against the bearing it has on the surroundings. Food balance sheets are tools that provide information on the food supply of commodities in relation to manufacturing, imports and stock changes, how food is used and values of supply per person per year in kilograms (FAO 2015a). The balance sheets serve as a means to assess the food and agriculture conditions of a country (FAO 2015b). There has been an increase in demand for vegetable oils and livestock products in Brazil, India and China. Land use is most impacted on and it was found that the impact of changing consumption habits

in one state may ignite environmental impact in another. The researchers suggest more value be put into the agricultural research on sustainable production of diverse crops to meet the needs of a nutritionally optimal diet (Gill, Feliciano, Macdiarmid and Smith 2015: 3).

The abovementioned variables of sustainable environments, trade, accessibility and availability of foods affecting the global adult population are not independent but over and above them there is still the continental and country landscape that poses further challenges to any community on the globe.

1.4 BACKGROUND TO THE HEALTH AND NUTRITION PROBLEM: AFRICAN PERSPECTIVE

According to Abrahams, Mchiza and Steyn (2011: 8) a study conducted in 40 Sub-Saharan African countries indicated that states with the highest nutrition transition scores were also likely to have relatively low infant mortality rates, stunting and underweight-for-age children. South Africa had one of the highest (six) nutrition transition scores in line with Ghana, Gabon and Cape Verde that scored a five per country. It was deduced that these states indicated a nation of people that are in the stage of nutrition related non-communicable diseases of the nutrition transition. NCDs that have been aligned to higher income countries are now present in developing countries too because of the rising industrial and technological advances, urbanisation, economic development and globalization. From the middle of the 90s economic standing on the continent of Africa has been improving with broad changes in economies, decreased inflation and economies being exposed to international trade. South Africa and Nigeria were the largest economies and led many states to build wise financial positions after 1995 (National Planning Commission (NPC) 2011: 84). According to the High Level Conference of Middle Income Countries of the United Nations Industrial Development Organisation (UNIDO: 2014), the World Bank uses per capita income to categorise countries. South Africa is regarded as an upper-middle-income country along with Angola, Algeria, Botswana, Gabon, Libya, Mauritius, Namibia and Seychelles. This is based on the average annual income per person of between $4,036 and $12,475 (approximately R48 420 to R149 700 based on a R12.00 US Dollar to ZA Rand exchange rate).

The AfDB (2011: 1) stated that the middle class is related to an exhibition of better governance within a country, economic expansion and the decrease of poverty and therefore policy makers

should be most interested in the middle class. The economic improvement in Africa has brought about the emergence of a significant middle class and a substantial decline in poverty. In consequence, there is a growth in the consumption expenditures because of this middle class. The middle class may play a pivotal role in balancing African economies towards being dependent on local demand and away from a hefty reliance on exports. Furthermore, Friel *et al* (2013: 121) explained that there is an international web of public-interest companies and researchers whose purpose is to check up on, set the standard for and support public and private sector workings. This is done to make healthy food environments and reduce obesity, NCDs and any existing incongruence. This web is known as the International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS).

Friel *et al* (2013: 121) also stated that public health issues have become significant in LMICs through the investment of transnational foreign companies in local food processing and retail sectors. This raises implications related to food labelling and advertising that could accelerate the nutrition transition towards NCDs. The African climate has seen a rise in food prices and Townsend (2015), in an interview for the World Bank, explained that the demand for food crops, erratic weather, trade policies, drought and export bans have been at the forefront of the food price increases. Africa especially is also affected because basic staples (maize, rice and wheat) make up 20% of the food eaten in Sub-Saharan Africa and furthermore, 45% of rice and 45% of wheat is imported in this region. This may lead to the need for populations to source cheaper foods or furthermore raises the need for urban agriculture.

Urbanisation has been increasing in Africa hence the growth of food manufacturing industries. Food brand names of Western origin have become popular and are seen as desirable status symbols. However, once again, the items are more expensive than what the average person can afford and not nutritionally ideal, too (Steyn and Mchiza 2014: 88). The African continent has an average dietary energy supply of 10 702.672 kJ (2558 kcal)/ per capita/ per day and food over-acquisition of 26.6% (FAO 2014b: 58). Consistently so, in a review study Steyn and Mchiza (2014: 91) also found that 15 countries in Sub-Saharan Africa had a dietary energy supply of over 10 460 kJ (2500 kcal) in 2009 from having fewer than 1800 kcal 30 years prior The gradual increase was said to have influenced the rise in obesity. However it is significant to bear in mind that consumer buying behaviours and consumption patterns; sedentary lifestyles and the food environment as a whole impact on the burden of obesity.

According to Ekpenyong (2015: 34), with Nigeria having gone through the highest population growth rate in the African continent, the spread of poverty has been affected and generally the main issue around how food is used is the health status of an individual. Iorlamen, Abu and Lawal (2014: 8750) also argue that in the case of Nigeria, too much focus has been put on rural food security and urban research neglected. The researchers highlight that increased rural-urban migration, scarce employment, heightened cost of living and poor economic structure could lead to food insecurity of urban households. In this study it was found that household size and income of the head of the house mostly influenced the food demand decision of a household.

Another study conducted on adults in Eastern Uganda revealed that overweight was predicated by the gender being female, living in a peri-urban area, having a higher socio-economic status and increasing age (Steyn and Mchiza 2014: 97). Delisle, Ntandou-Ousitou, Agueh, Sodjinou and Fayomi (2012: 1538) found that in a Benin study of rural and urban residents the BMI was higher at the urban site and especially for women. This is similar to the East Ugandan study. The more urbanised the area the less preventative the diet against chronic diseases. However, looking at the dietary transition it could be noted that the traditional diet was retained and combined with more 'westernised' foods in Benin. This was observed even in the main city of Benin where the diet consisted of traditional roots and tubers. In support of the findings in the Benin study Legwegoh and Riley (2014: 2) also reported in a Botswana and Malawi study that the Tswana (Gaborone) nation commonly consumed a diet comprised mainly of beef and cereal grains and the traditional urban diet in Blantyre (Malawi) is mainly a balanced meal of vegetables, grains and meat products. However, the two sites that were researched differ in terms of environment and political economy where Blantyre is considered low-income and Gaborone-middle income. So, although the environments differ, there are similarities in the BMI profiles.

The life expectancy rate in Africa is projected to reach 64 years by 2030, a seven year increase from 2010 (AfDB 2012: 3). The population is considered as young and has a growing work force which could be an advantage to capitalise on the demographic numbers of people that can work efficiently. HIV and AIDS and non-communicable diseases still pose great challenges on the mortality in Africa (AfDB 2014: 11) as also in South Africa. South Africa still has to manage domestic issues concerning health, poverty and economics and must benchmark progress in relation to the rest of the world under the prevailing governmental/ political, technological and social climate.

1.5 BACKGROUND TO THE PROBLEM: SOUTH AFRICAN PERSPECTIVE

South Africa has a population of about 54 000 000 of which adults (aged 19 years and older) make up 60.54% and is considered an upper middle income country and the second largest economy in Africa (StatsSA) 2015: 2- 3) with an overall adult literacy rate of 94.3% (CIA 2015), which may be integral in the dissemination and receipt of health messages or education.

Figure 1.5: Map of South Africa showing the nine provinces

According to Labadarios, Dhansay and Hendricks (2008: 111-113) the KwaZulu-Natal (KZN) province was the second highest (16.4%) contributor to the South African economy in 2006 and it also had the second highest (16%) personal share income. KZN is the second most populated province with a population of 19.8% (n=10 267 300) of the country's total population. According to the General Household Survey 2011 (StatsSA 2012a: 15) the adult literacy rate in KZN is 91.4%. There are 2.5 million households in the province with 34% of people residing in the eThekwini district (the largest municipality in KZN). The 2011 Census

results indicate that 174 228 people migrated to KZN mainly coming from the Eastern Cape Province (StatsSA 2014a: 40). Socio-economic factors cannot be discussed independently of class categories. According to the definitions provided by StatsSA (2009: 3) and the Bureau of Market Research of the University of South Africa (UNISA) (2011) it is significant to highlight that the community (Ward 84 of the EThekwini Municipality in KZN) being investigated has been recognised as an emerging middle income and/or middle class community.

The South African National Planning Committee (NPC) stated that the population growth rate of South Africa is slowing, birth rates are declining and life expectancy is increasing. It seems there is now a significant youth and working-age population, also known as the 'sweet spot'. The SA demographic state resembles that of other middle-income countries such as Brazil, Mexico, India and the Maghreb states (NPC 2011: 98). It has been suggested that the main challenge would be about having to provide jobs for this working-age population. This needs to be achieved before 2030 as the age group of 64 year olds and above will begin to place the SA economy under stress (NPC 2011: 100).

South Africa, like many other developing countries, is making a rapid shift from receding famine towards a dietary pattern of nutrition related chronic diseases of lifestyle (NR-CDL). The shift is, however, occurring faster than the eradication of undernutrition. This is therefore why the country is suffering from what is termed as a double burden of malnutrition and this poses substantial challenges for policy makers. Consideration should be given to counteracting factors contributing to the movement from receding famine to NR-CDL and to encourage those responsible for the pattern of behaviour change (Vorster and Bourne 2008: 240). The latest statistics on the nutritional status of the country have been reported from the South African National Health and Nutrition Examination Survey-1 (SANHANES-1) of 2013 and provide an overview for the basis of intervention programmes and policy formation. The following section will highlight a few of the relevant statistics which will be discussed in more detail in the second chapter of this dissertation.

SANHANES-1 and related statistics

The SANHANES-1 included people of all age groups living in households in South Africa. Questionnaires were administered in interviews and health measurements done through

clinical assessments. A total of 25 532 individuals in 8 166 households participated in the study (Shisana, Labadarios, Rehle, Simbayi, Zuma, Dhansay, Reddy, Parker, Hoosain, Naidoo, Hongoro, Mchiza, Steyn, Dwane, Makoae, Maluleke, Ramlagan, Zungu, Evans, Jacobs, Faber, and SANHANES-1 Team 2013: 2).

According to Shisana *et al* (2013: 3) it was found that adults younger than 55 years old had relatively higher levels of educational attainment; however, there were no significant differences in gender comparison. About two thirds (62.4%) of the men were reported to be physically fit as compared to 42% of the women.

Steyn and Labadarios (2008: 304) attest that many of the non-communicable diseases encountered in South Africa can be ascribed to a BMI of 21 kg/ m^2 and in SANHANES-1 it was found that BMI seemed to increase with age in both genders. Men had a mean BMI of 23.6 kg/m^2 and women 28.9 kg/m^2. The prevalence of overweight and obesity was much higher in women than in men (24.8% and 39.2% compared with 20.1% and 10.6% for women and men respectively). Age groups of 45-54 years old and 55-64 years old had higher mean BMI (Shisana *et al* 2013: 9).

Almost ten percent (9.8%) of men had a waist circumference (WC) of 102 cm or more, while slightly more than half (50.8%) of the women had a WC equal to the cut-off point of 88cm or more. The highest prevalence of increased waist circumference (WC) was found most in males aged 45-54 years old and in females 55-64 years old (Shisana *et al* 2013: 10). This measurement is important as the waist circumference measurement is also used as an indicator of body fat distribution (Senekal, Mchiza and Booley 2008: 489).

According to Shisana *et al* (2013: 135) the prevalence of underweight and normal weight was significantly higher in males than females (12.8%and 56.4% compared to 4.2% and 31.7% for males and females, respectively in the SANHANES- study. The prevalence of obesity in women from different race groups was found to range between 48.9% and 58.5%. The prevalence of overweight and obesity was significantly higher in females than males (24.8% and 39.2% compared to 20.1% and 10.6% for females and males, respectively). Females living in urban formal areas had the highest mean BMI (29.4 kg/m2), as well as the highest prevalence of obesity (42.2%). This exhibits an increased risk of metabolic complications associated with NCDs. According to the mortality and cause of death report by StatsSA

(2017: 27) there has been a rise (52.9 to 55.9%) in deaths from non-communicable disease between 2013 and 2015.

The South African NPC reported that 25% of the country's spending on health is dedicated to combating and treating cardiovascular diseases (CVD). The WHO approximations suggest that non-communicable diseases have contributed to 28% of SA's total disease burden. It is also most probable that CVDs will be an increasing, if not the leading, cause of death by 2030 (NPC 2011: 330).

The participants of the National Health and Nutrition Survey-1 were asked to answer general nutrition questions and the overall scores amounted to 5.3 out of 9. Knowledge increased with age and was best in the age group of 45-64 years. The nutrition knowledge score was higher for participants dwelling in the urban formal areas. The black population had significantly lower scores (5.1) in comparison to other race groups that scored 5.8, 5.5 and 5.7 among the white, coloured and Indian populations respectively (Shisana *et al* 2013: 178). The current nutritional situation of the South African population is obviously affected by other factors which will be discussed further in the literature following.

In South Africa the consumer food environment is highly affected by the growth of huge enterprises that lead the food and drinks industry. This growth has implications for healthy or unhealthy diets (Igumbor, Sanders, Puoane, Tsolekile, Schwarz, Purdy, Swart, Durão and Hawkes 2012: 2). The term 'big food' is used to describe these multinational and national commercial companies (including retail supermarkets) that direct some elements of the food and beverage environment (e.g. labelling and advertising). The research indicates that more than half (51.8%) of sales in SA comes from the 10 largest 'packaged food' companies. Some examples include: Tiger Brands Ltd, Unilever Group, Parmalat Group, Nestle SA and Clover Ltd. Igumbor *et al* (2012: 4) illustrate that the aim of 'big food' is to facilitate the alteration of the consumer foods consumption market through availability, affordability and acceptability of products. As much as big food has led to a surge in packaged foods and consequently unhealthy food, too, strategies have been developed as part of Corporate Social Responsibility to involve optimum health input. In light of the 'Big Food' it is also relevant to match it with the price tag attached to other food commodities available to consumers. For instance, according to the National Agricultural Marketing Council (NAMC) (2015: 1-7) the food and non-alcoholic beverage inflation rate was 6.5% in January 2015, which was 2.5%

higher than the overall national inflation rate. Interestingly though, rural areas were found to pay more for certain foods than urban areas. In January 2015, 1 litre of long life milk cost R0.56 more, a loaf of 700g white bread was R1.11 more and 5kg maize meal was R1.24 more expensive in the rural areas. Generally, the food categories that showed the most inflation, however, were fruit, dairy, eggs, coffee/tea, animal products and bean products with inflation rates of 14.5%, 13.6%, 10.7%, 9.3%, 8.0% and 5.3% respectively. It was, however, mentioned in the NAMC summary that lower fuel prices that had been projected may have a desirable effect on food costs but will not last long. Affordability is a cause for concern for the many communities of South Africa (NAMC 2015: 9). Furthermore, it must be noted that there have been recent developments in South Africa regarding the tax on sugar and salt regulations which will have an impact on nutrient intake.

Fanta and Upadhyay (2008: 1793) conducted an empirical study into the effects of economic growth and its effects on poverty. It was found that economic growth does aid in easing poverty especially with higher levels of development. However, should income distribution be unequal the opposite occurs. It is then of significance to look at the earnings and expenses of the South African people. According to the Income and Expenditure report of 2011, black people occupy approximately three households (HHs) (76.6%) for every four HHs of the total households in SA; whites occupy 12.4% of the households, coloureds 8.5% of the HHs and Indians/ Asians occupy 2.5% of the HHs. Households with three, four and five occupants spent 11.2%, 11.0% and 17.4% of their income respectively on food and beverages (StatsSA 2012b: 12). For the Black (R10 545), Coloured (R16 049) and Indian/ Asian (R13 282) population groups, food and beverage consumption was rated as the second highest consumption of the household after the housing, water and electricity category. In the White HHs, food and beverage consumption of R20 133 per annum was the fourth highest consumption item by the household head. The consumption of food and beverages was surpassed by the category of firstly, housing, water and electricity, secondly transport, and thirdly miscellaneous goods which is made up of personal care, jewellery, insurance, financial services and social protection services (StatsSA 2012b: 102). In South Africa the average annual household income generally increased to R119 542 in 2011 from R102 401 in 2006. Even though the population is generally becoming wealthier, income inequality is still evident across and within the population (StatsSA 2012b: 5).

In light of these issues and the current landscape in the various settings detailed in chapter one it is pertinent to keep in mind the rising prevalence of an undesirable nutritional status of the population. On the positive side, the country is venturing out economically into foreign markets and collaborations such as the BRICS (Brazil-Russia-India-China-South Africa) movement (to be detailed in chapter two) which is yet to show results, and this indicates South Africa has a working age population, availability of resources of agriculture, improved education and an emerging middle income group that could change the future of the nation.

There is still a lack of nutritional status and food intake statistics in South Africa. In table 1.4 studies carried out in the last 10 years in SA, relating to the nutrient and food intake, socioeconomic status and dietary patterns among adults (19 years +) are summarised. The table aims to provide information on various studies that have been conducted to advise future interventions. Furthermore viewing what is known may assist also to identify gaps where further research may be conducted. A focus is not placed on only anthropometric studies however more specifically the lack of studies investigating socio-economic developments affecting the nutrition transition.

Table 1.3: Studies conducted in the last ten years on South African adults

Author and reference	Study population	Measuring Instrument	Summarized results
Cois and Ehrlich (2014) Analysing the socioeconomic determinants of hypertension in South Africa: a structural equation modelling approach.	15 574 adults 15 years old and over from a sub-sample of the first wave of the National Income Dynamics Survey (NIDS)	Longitudinal panel survey Interview and measurements of anthropometric data and socio-demographic variables Blood pressure and resting heart rate Use of anti-hypertension medication was assessed by asking subjects if they were currently taking treatment for high blood pressure.	After adjustment for age, race and antihypertensive treatment, higher education and income were each found to be associated with higher diastolic blood pressure in men. In women higher education predicated lower values of both diastolic and systolic blood pressure while higher income predicated lower systolic blood pressure. In both genders, body mass index (BMI) was a strong indicator of an adverse indirect effect of socioeconomic status on blood pressure.
Shisana, Labadarios, Rehle, Simbayi, Zuma, Dhansay, Reddy,	South African population, all individuals living in	Survey by use of questionnaires, clinical	• Ages between 15-55 years had higher levels of education attainment.

Parker, Hoosain, Naidoo, Hongoro, Mchiza, Steyn, Dwane, Makoae, Maluleke, Ramlagan, Zungu, Evans, Jacobs, Faber and SANHANES-1 Team (2013) South African National Health and Nutrition Examination Survey (SANHANES-1). Cape Town: HSRC Press.	occupied households (25 532 individuals)	examinations, tests and biomarkers	• The participants were found to have a mean BMI of 28.9 for women and 23.6 for men. • Almost ten percent (9.8%) of the men exceeded the 102 cm waist circumference cut-off point. More than half of the women exceeded the 88 cm waist circumference cut-off point. • The average dietary diversity score was 4.2. • Males that did not do grocery shopping amounted to 54.4% of the participants.
Van Zyl, Van der Merwe, Walsh, Groenewald, Van Rooyen (2012) Risk-factor profiles for chronic diseases of lifestyle and metabolic syndrome in an urban and rural setting in South Africa.	499 rural and 387 urban households amounting to 694 rural and 565 urban participants (adults between the ages of 25 and 64 years and children).	HH socio-demographic and health information, diet, risk factors and habits were determined. Adult participants undertook anthropometric evaluation, medical examination and blood sampling.	Self-reported hypertension and physical inactivity were ranked the highest risk factor for the rural and urban groups respectively. 40.1% of the rural and 34.4% of the urban study population had three or more risk factors for chronic lifestyle diseases. In addition 52.2% of rural and 39.7% of urban participants had three or more risk factors for metabolic syndrome.
Steyn, Nel, Parker, Ayah and Mbithe (2012) Urbanisation and the nutrition transition: a comparison of diet and weight status of South African and Kenyan women.	Women aged ≥15 years (*n*=1008) were assessed in Kenya. Demographic and Health Survey (DHS) of women in South Africa (n=4481).	Weight, height, and waist and hip circumferences were measured and 24-hour dietary recall was administered. Dietary intake of South African women was based on secondary data analysis of dietary studies using the 24-hour recall method.	In South Africa, 27.4% of women had a BMI ≥30 kg/m2 compared with 14.2% of Kenyan women. For both countries the highest prevalence of BMI was found in women in urban areas. BMI and abdominal obesity increased with age. The nutrient mean adequacy ratio (MAR) of the South

			African rural diet was lower than those of the Kenyans' diet (55.9; 57.3%, respectively). Dietary diversity score (DDS) and food variety score (FVS) were significantly lower in South African rural women compared with Kenyans.
Stern, Puoane, Tsolekile (2010) An Exploration into the Determinants of Non-Communicable Diseases Among Rural-to-Urban Migrants in Peri-urban South Africa.	45 women and 10 men who had lived in Khayelitsha for <5 years or less	Qualitative study using in-depth interviews, participatory reflection and action groups and focus group discussions.	Changes in eating patterns and physical activity were a result of socioeconomic and environmental limitations. Respondents were not concerned about these changes as they were pleased with their urban lifestyle regardless of adversities experienced. Weight gain appeared to symbolise dignity and respect, therefore was well accepted. Participants who attended health clubs found them informative and socially and emotionally supportive.
Malhotra, Hoyo, Østbye, Hughes, Schwartz, Tsolekile, Zulu and Puoane (2008) Determinants of obesity in an urban township of South Africa.	107 males and 530 females, aged ≥ 18 years.		The prevalence of obesity was 53.4% and 18.7%, and that of abdominal obesity was 71.5% and 23.4%, among women and men respectively. Female gender and being married were associated with a high BMI and large WC. Recent migration was associated with a smaller WC. The level of physical activity was not associated with BMI or WC.
Thandi Puoane, Princess Matwa, Hazel Bradley and Gail Hughes (2006)	32 men and women (6 for in-depth interviews, 26 for focus group discussions)	This was a qualitative study with an exploratory research design.	• Important events and ceremonies are always accompanied by food specifically prepared for the

Socio-cultural Factors Influencing Food Consumption Patterns in the Black African Population in an Urban Township in South Africa.	The participants were made up of a subset of men and women who participated in a cross-sectional study, designed to collect data on the prevalence and risk factors for CVDs in the black population living in Khayelitsha in Cape Town, South Africa.	Data were collected by conducting focus group discussions.	occasion. • The consumption of traditional food was associated with poverty. • The population associated meat with high socio-economic standing and therefore tried to consume it daily. • There was a marked tendency to increase consumption of high protein foods as family income increased .
Charlton, Steyn, Levitt, Zulu, Jonathan, Veldman, Nel (2005) Diet and blood pressure in South Africa: intake of foods containing sodium, potassium, calcium, and magnesium in three ethnic groups.	325 black, white, and mixed ancestry hypertensive and normotensive subjects	Three repeated 24-hour urine samples were collected for assessment of urinary sodium and three corresponding 24-hour dietary recalls were administered. Blood pressure and weight were measured. Secondary analyses were performed on existing dietary databases obtained from four regional surveys.	Mean urinary Na excretion values equated to daily salt (NaCl) intakes of 7.8, 8.5, and 9.5g in black, mixed ancestry and white subjects, respectively. Between 33% and 46% of total Na intake was discretionary. Bread was the single biggest contributor to non -discretionary Na intake in all groups. More than 70% of total non-discretionary Na was provided by bread and cereals in rural black South Africans compared with 49% to 54% in urban dwellers. Black subjects had particularly low intakes of calcium.
Labadarios, Swart, Maunder, Kruger, Gericke, Kuzwayo, Ntsie, Steyn, Schloss, Dhansay, Jooste, Dannhauser, Nel, Molefe, and Kotze, (2005)	The survey population consisted of all the children aged 1–9 years (12–108 months) and women of reproductive age (16–35 years) living in the same HH in South Africa, 107 of which were urban-formal, 23	Socio-demographic Knowledge, Attitude and Behaviour questionnaire (KAB), Food Procurement and HH Food Inventory and Hunger Scale	• Almost half of the HHs were headed by males (father, husband). • More than one in two HHs (55%) had a monthly income of between R1–R1000 with urban informal HHs reporting the highest percentage of

National Food Consumption Survey - Fortification Baseline (NFCS-FB-I): South Africa. Directorate: Nutrition, Department of Health. Pretoria.	were urban-informal, 15 were rural-formal and 81 were from tribal areas.	Anthropometric measurements Blood and urine samples were taken to assess micronutrient status. Samples of tap water and maize were collected and tested for iodine and vitamin A respectively, the latter at the HH level.	no income (6%) as well as an income of R1–R500 (35%). • Nationally eight out of ten women respondents included in the survey had a sound to very good basic nutrition knowledge score on vitamins and minerals, except for iodine • The most popular bread products consumed in the country were vetkoek followed by steamed bread.

1.6 RATIONALE AND MOTIVATION

The South African population is shifting away from a traditional and rural lifestyle to a more urban and modern lifestyle with about 60% of the population now living in urban areas (WHO 2011). For this reason, nutrition is also evolving in terms of eating patterns, intake of nutrients, physical activity, and socioeconomic and education levels. In consequence the abovementioned variables make an impact on the nutritional status of the nation as a whole (Vorster 2010: 2). Other factors that may influence dietary patterns are the literacy and education levels of a population which enable consumers to read and understand food labels and other nutrition information that may be communicated.

It may be safe to assume that if socioeconomic status is increasing in the South African communities then, in effect, wiser food consumption choices should be made. However, Temple and Steyn (2011: 506) noted that the cost of a 'healthy' diet in South Africa is not particularly ideal. The researchers found that foods that are generally energy dense cost much less than healthier foods that provide nutrient density but not energy. A comparison of typically eaten foods was conducted to evaluate cost against the energy density of a food. The study states that the taste of less healthy food is preferred due to its energy density and the motivation to buy healthier food is insignificant because cost is a contributing factor to South Africans' food choices.

Reports have indicated that lower socioeconomic classes have the highest rates of overnutrition in developed countries (Williams, Germov and Young 2011: 719). However, in observing that South Africans are upwardly mobile in terms of socioeconomic class, the nutritional implications of this trend of upward mobility also need to be investigated. The factors of the relationship between socio-economic class and malnutrition will be discussed in detail in chapter 4 discussions.

Faber and Wenhold (2007: 396) forecasted that overnutrition would become more common in urban areas than rural areas and attributed a continual rise of this trend to the fact that South Africans are adopting more westernised food behaviours. Pretorius and Sliwa (2011: 179) characterise a 'Westernised diet' as being more energy dense and having more salt and saturated fat and sugar, hence the risk of lifestyle diseases such as cardiovascular disease, diabetes and hypertension is high. According to Pretorius and Sliwa (2011: 179) in a study in Soweto – another township of South Africa – it was also expected that lifestyle diseases would emerge due to the increased consumption of processed and convenience foods that did not previously feature in the diet of Sowetans. It is important then to develop the promotion of healthy food consumption taking into consideration what is available and affordable to the study population (Pretorius and Sliwa 2011: 178).

Umlazi Township

This study was conducted in Umlazi, previously part of the Vumengazi tribal area (United Nations Human Settlements Programme 2007: 10). The township was established in 1845 during the British colonization (eThekwini Municipality 2016). It became a dormitory town for people who had been moved from the central (urban) regions during the government's enforcement of apartheid (United Nations Human Settlements Programme 2007: 10). Under the apartheid government it was established as a black township and many of the residents of Cato Manor that were displaced through the forced removals of 1967 ended up in Umlazi (eThekwini Municipality 2016). These forced removals occurred also in other areas such as Sophiatown in Johannesburg and District Six in Cape Town. Mainly black people were driven out far away from work places and into secluded locations (Michigan State University 2016). According to COGTA (2009: 6) townships were also labelled 'locations' which have historical implications in terms of socioeconomic status and the way people perceive them and function within them. Umlazi is now the biggest township in KwaZulu-Natal (eThekwini Municipality

2016) with the surrounding (predominantly Indian occupied) areas being Isipingo and Chatsworth (United Nations Human Settlements Programme 2007: 10). The township is now also a tourist attraction due to its infrastructure upgrades since the 1994 democratic liberation (eThekwini Municipality 2016).

Emerging middle income community (Ward 84)

Ward 84 of Umlazi is the area that was selected as the study population and it will be profiled in detail in Chapter 3 - Methodology.

A situational analysis of the nutritional status and food intake patterns of the adults in Ward 84 Umlazi was conducted and recommendations made to advise future research and interventions.

1.7 RESEARCH AIM AND OBJECTIVES

The main aim of the study was to determine the socio-demographic profile, investigate the food intake and nutritional status among adults (+19 years old) in an emerging middle income community in Umlazi. The outcomes of the research will aid in the collation of suggestions for possible intervention strategies and educational programmes to enhance the nutritional status of this community to optimal levels.

1.7.1 Specific research objectives

This research aims to investigate the nutrition status and food consumption patterns of black emerging middle income adults in a township. Correlating the socio-demographic data, food intake and nutritional status may provide insight into the nutritional profile of this group of black South African adults. This profile could advise the development of suitable guidelines to promote the modification of food habits.

The specific objectives of the study were to:

- Determine the socio-demographic profile of adults by means of a Socio-Demographic Questionnaire
- Determine the BMI and waist circumferences of participating emerging middle income adults by taking anthropometric measurements.
- Assess daily food intake by use of two weekday 24-hour recall questionnaires and one weekend day 24-hour recall questionnaire.
- Establish food variety scores and food group diversity by means of a Food Frequency Questionnaire.
- Formulate recommendations for the improvement of the nutritional status of the study population.

1.7.2 Framework of the study

The framework of the study is represented by Figure 1.6.

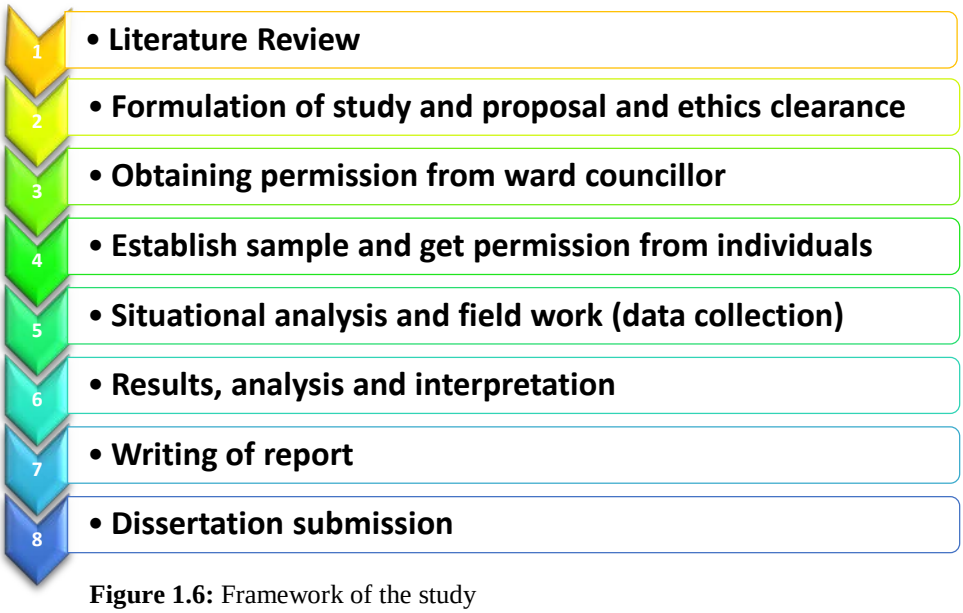

Figure 1.6: Framework of the study

1.8 STRUCTURE OF THE DISSERTATION

An overview of the dissertation is represented in Figure 1.3 which depicts a summary for each chapter.

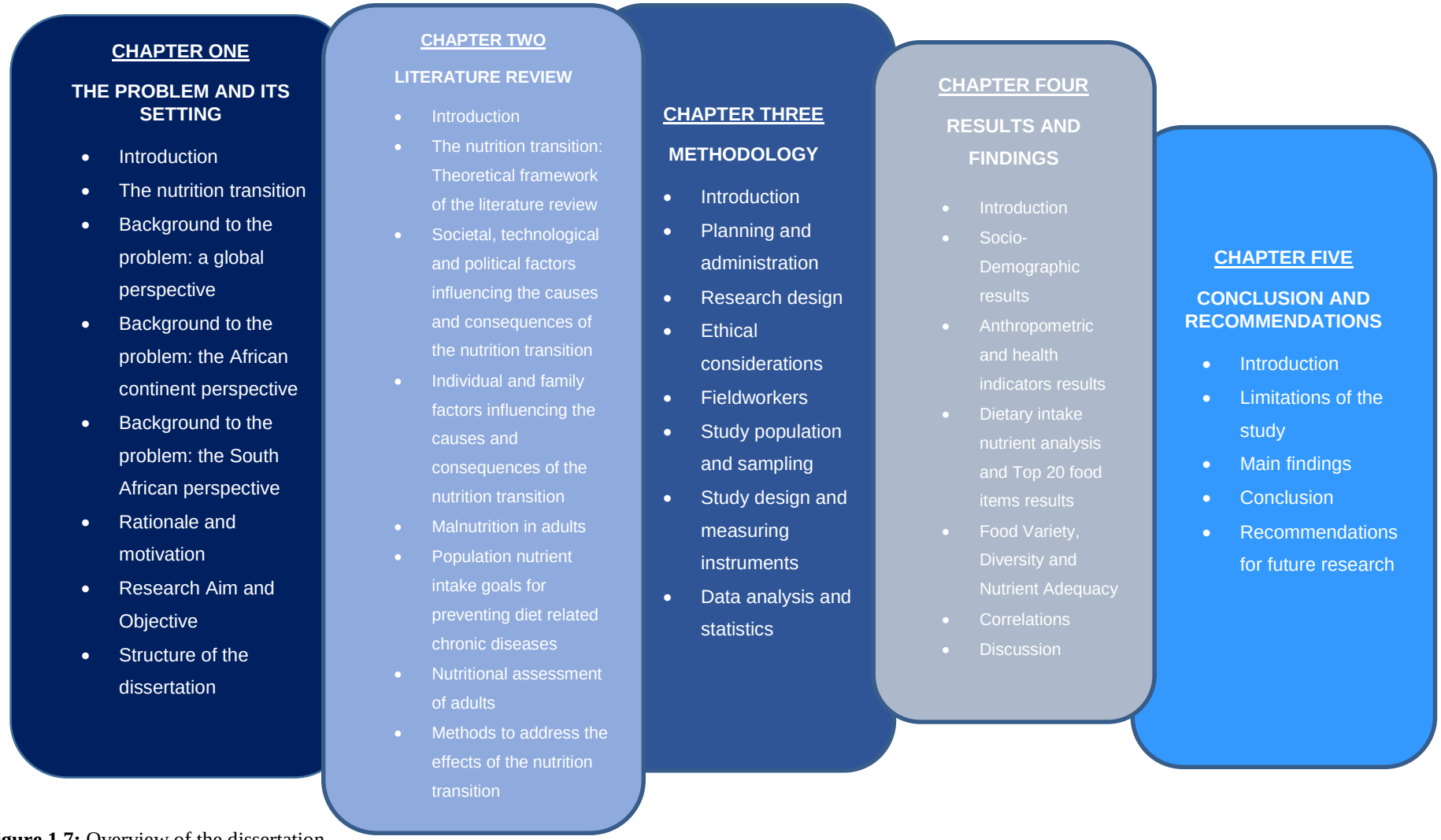

Figure 1.7: Overview of the dissertation

1.9 CONCLUSION

The research is a situational analysis and descriptive study. The dissertation includes five chapters, namely: Chapter One – The problem and its setting, Chapter Two – Literature review, Chapter Three – Methodology, Chapter Four – Results and findings and Chapter Five – Conclusion and recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Adults (15 to 64 years old) make up approximately 65.88% of the 7 billion people in the world with most (40.98%) being aged between 25 and 54 years (CIA 2016). The world population is estimated to increase by more than one billion people within the next 15 years, reaching 8.5 billion in 2030, and to increase further to 9.7 billion in 2050 (United Nations 2015). The growing population has major implications for land use, food systems, healthcare and the wellbeing of civilisation especially in developing countries.

The concept of a 'nutrition transition' may be defined as the changes in dietary patterns and nutrient intakes. This change occurs in individuals, families, groups of people or whole populations when the food environment and other circumstances change (Vorster and Bourne 2008) and comprehending this issue is vital in designing a plan to prevent obesity and its impediments in the developing world (Popkin 2004: S140). The most challenging part of conducting food consumption surveys is how researchers and stakeholders keep up with the changing supply of food, getting information on foods added at the table, and capturing information on food eaten outside of the home (Vandevijvere, Monteiro, Krebs-Smith, Lee, Swinburn, Kelly, Neal, Snowdon and Sacks 2013). The availability of food intake data is important in advising food and nutrition policy development. Popkin (2004: S140-S143) made claims that shifts in diet, activity and body composition appeared to be occurring at a much faster rate. Secondly, it could be that biological factors and social structuring affect BMI-disease patterns. This would also bring into discussion the prevalence of previous disease patterns. Lastly, the problem of low physical activity, diets poor in nutrients and obesity is becoming prominent in poor communities. According to the WHO (2015a: 133) there was a decrease (15%) in mortality rates caused by NCDs between 2000 and 2012 although declines appeared more in high-income countries. The SDGs target for NCDs will need interventions to deal with ageing populations, quick, unplanned urbanisation and globalisation of markets.

The main objective of this chapter is to provide a holistic map of the situation influencing food patterns especially among adults by reviewing past literature. A conceptual framework informed by Popkin's theory is used to illustrate factors influencing the causes and consequences of the

nutrition transition. The research study will delve into the topics presented in the nutrition transition theoretical framework Figure 2.1 below.

2.2 NUTRITION TRANSITION: THEORETICAL FRAMEWORK OF THE LITERATURE REVIEW

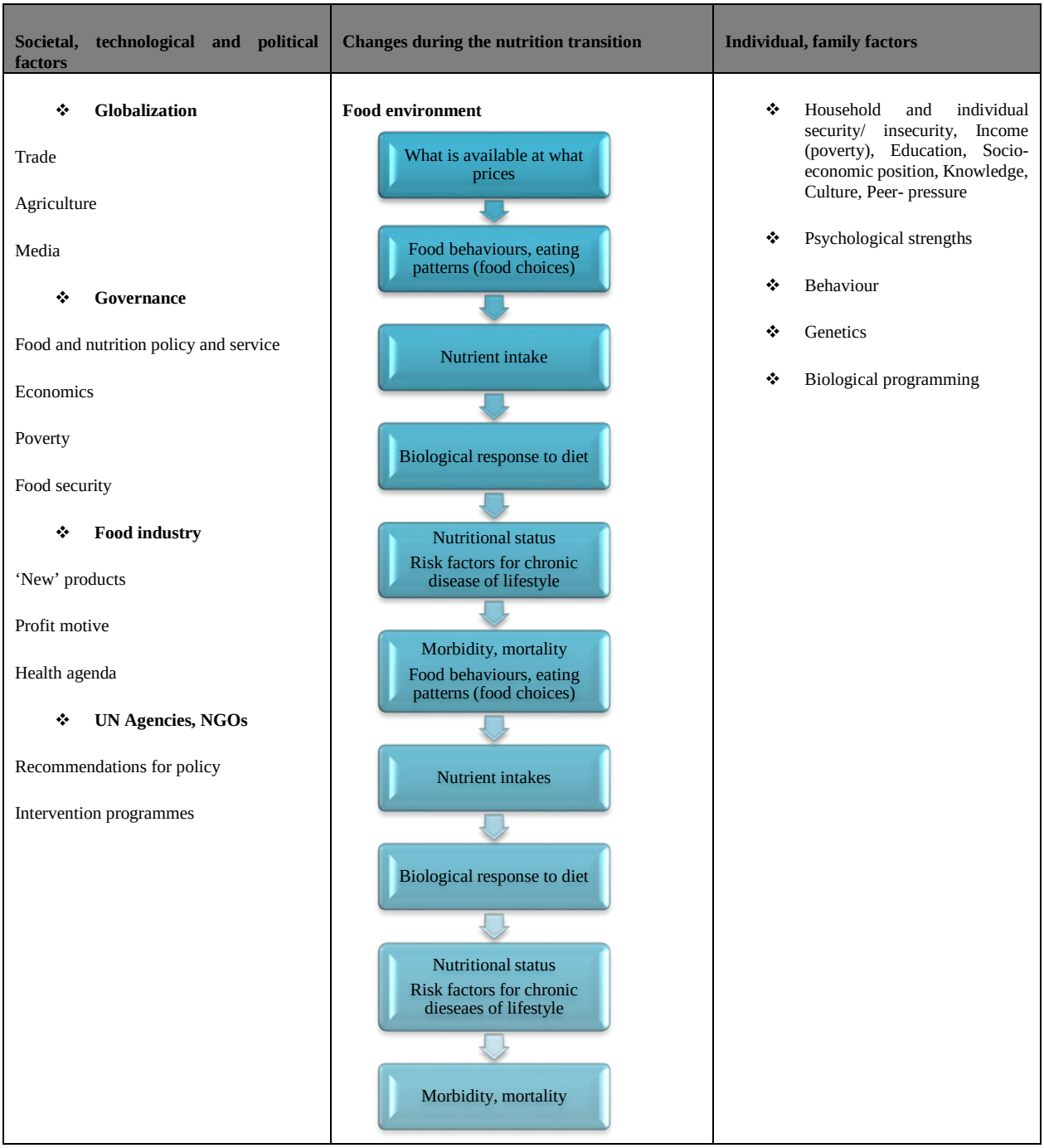

Figure 2.1: Theoretical framework to illustrate the factors influencing the causes and consequences of the nutrition transition (Vorster and Bourne 2008: 235).

Figure 2.1 shows the shifts linked with the nutrition transition ranging from technological, social and governmental factors to singular or familial factors. To better understand the issues highlighted in the framework, chapter two aims to further address and discuss extensively factors informing food choices and response to transitioning diets.

Advances in technology have played a pivotal role in world globalization. Avenues have been opened for economies, markets and individuals to trade. Media and the influence of the food industry have made efforts to make food environments accessible and provide a variety of food at all times of the year. However, poverty, wars and governmental administration could also have a detrimental influence on the benefits of globalization (Vorster and Bourne 2008: 236). The response to apparent changes associated with moving from a traditional diet to a western one are still being studied more in depth although it has been proven in many ways that a 'westernised diet' increases the risk of nutrient related chronic diseases of lifestyle. The phenomena of genes and biological programming also have implications for the formation of nutrition policies and interventions.

There is now a food environment whereby a wide range of palatable products of good quality, both healthy and not so healthy, are available at low cost and throughout the year. It is suggested that this environment has been enabled through globalization of countries, markets, economies, multinational companies and individuals together with international trade agreements, changes in agriculture, the influence of the food industry and the media. Disparity in trade policies and governance, civil unrest and poverty, however, remain as the major factors preventing globalization from reaching the poor in most developing countries. As the food industry is the main promoter of palatable foods, mainly high in sugar and fat, it is noted that efforts are now being made to embrace health in the creation of new functional foods. It is also significant that the marketing efforts be ethically principled and preferably governed and supported by legislation. The nutrition transition is rarely independent of a demographic transition as well as an epidemiological shift. It is commonly affiliated with urbanisation, modernization and acculturation. Urbanisation is the process of a population moving from rural to urban areas. Modernization is the adoption of a more 'westernised' lifestyle and acculturation may be defined as what happens when people leave traditional cultures and adopt a new lifestyle and belief system. Most importantly, it is the way in which people respond to these changes that ultimately influences

their health status (Vorster and Bourne 2008: 234). To further conceptualise the nutrition transition it is divided into stages of distinct patterns to assist in identifying the relevant strategies to be administered in the response against changing diets.

Stages of the nutrition transition

The progression of the nutrition transition may provide perspective into the past situation affecting the current landscape and advise future plans to deal with the global phenomenon. The stages of the nutrition transition are distinguished into five patterns.

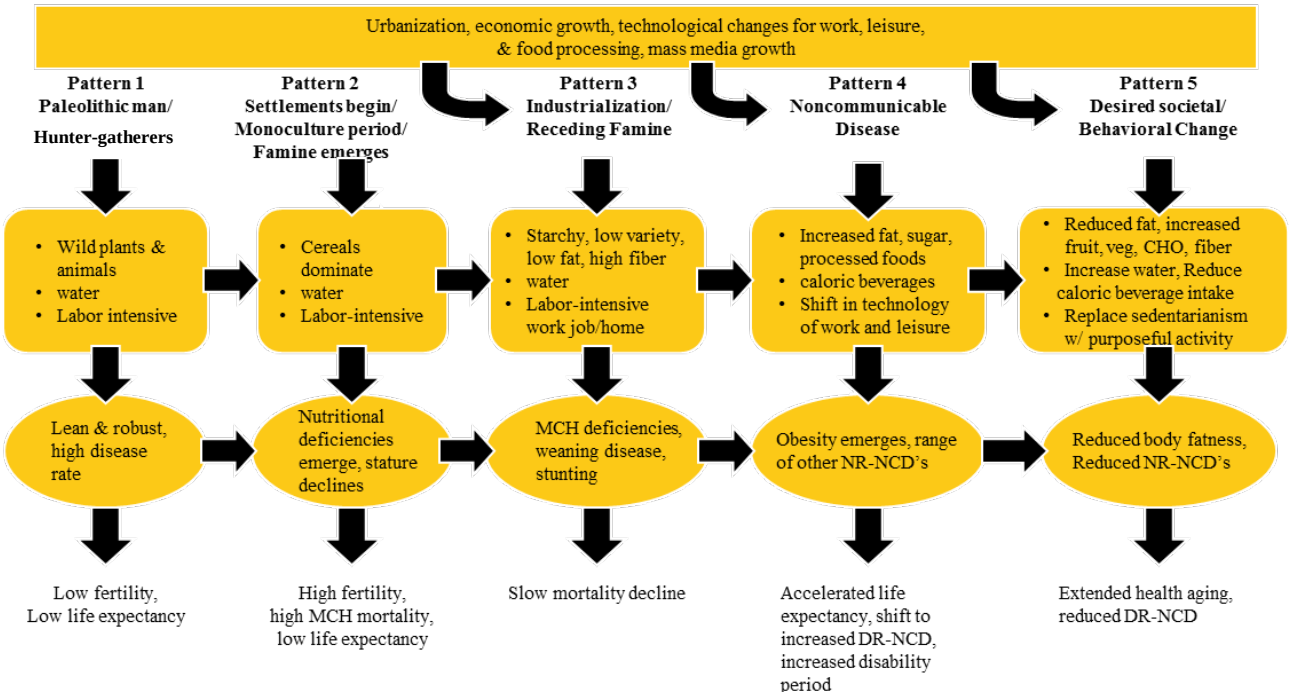

Figure 2.2: Stages of the nutrition transition (Popkin 2003: 582)

Pattern 1 is characterised by the nature of having to collect food that yields a diet high in carbohydrates and fibre and low in fat. Physical activity pattern is high and these populations experience the least prevalence of obesity. In Pattern 2 dietary variety is low and a stage of famine may set in caused by nutritional stress and decrease in stature. It is said that at the later stages of this pattern social segregation is emphasised and differing diets are determined by social status. The pattern of receding famine is the 3rd stage of the nutrition transition. It is the stage where fruit and vegetable consumption is increased and less significance is placed on starchy staples. Physical activity is seen to decrease and more people lead sedentary lifestyles. Populations undergoing Pattern 4 present with diets high in fat, sugar and refined carbohydrates

that become easily available at low cost and with a further reduction in physical activity. This pattern is characteristic of most high-income communities and is affecting lower income populations too. This is known as the stage of the development of non-communicable disease as the prevalence of obesity escalates further and impacts degenerative diseases. Behavioural change is the desired stage and the 5th pattern of the nutrition transition. The emergence of a new, prudent, healthy dietary pattern based on scientific knowledge of the relationships between diet and health, as well as the benefits of increased physical activity are practiced. These changes occur because of the need to prolong a healthy life (Vorster and Bourne 2008: 236 and Popkin 2002: 93-94).

The people of South Africa are at different levels of the nutrition transition but more prevalent is the stage or pattern of nutrition-related chronic disease of lifestyle (NR-CDL) due to urbanization. There are some groups that have begun the shift towards the behavioural change pattern which is characterised by prudent and healthy diet consumption. The SA Food Based Dietary Guidelines (FBDGs) have been developed to try and promote these dietary intake changes (Vorster and Bourne 2008: 240).

2.3 FACTORS INFLUENCING THE CAUSES AND CONSEQUENCES OF THE NUTRITION TRANSITION

2.3.1 Globalization and urbanisation

According to Hamdi (2013: 142) the phenomenon of globalization is the development of world-wide collaboration economically, culturally and politically leading to accessibility between nations and more profoundly, having implications for developing countries. Globalization has caused changes to occur in the food environment and the systems in which countries operate in and under. Previously the food systems were driven by local production for the local markets. However, today we find that there is a world-wide network of associations between different stakeholders from the initial sowing of food crops to when it reaches the consumer's table. This process whereby businesses or other organizations develop international influence or start operating on an international scale opens up opportunities and affects health systems, technological progress and natural environment dynamics. Although there are many positives

linked to globalization it is noted that several negatives may be presented. Globalization may have adverse effects causing market instability, damage to the environment and inequity among countries. The education and health systems of a country, too, are affected by globalisation in that the phenomenon requires higher educational attainment because of the need for a higher skill set. Health and education are vital in the improvement of a nation, globalization facilitates doctors and scientists to collaborate in identifying new illnesses and developing measures to combat them. On the other hand, allowing cross-border exchanges brings about implications for transfer of diseases, too and affects living standards. An increased education standard has also led to skill sets developed in developing countries to be used at an international level as people also seek improved livelihoods (Anand, Hawkes, de Souza, Mente, Deghan, Nugent, Zulyniak, Weis, Bernstein, Krauss, Kromhout, Jenkins, Malik, Marinez- Gonzalez, Mozaffarian, Yusuf, Willet and Popkin 2015: 1591 and Hamdi 2013).

It has been accepted that a westernised diet increases the risk of NR-CDL. The manner in which human biology responds to changes from a rural to an urban diet is yet to be clearly defined. It is worth noting, however, that through evidence it has been found that people who suffered from undernutrition in foetal life and/or infancy do have an elevated risk or are more prone to the NR-CDL when a westernised diet is adopted (Vorster and Bourne 2008: 238). The implications of this phenomenon can have a major influence on nutrition policy and programmes. Emphasis should now be placed on ensuring ideal nutrition for reproductive women, good nutrition in infancy and childhood as well as continued consumption of a healthy diet in adulthood to prevent NR-CDL (Vorster and Bourne 2008: 238).

Malhotra, Hoyo, Ostbye, Hughes, Schwartz, Tsolekile, Zulu and Puoane (2008: 319) reported that in Khayelitsha, an urban township in Cape Town, South Africa, the duration of residence in the township is related to a higher risk of abdominal obesity. A lower risk of abdominal obesity was found in residents that arrived in the township after the year 2000 as compared to those that arrived before the year 1980. Similarly, in the 1960s the United Arab Emirates experienced a fast move from traditional semi-urbanised life to a modern and urbanised society which occurred after the detection of oil, a resource with economic implications (Ng, Zaghloul, Ali, Harrison, Yeatts, Sadig, and Popkin, 2011: 1329). South Africa is approximately 60% urbanised and projected to reach 70% by 2030 (NPC 2011).

The Cardiovascular Risk in Black South Africans (CRIBSA) evaluated the effects of urbanization on the nutrient intake of black adults living in Cape Town. The data was stratified by the percentage of life spent in an urban environment. The results were reflective of an approval of a westernised dietary profile and of a population in a nutrition transition as fat intakes were high although carbohydrate intake had lowered between 1990 and 2009 (Steyn, Jaffer, Nel, Levitt, Steyn, Lombard and Peer 2016: 9).

2.3.2 Trade and food policy

The International Food Policy Research Institute (IFPRI 2011) defines food policy as: 'the sum of decisions made by public entities that affect the production, distribution, and consumption of food.' Due to trade barriers previously developing countries were unable to access the global economy. The food system changes in the LMIC were driven by the need to have regulations pertaining to the subsidizing of food, taxing certain agricultural products and procedures to govern the supply and marketing of important products (Anand *et al* 2015: 1592). In a large number of states the political environment does not allow health experts to directly influence decision making at the national level. The knowledge provided on the health of a population and authority over the social and health policies puts policymakers in a position of privilege to ensure that as economic globalization grows the local legislation is tailored to enhance social protection and connect economic advantage of trade through policies pertaining to redistribution (Blouin, Chopra and Van der Hoeven 2009: 595).

Snowdon and Thow (2013) reported that the Pacific Islands have restricted powers of bargaining and keeping a presence at the World Trade Organization (WTO) is financially strenuous for islands with small populations. Due to this, for instance, Vanuatu's negotiating strength led to its accession contract containing more difficult conditions than larger countries. The challenges facing Pacific Island Countries Trade (PICT) include remoteness of the location and limited natural possessions. The amount of energy being expended on upgrading the PICT is caused by the eagerness of Europe to gain entry to the Pacific fishing industry. The Pacific Island Countries Trade Agreement (PICTA) has experienced some disagreements regarding the trading of biscuits, ice cream and canned meats amongst some Pacific states as these countries have attempted to guard developing local markets from imports using fees and levies. It would have

been of pertinent consideration to the Pacific Island countries to observe the reaction of other WTO members when South Africa regulated maximum levels of salt in a variety of products.

Friel *et al* (2013) summarised that food environments are affected by trade agreements in three ways, that is, 'impacts on trade goods, trade in services and foreign direct investment, and domestic protections and supports.' Theoretically, trade liberalisation could enhance growth in the economy, assist in the reduction of poverty and increase quality of life via the increment of export opportunities and access to international industry, appealing towards lower expense imports and inward foreign direct investment and extending the outreach of technology and developments in medicine. However, liberalisation has been seen to elevate the sum of food imports and mostly volumes of animal products and highly processed foods in LMICs.

2.3.3 Agriculture

Agriculture is an important contributing factor to the economy of many countries and forms part of the workforce. Various shifts in the global trade are posing a challenge to food production because food has to be produced in larger quantities but with fewer resources. As much as the consumption rate and price levels may remain stable until 2030 in some nations, this has implications for the persistence of malnutrition issues. Further limited arable land and extension into unmanaged forests has a minor impact on high food prices. When incomes or the population grow food demand may rise; however, since the resources remain low, food commodity prices increase and factor in the price for this production of food. Technical developments in agriculture decrease food commodity prices but also cause an increment in production factor costs. When a country's agricultural and trade policies are modified the effects may be experienced in other regions. For instance, if changes were made within Europe to promote the reduction of saturated fat intake this would lead to a decrease in the domestic demand for food from animal sources and an increased demand for substitute products consequently forcing Brazil's supply to meet the demand of Europe (Schneider, Havlik, Schmid, Valin, Mosnier, Obersteiner, Böttcher, Skalský, Balkovic, Sauer and Fritz (2011) and Lock, Smith, Dangour, Keogh-Brown, Pigatto, Hawkes, Fisberg and Chalabi 2010). According to Laing (2011: 12) agriculture influences food security based on global regulations making it cheaper to trade in commodities than it is to produce food. Infrastructure to deliver food to the population remains a political issue. Access to land, capital to procure agricultural resources and marketing capacity

as well as the natural environment (soil and climate) are factors that affect agricultural productivity. The availability of food to be consumed is reliant on the turnaround time between breeding and delivery, and sowing and harvesting. Furthermore, urbanisation has put pressure on the need for economic development to ensure that people in rural areas are still able to be sustained through subsistence farming. In South Africa, food security is directly linked to job security. Small to medium-scale farming is not really growing sufficiently and as much as there may be food availability, affordability still hinders sufficient food intake to prevent micronutrient deficiencies.

2.3.4 Nutrition information and food industry

According to Grunert, Wills, Celemin, Lähteenmäki, Scholderer and Storcksdieck-Genannt Bonsman (2012) the nutritional traits of food are determining their position in the market because of consumers' attention to eating healthily. Snowdon and Thow (2013) state that as many Pacific Island countries depend on imports of food this brings about awareness about the long-standing laws that oversee the quality of foods available for retail. In addition it was suggested that this perpetuates the importation of poor quality and inadequately labelled products. In 2010 the SA government introduced new legislation on labelling and advertising of foodstuffs in response to the WHO Global Strategy on Diet, Physical Activity and Health initiative. The regulations goal is to warrant that consumers have access to correctly and truthfully labelled foodstuffs, which will in turn assist them in making wise food choices (Government of South Africa 2012). A London study of gym (n=129) and non-gym (n=58) users indicated that a larger number of gym users were in the age category of 24 to 34 years of age. There were no statistically significant differences observed in the frequency of label reading between gym users and non-gym users. From the total group 58% (of which more were women) were 'label readers', which means being a person that always or mostly reads nutrition labels. The authors concluded that even if one has a high nutrient label reading rate it does not mean the consumer is able to use the information to make healthier food choices. There was also a low knowledge score with information pertaining to the energy content of food which called for further efforts to be made in educating consumers towards making good food choices. Furthermore, gym users did not appear to have better nutritional knowledge than non-gym users except for men gym users regarding knowledge about protein (Wade and Kennedy 2010). Dissimilar findings appeared on nutrition knowledge and the reading of nutrition labels in South

Africa. Kempen, Muller, Symington and Van Eeden (2012) found that in Gauteng a significant proportion of the respondents appeared to be concerned about their state of personal wellbeing and interested in getting information on issues of health. Some respondents indicated that fruit and vegetables were eaten often, there was monitoring of personal alcohol intake, efforts were made to avoid smoking and respondents would limit the consumption of snacks and treats. Health-cognizant consumers keenly sought out nutritional information on products and possibly used food-label information due to specific diets being followed, eating strategies or health matters. According to a study conducted in Gauteng among 357 adults that are likely to read food labels, researchers found that approximately two thirds of the respondents did concern themselves with personal health. This group of adults also sought health information and subscribed to a healthy livelihood (Kempen, Muller, Symington and Van Eeden 2012).

According to the Right to Food Guidelines adopted by the FAO in 2004 member states have been encouraged to take action in the prevention of consuming excessive and unbalanced diets that may cause malnutrition, obesity and degenerative diseases. It is suggested that this may be accomplished through education, information and labelling regulations (Steyn, Blaauw, Lombard and Wolmarans 2008: 699).

There has been a rapidly escalating appearance of supermarkets providing proof that there is a continuous process of transformation and modification in technology and infrastructure. This emergence affects food policy via the timely alleviation of hunger and poverty in an environment that enhances health and life expectancy. The food system has become more consumer driven and marketing and advertising is most significant as the mode by which consumers' needs are communicated to producers (Timmer 2009: 1817).

Layman (2014) summarises that the leading trends impacting and influencing the food industry include, namely: increased demand for minimally processed foods; focus on the quality, quantity and distribution of protein within a meal; a need to decrease the carbohydrate and glycaemic index of foods; the addition of products to make meals more balanced; and the increment of snacks in line with the evolution of nutrition knowledge of the consumer. Parallel to these trends the food industry is faced with challenges in supplying to populations as goals tend to be divergent; for instance, as much as consumers require healthy foods purchases are made

according to taste, price and level of convenience. As meat is a relatively more expensive product the industry still has to provide protein conveniently, at an affordable price and in a desirable form. The food industry would also need to take steps to use favourably low-cost carbohydrates in processing raw material in lesser quantities in order to accommodate the health agenda of reducing the prevalence of diabetes and obesity. Similarly, Grunert, Tudoran, Chrysochou and Migkou (2012) concur and supplementary to these factors include sustainability and authenticity as factors trending within the food industry.

The food industry may also play a role in conducting research to inform public health policy and Aveyard, Yach, Gilmore and Capewell (2016) present the pros and cons of having industry provide the funds for such research to occur. It was stated that the advantages of industry funded research are that the food industry is a major employer, the research meets the objectives of the researcher and the company, and funds are managed well in that money is not given to an individual. Industry does inevitably want to meet the nutritional needs of consumers by improving the quality of production and if research is done by the company instead of a public health research entity it is most likely that the public would have to compensate for that, possibly in the form of increased food prices. The downside of industry-funded research includes that public health policies run the risk of maximising shareholder profits, evidence from research may be manipulated to favour the industry and increase bias especially if researchers are incentivised, and findings may be distorted when questions to be asked are mandated to avoid 'attack' directed at the company. Furthermore, there is a risk that ineffective interventions aimed at individuals may be implemented instead of having legislation targeted at a larger population, with emphasis on physical activity and energy balance but eliminating diet related drivers which are the ultimate concern of industry.

Baum and Anaf (2015) suggest there should be an agenda to evaluate the health and equity of transnational corporations (TNCs), assess the success of government regulations, and further probe the work of activist assemblies and connections that bring to light the negative effects of TNCs. In addition, distribution of power and resources are a vital health determinant therefore focus should be placed on the growing impact of trade programmes by means of which TNCs affect health.

2.3.5 Traditional vs Westernised Diet

Mbhenyane, Makuse, Ntuli, Mbhatsani and Sayed (2008: 206) alluded to the fact that within urban areas traditional foods are not always freely available. This may be contributing to urban black people consuming a more westernised diet. Commercialisation of production and marketing could be one way of increasing the consumption of traditional foods.

The characteristics of a modern, or western, diet are accompanied by a shift in taste and access to convenience food. Intense information dissemination needs to be done in order to assure people in transition that the traditional diet is synonymous with a palatable diet, good health and a decreased risk of NR-CDL (Vorster and Bourne 2008: 242).

Mbhenyane *et al* (2008: 202) stated that the 'traditional' source of foods included agricultural products, plants and animals from the wild, which included indigenous foods. The traditional foods were of good nutritional quality, having high fibre and carbohydrate content, low fat and moderate protein. This may still be seen in the rural diets of South Africans today. The main differences between the rural African diet and the urban African diet are as follows: more cereal and legumes in the rural diet and more sugar, confectionary, meat, wheat-based products and fats and oils in the urban diet.

The expansion of NR-CDL seems to be occurring at a much earlier age due to the migration and westernization of the populations in developing countries and more to their detriment than to the detriment of the host population. Should the maintenance of traditional foods and keeping cultural eating behaviours be promoted amongst rural-to-urban migrants this pattern may be avoided (Vorster and Bourne 2008: 242).

Due to the patriarchal nature of black households in South Africa it is found that boys are given more attention nutritionally as toddlers and children. This then brings about the disparity in nutrition status when compared to girls and the differences in obesity rates in adulthood as well Micklesfield, Lambert, Hume, Chantler, Pienaar, Dickie, Puaone and Goedecke (2013).

2.3.6 Culture and eating away from home

Due to globalisation populations are shifting towards imitating other cultures through mass media of television, radio and the internet. As people get to know more about one another local and traditional cultures and practices have been neglected (Hamdi 2013: 143).

Jaworowska, Blackham, Davies and Steveson (2013) have mentioned that the Westernised diet is reflecting an increased consumption of foods outside of the household. Eating away from home could involve meals eaten at other homes, at work and at restaurants. For instance, through research it was found that a woman and man spend approximately only a little over ¾ of an hour and less than 20 minutes respectively on tasks required to make a meal. The major issue also arises in that regardless of the type of meal consumed humans still eat the same amount (weight) of food. The weight of food consumed does not factor in whether the meal is more energy dense. Previous research has indicated that, generally, meals bought from fast-food restaurants are energy dense. This has implications for health as weight is 15% more likely to be maintainable among women that seldom (once a month or less) or never consume takeaways and concludes that investigations looking into other nutrients of takeaways should be embarked on especially those from small stand-alone, speciality food establishments. Myhre, Loken, Wandel and Andersen (2012) reported that in Norway food consumed at eateries and other private households was higher in energy kilojoule content than that eaten at the consumer's own home. Evening meals consumed at restaurants contained lower fibre content than dinner consumed at home. The location at which dinner was consumed had a link to the nutritional quality of the diet. The healthier meals were found to be those eaten within the home.

It has been suggested by Mbhenyane *et al* (2008: 203) that inasmuch as the modern South African diet depicts a lack of knowledge about tradition culture and practices, an interest in the fusion of different cultures is arising.

2.3.7 Economics and Governance

The National Planning Commission (NPC) in the National Development Plan 2011 – Vision for 2030 reported that South Arica is one of the countries that did not hand over its governmental responsibilities to the activity of financial markets. In doing so the country's economy was protected from the worst results of the 2007/2008 global financial calamity (NPC 2011).

Developing countries are experiencing the most rapid transition leading to unhealthy food choices with most NCD deaths occurring among the 15–59 year old age group. Kengne, Mchiza, Amoah and Mbanya (2013) reported that in most African countries individuals, households, families and the government are unable to meet the cost demands of major CVDs and diabetes. It was forecast that by the year 2030 approximately 28 million deaths in Africa will be due to diabetes mellitus between the age group of 20–79 year old people. Currently, about 70% of stroke survivors in Africa also live with disability whereas in developed countries only 20% live with disability. Furthermore, the researchers reported that an estimated 10% increase in NCD-related deaths was associated with a 0.5% drop in annual economic growth. In addition rates of absenteeism typically from illness from NCDs causes a loss of productivity. These metabolic dispositions are life-long and require cautious specialist care, are expensive to diagnose, treat and monitor, need constant interaction with the health system and healthcare providers. This stresses the need for hospitalization costs, medication, and technology and rehabilitation services. For Africa specifically, issues still remain about the capacity of healthcare in terms of hospital bed availability and the ratio of patients assigned to one doctor.

According to Cecchini, Sassi, Lauer, Lee, Guarjardo-Barron and Chisolm (2010) policies and remedial actions regarding pricing are most likely to be the most efficient regarding health gains and interventions in primary healthcare have the potential to be very successful in countries that don't experience significant capacity limitation. A multitude of interventions at once would also produce better progression of results in health than singular programmes. Private sector resourcefulness might contribute to tackling some risk factors while easing the load on public sector funds although more evidence is needed.

Costs of a healthy diet

In both high income and emerging economies the cost of healthy food items has risen. This is a strong motivation to introduce levies and subsidies to offset these changes. In this way the consumption of healthy foods over non-nutritious items may be encouraged. It is also possible that the availability and cultural acceptability of foods plays a role in barriers regarding healthier diets (Wiggins, Keats, Han, Shimokawa, Alberto, Hernández and Claro 2015 and Rao, Afshin, Singh and Mozaffarian 2013). According to Lock *et al* (2010), in order to adopt a healthy diet

there would need to be a 30% decrease in consumption of vegetable oils and a 28% decrease in dairy products, consumption of animal fats would have to decrease by 30% and sugar consumption by 24%. Cereals, fruits and vegetable consumption would have to increase by 31%, 25% and 21% respectively. Rao *et al* (2013) further elaborates that the American population expend too little money on healthy foods in relation to income. However, there is a daily $1.50 additional cost difference in acquiring a healthier diet which would mean $550 more per annum. On the other hand this may be seen as reasonable considering the long-term effects and costs related to the liability of non-communicable diseases.

Hidden hunger, even in developed countries, could be caused by the fact that energy dense diets are cheaper and lacking in vital nutrients. Researchers also maintain that low cost energy is associated with high obesity levels. A food modelling method may be implemented to establish foods that are affordable, of nutritional quality and socially welcome. Education alone does not seem to be as effective and should supplement price reductions (Darmon and Drewnowski 2015).

Multi-dimensional Poverty Index

The theory of human development places emphasis on the ends rather than the means of development and growth. The main objective of improvement should be to create an environment allowing communities to sustain longevity, health and a creative lifespan. Availability of choices and improved livelihoods are at the forefront of human development. Supplementary matters include societal and administrative liberties. A common mistake that is made is that human development is focused on economic growth or theories of human capital formation and human resource development – which it is not. Human development is also not just focused on the human welfare approach and a basic needs approach. Thus the concept of human development is all-inclusive and focuses on putting people at the centre of the process of development. Some tools to measure human development include:

- **Human Development Index (HDI)**: gauges accomplishments of a country based on the three dimensions of human development. This is established from existing data at that time from international statistics agencies and other reputable sources.

- **Inequality-adjusted Human Development Index (IHDI):** utilises the HDI; however, it accounts for inequality in distribution of each dimension spanning the population. The IHDI equals the HDI when there is no inequality across people but is less than the HDI as inequality rises. In this sense, the IHDI presents an absolute level of human development (accounting for this inequality) while the HDI can be viewed as a reference of 'potential' human development (or the maximum level of HDI) that could be accomplished in the absence of inequality.

- **Gender Inequality Index (GII)**: indicates women's disadvantage in three dimensions – reproductive health, empowerment and the labour market. Inequality between men and women defines the level of forfeiture in human development. The range is from zero to one. Zero means that women and men are equal with one denoting that women fare poorly in all dimensions.

- **Multidimensional Poverty Index (MPI):** ascertains numerous deficits of individuals in well-being, schooling and standard of living. Data is deduced from household surveys from one study. Persons in a household are categorised as poor or non-poor according to the severity of deprivation experienced by the household.

The nutrition transition also affects the multi-dimensional poverty index (MPI) of a population and has been used in this study. The MPI reveals the combination of deprivations that affect a household at the same time and functions conjunctly with monetary measures of insufficiency as development is not only fiscal. A household is identified as multi-dimensionally poor if, and only if, it is deprived in some combination of indicators whose weighted sum exceeds 30 percent of deprivations. The dimensions and indicators are health, education and standard of living. A population is classified as being multi-dimensionally impoverished if deprived in any 2 health/education indicators or all 6 standard of living indicators or 1 health/education indicator plus 3 standard of living indicators (Alkire and Santos 2010 and UNDP 2014).

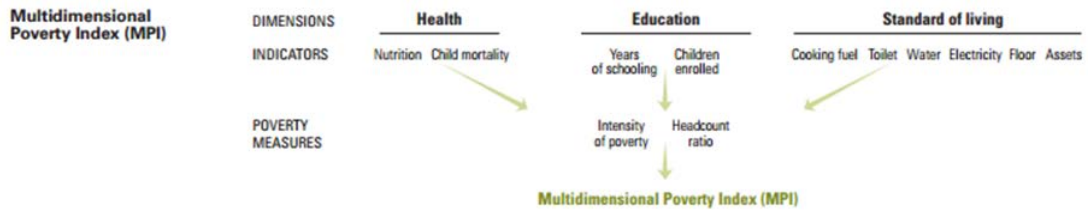

Figure 2.3: Multi-dimensional poverty index dimensions, indicators and measures (UNDP 2014)

The dimensions of the MPI are the same as of the HDI, depicting the proportion of the population afflicted with deprivation (33% or more of weighed indicators) as well as the amount of deprivations poverty-stricken homes typically face. It is a suitable tool for policymakers as it can be adapted to region, ethnicity and various associations including each dimension (UNDP 2014).

The South African MPI (SAMPI) uses data from censuses therefore does not consider factors of nutrition, hunger and food security. Figure 2.4 displays the impact of the different indicators towards the SAMPI nationally (StatsSA 2014b: 7).

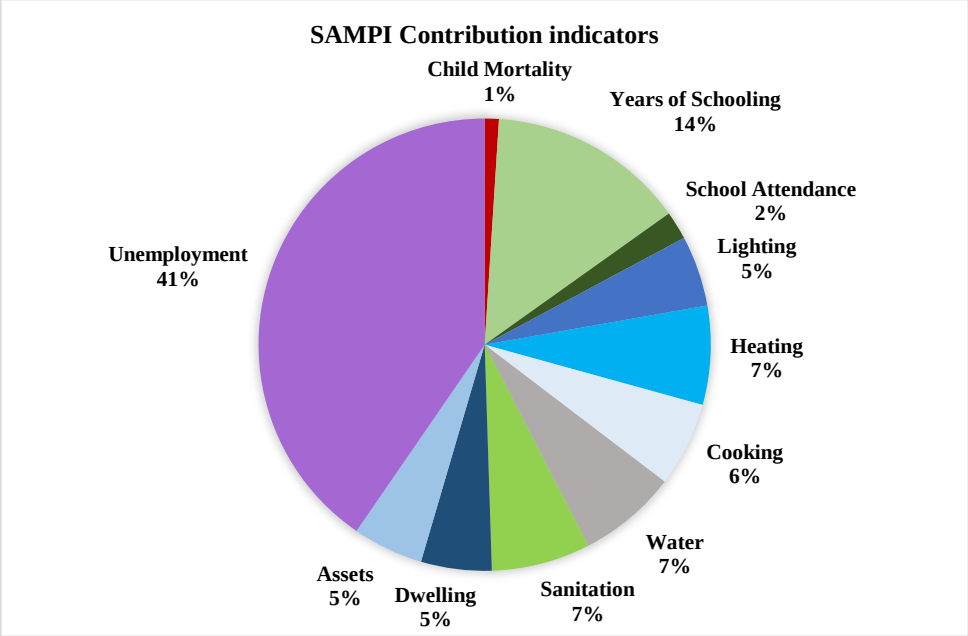

Figure 2.4: Contribution of weighted indicators to SAMPI 2011 at national level (StatsSA 2014b: 10)

The methodology of calculation of the MPI including factors of nutrition, hunger and food security for this study on adults in Umlazi Ward 84 is further explained in chapter 3.

Food and nutrition security policy and service

The South African Integrated National Food and Nutrition Security Policy strives to ensure that safe and nutritious food is available, accessible and affordable nationally and at the household level. The policy is in line with the NPC Vision 2030. The objective is to reduce the number of food insecure homes and do away with poverty. In addition, the policy aims to further enhance

present initiatives and strategies and to install better monitoring and evaluation initiatives. Moreover, the policy endeavours to guarantee that the response to food and nutrition insecurity is ambitious, thorough and active. Strategies included relate to: more enhanced and effective spending impacting food security, measures to maximise agricultural production and distribution, utilising government food trade to assist community-based food production programmes and subsistence farmers, as well as the organised use of market interventions and trade measures that would stimulate food security (Department of Social Development Department of Agriculture, Forestry and Fisheries (2013).

The Food and Nutrition Security Strategy (FNSS) 2015-2025 that encompasses South Africa as a member state in the Southern African Development Community (SADC) and African Union (AU) puts into practice the food and nutrition aspects of the SADC Regional Agricultural Policy (RAP), the SADC Health Policy Framework (HPF), Orphans, Vulnerable Children and Youth (OVCY) Strategy (2009-2015), as well as the Maseru Declaration on HIV and AIDS (2003-2007), among others. The African Union's African Regional Nutrition Strategy (2015-2025) and member states' national food and nutrition security policies and strategies are also included for consideration. Particular focus should be on children under five years and women of childbearing age in relation to dealing with food security as stunting, a dearth of nutrition and also overnutrition are pertinent nutritional challenges within the southern African region. Based on global trends, the FNSS 2015-2025 appeals for a life-cycle approach to be used in efforts to address food and nutrition security (SADC 2014).

BRICS

Brazil, Russia, India, China and South Africa (BRICS) are leading emerging economies and political powers at the regional and international level. The acronym was originally coined in 2001 to highlight the exceptional role of important emerging economies and only included Brazil, Russia, India and China The four countries themselves started to meet as a group in 2006 and it was only in 2010 that South Africa was invited to join the group, which was then referred to as BRICS (European Parliament 2012).

The BRICS forum was officially founded in 2011 to stimulate corporate, political and social cooperation between countries also involved in efforts to transform international governance and economic affairs. The key focus areas for the BRICS member states are trade and investment, manufacturing and minerals processing, energy, agricultural cooperation, science, technology and innovation, connectivity, financial cooperation and ICT Cooperation (Industrial Development Corporation 2014 and BRICS Business Council 2015). South Africa represents the African continent as a resource-rich entity in global economics. Although among the BRIC states South Africa had the lowest economic growth rate (3.5%), smallest population, highest unemployment rate and lowest savings, long-term benefits are forecast in terms of foreign direct investment (FDI) and heightened trade. South Africa is also one of the largest economies in Sub-Saharan Africa, has a multitude of natural resources, sound infrastructure, a traceable corporate trail, innovative culture, ease of access to finance for business including the established financial climate and progressive banking structure (Gauteng Province 2013).

According to Guimei (2014) the total GDP of the BRICS states might overtake that of the Group of 7, having seen an increase in global output from 13.7% to 17.5% between 2007 and 2010. As the BRIC states' assistance to Africa rises this translates to improved economic development within various sectors such as the energy industry, demographic dividend, construction of urbanisation and the growing demand from the middle class. The inclusion of South Africa in the BRICS states allows for better comprehension of African economies and in turn, safe-guarding African interests. The projected threats facing South Africa being involved in the BRICS partnership could be the lack of competitiveness due to the small GDP and population and similarly, competition increases in importation much like the infiltration of China into the textiles industry. South Africa could risk the loss of ownership of natural resources to other member states. It is important that South Africa's involvement does not lead to the adoption of malpractices concerning labour. Commercial investors seek to ensure security in private interests first. South Africa needs to be discerning in the trade relations it embarks on and set clear regulations to evade manipulation and corruption (BRICS Business Council 2015).

2.3.8 SA Government nutrition initiatives

According to the conceptual framework to understand nutrition transition it is depicted that food habits are determined by cognitive strengths and knowledge of healthy diets, academic ability,

food cultures and buying power. These factors can be addressed through adequate policies and programmes during intervention planning. In as much as people have a responsibility for personal health outcomes, it is the government's responsibility to address matters of pricing, marketing and physical barriers to acquisition of food. The environment needs to be favourable to make these healthy choices via policy development for all stakeholders involved (Vorster and Bourne 2008: 237, 241). Furthermore, the authors also suggest that it is the right of every citizen to have access to affordable, safe and nutritious food. According to the South African Constitution the government has a role to play in the education and empowerment of people. The sharing of relevant information and knowledge with regard to diet and its consequences on the health profile is a governmental duty.

Programmes of nutrition promotion and intervention planned for implementation in communities have the likelihood of putting into practice the right to food and nutritional health. Fostering a supportive macro-environment through a solid political and public awareness-raising campaign plus ensuring active community participation is achieved, are the most important considerations that need to be made for community-based nutrition programmes. Through these programmes it should be highlighted that improving nutrition is a display of development; sufficient food and nutrition is a rudimentary human right for all. Programmes require a conceptual framework showing the multi-sectorial pathway to improving nutritional status. This would then highlight the need for inter-sectorial partnerships, the function of various sectors in improving good quality basic services and how this may be a factor to improving nutrition. Furthermore, the role and input of the community as well as its participation and connecting a top-down approach with a grassroots approach through delegation should be implemented (Moeng and de Hoop 2008: 288).

Integrated Food Security and Nutrition Programme (IFSNP)

It was realised that food security formed part of Section 27 of the Constitutional Bill of Rights and this formed the objective of the Integrated Food Security and Nutrition Programme. The programme was launched in 2002 and intended to 'reach total physical, social and economic access to sufficient, safe and nutritious food by all South Africans at all times to meet dietary and food preferences for an active and healthy life'. The goal was set to be achieved beyond 2015.

There are seven strategic objectives in place and they encompass the increment of household producing and trading, enhancing income generation and job creation opportunities, improvement of nutrition and food safety, elevation of safety nets and food aid management schemes, advancement of analysis and information management systems, and offering capacity building and facilitate stakeholder dialogue.

The IFSNP exercises a developmental approach concentrated on household security within the national food security context. The leading government departments that support the IFSNP are: the Special Programme for Food Security of the Department of Agriculture, the Community Development Programme of the Department of Public Works and the Integrated Nutrition and Food Safety Programme of the Department of Health (DOH), the Comprehensive Social Security Programme of the Department of Social Development (DOSD), the Information and Communication Programme - Statistics SA, the Food Security Capacity Building Programme from all national departments as well as the Food Security Dialogue Programme also from all national departments (Moeng and de Hoop 2008: 289).

Micronutrient Malnutrition Control: **Salt Iodation**

Iodine is a trace element essential for the production of thyroid hormones and can only enter food sources through the addition of this, nutrient to nutrient delivery interventions. Approximately 1.88 billion people world-wide are at risk of deficient iodine intake if iodine-delivered interventions are not maintained. There are large parts of the world where natural sources of iodine are low, and therefore it becomes vital to have continuous iodine-supplying interventions. Salt iodization is considered the most acceptable strategy for control of iodine deficiency disorders and is implemented in more than 120 countries globally. Many countries world-wide have successfully eradicated or progressively controlled iodine deficiency disorders, attributed largely to the iodisation of salt and dietary diversification. Salt is considered an appropriate mode for fortification with iodine due to the following: it is consumed by almost all populations; as production sites are few this facilitates good quality control; the well-established technology to iodate salt is inexpensive and can be easily conveyed to other countries; consumer acceptability is high because iodation does not alter the taste or smell of food; other salt dense products such as stock cubes then become vehicles of iodine; the low-cost nature of salt; and the

concentration may easily be attuned to subscribe to policies targeted at limiting salt intake for the prevention of CVD (WHO 2014c and Herbst 2016).

The obligatory iodation of food grade salt in South Africa came into effect in 1995 in terms of the regulations of the Food, Cosmetics and Disinfectants Act (Act 54 of 1972). The regulation states that the iodation level should be 40–60 ppm at the point of production/ packaging and compliance thereof would be monitored at the processing/ packaging stage. A study on the iodine content of household salt was conducted in 1998 by the SAMRC. It was found that the coverage of iodated salt improved from 30% of table salt being iodated to 62% of households using adequately iodated salt after mandatory iodation of at least 15 ppm. In 2001 salt iodation regulations were included into the regulations pertaining to salt. It was in 2001 that a coalition was founded for the eradication of Iodine Deficiency Disease (IDD). This coalition incorporated DOH (Nutrition and Food Control directorates), United Nations Children's Fund (UNICEF) and the SAMRC. Some other role players were the Consumer Goods Council, representatives of the salt industry as well as later the Micronutrient Initiative (MI). Through the monitoring of compliance with regulations that is carried out by environmental health practitioners it was discovered that 19% of the salt packages in retail stores still had an iodine content of less than 20 ppm. The SAMRC found that within one year of compulsory iodation the iodine content of the table salt available in three of the nine provinces more than doubled from an average of 14 to 33 ppm. Another evaluation of iodine at the producers' level was conducted by the SAMRC in 2005 to produce results indicating that the overall iodine concentration had improved by 93% from 30 to 55 ppm. The salt regulation was then changed to comply with a broader range of 35 to 65 ppm following which these changes were then published in March 2007 (Moeng and de Hoop 2008: 298).

Strategy for the Prevention and Control of Obesity in South Africa 2015-2025

The strategy emphasises the importance of utilising several methodologies to overcome obesity and overweight challenges in the country. A population-based approach is fixed on policy, circumstance and environmental modification.

The strategy has six goal focus areas:

Goal 1: Create an institutional framework to support inter-sectorial engagement.

Goal 2: Create an enabling environment that supports availability of and accessibility to healthy food choices in various settings.

Goal 3: Increase the percentage of the population engaging in physical activity.

Goal 4: Support obesity prevention in early childhood (in-utero–12 years).

Goal 5: Communicate with, educate and mobilise communities.

Goal 6: Establish a surveillance system and strengthen monitoring, evaluation and research.

This strategy is aligned with the Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2013–17, the Health Promotion Policy and Strategy, the WHO Global Strategy on Diet, Physical Activity and Health, the WHO Initiative on ending childhood obesity and halting the prevalence of obesity globally. The strategy has been developed for all South Africans and should be adopted by all to improve the quality of life and enhance the potential of each person to make informed decisions (Department of Health (DOH) 2015).

2.3.9 Health promotion

The concept of health promotion is to equip people to increase control over and improve their own health. According to the Ottawa Charter for Health Promotion the different action areas involve building a public health policy, the creation of supportive environments, reinforcing community action, developing personal skills and reorienting health services. The effectiveness of nutrition education is dependent on its capability to address health communication and health promotion actions and strategies. Nutritional status is related to an inadequate level of education and nutrition knowledge. In addition to this, it is the inappropriate nutrition education, interchange of misinformed ideas and spreading of harmful traditions in a cycle of poor nutritional practices in rural communities that lead to poor nutrition. Health promotion in SA was introduced by the African National Congress health promotion policy. Prior to the establishment of the Directorate of Health Promotion (DHP), health education remained as the primary focus. It was also the Fifth International Conference on Health Promotion in Mexico-2000 that zoned in on the need to limit the deficiency in implementation and shift to policies and collaboration for

action. The South African health promotion policy is based on the Ottawa Charter (Behr and Ntsie 2008: 316).

The Health Promotion Directorate of the DOH in South Africa took on four strategies, namely: firstly, policy, advocacy and healthy environments; secondly, the setting of an approach which evaluates the environment and aims to eradicate any elements detrimental to health; thirdly, education and information, where the main focus is on educating via various media; lastly, reorientation of the health services and community participation (Behr and Ntsie 2008: 316). The facts provided through health promotion are used to enhance the population's knowledge that may affect positive modifications in respect of previous notions and customs pertaining to food and exercise. Knowledge and practical food applications may prevent and manage NCDs (Shisana *et al* 2013: 178).

According to the DOH (2014) the National Health Promotion Strategy aims to promote an all-inclusive approach to health by emphasising the relationship between health promotion and determinants of health, focusing on the role of inter- sectorial and multidisciplinary methodology in coordinating intervention actions, providing a framework of health promotion activities across multiple and varying sites and identifying particular strategic indicators that have to be monitored.

2.4 INDIVIDUAL AND FAMILY FACTORS INFLUENCING THE CAUSES AND CONSEQUENCES OF THE NUTRITION TRANSITION

2.4.1 Genetics and biological programming

Lillycrop and Burdge (2012) state that the make-up of human DNA is not the only factor contributing to disease risk but that variables exist in the quality of the environment experienced in early life by the alteration of the changes in organisms caused by modification of gene expression. It was suggested that identification of persons at risk of NCDs could be done at much earlier life stages and long-term nutritional and lifestyle interventions implemented. Lifestyle diseases such as diabetes, increased blood pressure, CVDs and other metabolic conditions have often been linked to changes in epigenetic patterns; furthermore, obesity and weight loss outcomes have also been associated with these changes that occur in human genes. Among adults health outcomes of fatty liver or insulin resistance may be distinguished due to similarities

in the genetic variants. Polyphenols and organosulfur compounds have been identified as agents that are possibly epigenetically therapeutic against obesity and related conditions (Milagro, Mansego, Miguel and Martinez 2013). Similarly, Jiménez- Chillarón, Díaz, Martínez, Pentinat, Ramón-Kraeul, Ribó and Plösch (2012) state that nutrients affect the epigenome and modifications in prenatal growth stages may have life-long effects in changing arrangements of gene expression as part of preparation for the upcoming environment. Van den Berg, Henneman, Dijk, Delemarre-Van deWaal, Oostra, Van Duijn and Janssens (2013) also support the above by stating that particular food consumption trends are associated with the risk of obesity and are hereditary traits.

2.4.2 Presence and absence of diseases

According to the American Diabetes Association (2010) diabetes can be classified as a group of various metabolic disorders. Increased blood glucose levels due to either lowered quantities of insulin, defective insulin or a combination are characteristic of these metabolic disorders. Diet control is vital in the regulation of blood glucose levels and preventing other diseases that may arise from diabetes (WHO 2016a: 7).

The type of food and medication in the management of diabetes play a major role in decreasing blood glucose levels after a meal has been consumed. Effective insulin control translates into blood glucose management as the digestion and absorption of glucose from food and its clearance from the blood circulation depends on the insulin response. The consumption of complex carbohydrates (CHOs) and fibre is emphasised always. The aim should be to consume 20-40g of fibre per day in order to improve blood glucose and lipid metabolism. Protein does not directly impact the level of plasma glucose; however, it may increase serum insulin response. There is also no clear evidence of the effect of micronutrients on diabetes development or management. The essence of successful diet management for diabetics lies in adherence to a balanced diet and attainment of all the nutrients essentially from natural foods. It is also advised that meals be eaten at approximately the same time every day (Steyn, Blaauw, Lombard and Wolmarans 2008: 704).

The most commonly used indicator of weight status is the body mass index. The measurement is calculated as weight (kg) divided by height (m^2). It has been noted though, that the measurement

may not depict real body composition. The implications are that a person can be overweight bar excessive fat if the 'weight' comprises of muscle, bone and body water (Senekal, Mchiza and Booley 2008: 487).

The excessive intake of salt could lead to high blood pressure and consequently a risk of heart disease and stroke. It has been found that most salt comes from processed food, or food consumed in large quantities, for example, ready meals, bacon, ham, salami, cheese, salty snacks and bread. In addition, salt is also added during cooking (by use of bouillon, stock cubes) or at the table (WHO 2015g). From the fact sheet of the WHO, WHO Member States concurred to minimize the consumption of salt by 30% by the year 2025 (WHO 2015g). Moreover, the WHO reported that a lot of people consume salt excessively, up to approximately 9-12g in a day. The recommended intake should be limited to only 5 grams per day (Steyn *et al* 2008: 726).

Steyn *et al* (2008: 718) cites it was estimated that more than 5.5 million South Africans above the age of 30 years are at risk of developing cardiovascular disease (CVD) as a result of their total cholesterol (TC) levels. Hypertension is another risk factor in the growth of CVD in South Africa. Individuals with high blood cholesterol levels should make dietary treatment a priority in the management of dyslipidaemia. Dyslipidaemia is an abnormality in circulating fats i.e. total cholesterol (TC), triacylglycerol (TAG) and lipoproteins (LDL-C and HDL-C) which leads to the development of coronary heart disease (CHD) and disorders related to it. The objectives of dietary intervention would be to strive for and maintain desired TC, TAG, LDL-C and HDL-C levels. The maintenance of cholesterol below 5mmol/l is required through balancing energy intake and expenditure to achieve and maintain favourable body weight. Intervention should aim for the consumption of nutrients favourably influential to blood lipids and lipoproteins, and to decrease those with a negative effect. The dietary involvement needs to ensure ideal nutrition for the individual with dyslipidaemia so as to meet micronutrient needs (Steyn *et al* 2008: 720).

Abdominal fat can be used as a risk factor for heart disease and dyslipidaemia. Individuals with a waist circumference of >88 cm for women and >102 for men should be encouraged to lose weight. The ideal BMI range is that between 18.5 and 24.9 kg/m^2 and a BMI of >25 kg/m^2 indicates overweight to obesity; persons in this range should also strive towards weight loss (Steyn *et al* 2008: 720).

The type of fat consumed in a diet can have implications on the development of CVD. In most adults at least 15% of the total daily energy intake should come from fat; however many South African adults following a westernised diet consume fat in excess of 30% of the total energy intake (Steyn *et al* 2008: 720).

The following recommendations are made for adults: 34g per 4200 kJ for adults with moderate risk hypercholesterolaemia. Adults with hypercholesterolaemia in addition to two other risk factors or with a high risk of hypercholesterolaemia are encouraged only to consume 25g/ 4200 kJ. It is only individuals with very high risk hypercholesterolaemia that should consider a fat intake of 20% under the supervision of a dietician or medical doctor. A very low fat diet reduces both low density and high density lipoproteins and may increase triacylglycerol levels (Steyn *et al* 2008: 720).

Saturated fatty acids increase blood cholesterol levels but not all have the same cholesterol elevating effects; however, lauric, myristic and palmitic fatty acids have cholesterol elevating properties (Siri-Tarino, Sun, Hu and Krauss 2010: 385). Animal fat, coconut oil and palm kernel oil are also sources of cholesterol elevating saturated fatty acids and should be avoided. Labels on food products should provide information about these ingredients.

Bacterial fermentation causes natural formation of trans-fatty acids in foods such as butter and beef fat. The trans-fatty acids of most concern are those that arise from the commercial hydrogenation of vegetable oils in the production of products such as margarine. Due to hydrogen atoms being added to the carbon atoms of the double bond in the fatty acid chain saturation occurs. The cis-form of some of the double bonds in the fatty acid chain is also changed to the trans-form due to the partial hydrogenation and leads to a more solid fat. Sources mainly high in trans-fatty acids include some brick margarines, cooking fat and food prepared with these ingredients (Steyn *et al* 2008: 721).

According to the WHO (2014b) 27% of deaths arise from cancer. The modifiable risk factors of cancer include smoking of tobacco, alcohol consumption and unsatisfactory dietary intake. Fruit and vegetable intake appears to be the most protective dietary factor against cancer. It is the presence of antioxidants in the fruit and vegetables that contain cancer fighting properties (Steyn *et al* 2008: 738 and Center for Disease Control and Prevention (CDC) 2013).

According to Vineis and Wild (2014), as the global burden of cancer escalates it presents population expansion and a transformative age distribution and other significant changes in underlying incidence associated with the prevalence and dispersal of risk factors. The transition of cancer in low-human development index countries jointly with ageing populations implies that a large number of countries are encountering a dual burden of cancer; the first being linked to infectious agents and the second being connected to Westernised lifestyles that are on the rise.

2.4.3 Food intake

Achieving food security is imperative for every individual and food strategies should additionally consider as important meeting the intake of a sufficiently healthy (safe and of good quality) diet. Globally, food consumption per capita has risen and would be higher had the 1990s economic downturn not been averted. The progression in food consumption has seen diets decrease in staples (root and tubers) and increase in more livestock products and plant-based oils (Vasileska and Rechkoska 2012).

According to Mchiza, Steyn, Hill, Kruger, Schönfeldt, Nel and Wentzel-Viljoen (2015) a systematic review of dietary intake surveys in South Africa revealed that although intake of fat, protein and carbohydrates remains within the acceptable macronutrient distribution ranges (AMDR), there remains a low intake of micronutrients in SA. Energy intake ranges from being low in the rural areas to very high in urban populations. The lowest micronutrient intake was mostly observed in black and Indian adults. In a Brazilian study it was found that a highly diverse diet did not translate to a ‘healthier’ diet. The abundance of food brands entering the Brazilian markets annually may be a contributory factor for individuals purchasing both healthy and unhealthy foods. Moreover, unhealthy foods are highly palatable and this impacts energy intake. Simultaneously, unhealthy foods are presented as ‘natural’ foods. The suggestion raised was that obesity prevention messages should be accompanied with a focus on eating less (Bezerra and Sichieri 2011). Myhre, Løken, Wandel and Andersen (2015) also bring forth that the culture of eating snacks has increased; however, not enough is known about the implications of where the snacks are consumed in comparison to the composition of such foods as well. The authors presented that in a Norwegian study of 1787 adults who completed two 24-hour food recalls, snacks made up 17% and 21% of daily energy intake for men and women respectively. The snack items consisted of higher dietary fibre then the main meals. The most commonly

consumed snacks included cakes, fruits, sugar/ sweets, bread and alcohol. Home (58% of all snacks) and work (23% of all snacks) were the most common places of snacks consumption. It was concluded that consuming snacks at home or work yielded an intake of a healthier snack than when eaten at another private home or bought from a restaurant/ café or fast food establishment.

A Water Research Commission (SA) report suggests that the dearth of household food intake information can negatively affect initiatives of intervention. The lack of national food and nutrition surveillance methodologies remains a challenge as periods of food shortage are not monitored. These periods include seasonality, the days preceding social grant pay-outs and acute expenditure for funerals or a bread winner's relocation. Food consumed is dependent on a person, the home environment, social conditioning, geographical placement, climate and knowledge and schooling levels. Mchiza *et al* (2015) and Backeberg (2013) agree that high prices and lack of availability of dairy and fruit and vegetables mostly affects poor urban areas and townships. Consequently, much of the vulnerable SA population is unable to afford healthy food as higher prices are synonymous with nutrient-rich food compared to the less nutritionally sound alternatives available. Coping mechanisms employed generally see communities compromising on meat, dairy and fresh produce intake. Regarding the question as to why a population would consume a particular diet, it is important to understand the food and nutrition security situations households and individuals are placed under. Maize, wheat, bread and salt are the main foods procured among the South African population. Similar to the world-wide pattern, people are also eating more food that has not been prepared within the home. These foods tend to have a low nutritional quality, which render an increased prevalence of over-nourishment (Backeberg 2013).

2.4.4 Workplace health and wellness

According to Productivity SA (2015) a study conducted by the International Labour Organisation stated that poor nutrition in the job arena negatively influenced productivity. Nutrition accounted for approximately two thirds of loss in productivity and physical activity was linked to a 50% increased risk of low work efficiency. Factors such as inadequate water consumption, lack of balanced nutrient intake and insufficient fruit and vegetable intake may cause inferior productivity on the job. Additionally, employees become more at risk of gaining weight and

contracting other illnesses. It was also suggested that obese workers have a higher absenteeism rate than more fit workers (Productivity SA 2015 and Pietersen 2016). The World Health Organization's Regional Guidelines for the Development of Healthy Workplaces' definition of a healthy workplace is as follows: firstly, one that objectifies the creation of a healthy and safe work space; secondly, one where management practices are focused on the promotion of workplace and occupational health; thirdly, the style of work and livelihood should be of a health promotional nature; fourthly, it should be one where total organisation participation is mandated; and lastly, one where one's gains and successes are transferred to surrounding societies (Quintiliani 2007). The Heart and Stroke Foundation of South Africa advises that individuals should organise colleagues and form walking groups, ensure packed lunches are wholesome and avoid vending machines by storing snack food such as dried fruit and nuts at the work site, always keep water at the work desk as a reminder to keep hydrated, and change typical routes of getting to work to avoid take-away establishments along the way (Pietersen 2016).

2.4.5 Smoking and alcohol

Tobacco use is the most non-communicable cause of death in the world today and is expected to escalate to more than eight million deaths annually by 2030. Smoking increases the chances of an individual acquiring heart disease, carcinogenic abnormalities, lung disease, diabetes and premature death. It also has economic implications as medical expenditure rises and there is loss of productivity. Governments are not able to recover the burden of the costs of tobacco use through taxes collected from tobacco products either. In 2012 the prevalence of adults' tobacco smoking was 22%. Various countries' legislations have made progress in the control of tobacco use. This has been made possible through the affiliate states of the World Health Organization (WHO) having co-signed the WHO Framework Convention on Tobacco Control (WHO FCTC), which was instituted in 2005. The achievements to date will have a positive effect in future especially for public health efforts to combat NCDs. It would, however, require more effort and further innovative methods based on the WHO FCTC foundations and may promote further consultation and transformation across the globe (Lien and DeLand 2011 and WHO 2014b). The South African National Health and Nutrition Examination Survey-1 classified other tobacco products as 'hand-rolled cigarettes, pipes, cigars, cheroots and cigarillos, hookahs, hubbly-

bubbly pipes, a water pipe session, electronic cigarettes, snuff, chewing tobacco, and smokeless tobacco' (Shisana *et al* 2013: 95).

Major international companies have major implications on non-communicable diseases and make financial gains as the consumption of tobacco, alcohol, and ultra-processed food and beverages increases. Food and beverage markets use similar methods to the tobacco industry to weaken progressive public health strategies and interventions. The researchers believe that industries manufacturing unhealthy products should not be included in policy making for chronic diseases. Whilst understanding the fact that there is a reliance on regulations and partnerships to enhance public health there is still little proof of its usefulness. Therefore it is maintained that public regulations and market interventions are the best strategies to be used to prevent and treat non-communicable diseases (Moodie, Stuckler, Monteiro, Sheron, Neal, Thamarangsi, Lincoln and Casswell 2013). Aside from health concerns (and non-communicable disease conditions), the harmful use of alcohol brings substantial losses within social and financial contexts for individuals and communities. Of all the deaths in the world, alcohol related fatalities make up 5.9% and alcohol abuse is a feature resulting in more than 200 diseases and injury afflictions. Amongst the group of people aged between 20 and 39 years approximately 25% of the total deaths are the consequence of alcohol abuse (WHO 2014d).

Alcohol consumption can be the source of a multitude of diseases. How often consumption occurs and the quantity of intake may increase the risk of malnutrition, weight-gain, obesity and cardiovascular disease. A study on the nutritional status of alcoholics in peri-urban areas of Ghana (Accra) found that total energy intake for alcoholics was below the minimum estimated energy requirement intake for both males and females. Similarly, dietary intake was insufficient which could be associated with nutritional deficiencies. Respondents indicating predominantly beer or predominantly mixed alcoholic beverages intake had significantly higher weight, BMI and hip circumference. Higher anthropometric values could be explained by the effects of the nutritional content of beer (Klobodu 2014).

One review concluded that short-term consumption of alcohol does not decrease food intake but instead can encourage one to eat more after drinking alcohol. Equally, the kilojoules consumed from alcohol are added to the energy from other foods. This would mean that alcohol could be a

risk factor for high BMI. The researchers argue that moderate alcohol intake may protect against weight gain especially in women. Alcohol metabolism may contribute to this phenomenon; however, it should not be disregarded that different effects may present in different consumers. Concerns regarding binge drinking and frequency and type of alcoholic beverage consumed should also be taken into account and future research needs to be conducted to understand the relationship of alcohol consumption and the need to eat and obesity (Yeomans 2010: 87).

Another review study on the impact of alcohol on nutritional status, lipid make-up and hypertension prevalence presented that the extra intake of ethanol energy escalates weight gain and metabolic fluctuations leading to an increased risk of the development of cardiovascular disease, changing the lipid profile and promoting high blood pressure (Toffolo, de Aguiar-Nemer and da Silva-Fonseca 2012). Chiva-Blanch, Arranz, Lamuela-Raventos and Estruch (2013) state that heavy binge drinking of alcohol leads to causes of death and has dire effects on societies; however, they suggest further studies on the cardio-protective properties of moderate alcohol consumption should be conducted. But Toffolo, de Aguiar-Nemer and da Silva-Fonseca (2012) emphasise that even a moderate consumption of alcohol should not be recommended.

2.4.6 Physical activity

Physical activity is defined as ≥30 minutes moderate-intensity exercise per day for adults and 60 minutes for children and adolescents and the promotion of this is an important factor in interventions focusing on NCDs in SA. Additionally, research should not only place emphasis on increasing knowledge related to activity but also assist in limiting challenges that hinder activity. Supplementary to all this, biokineticists should play an active role in prescribing physical activity. The essentiality of physical activity is because it facilitates achieving constant energy balance and improving the body structure as it has positive effects on appetite, weight goals, glucose regulation, cholesterol control, blood pressure and the adversities of stress (Botha, Wright, Moss and Kolbe-Alexander 2013). A Chinese study highlighted that physical activity was also dependent on socio-demographic variables. For example, factory workers had physical activity rates higher than a population that is not in paid employment and adults endured half the amount of physical activity than the younger population. The most significant finding was that physical activity and fewer leisure periods were independently related to less adiposity as well as

that insufficient physical activity and more sedentary behaviours presented with higher adiposity (Du, Bennett, Li, Whitlock, Guo, Collins, Chen, Bian, Hong, Feng, Chen, Chen, Zhou, Mao, Peto, and Chen 2014).

2.4.7 Expenditure and behavioural factors

According to (Prasada 2016) the GDP of a country has a positive link with BMI and the rate of obesity and overweight is seen to peak among middle income ranges. Sturm and An (2014: 348) suggest that obesity is developed over a prolonged period of time and has escalated in the same away across different socio-demographic groups therefore meaning the environment affects people in similar ways. In America the obesity epidemic is propelled by the low cost of food in relation to income. According to the Living Conditions of Households in SA 2008/2009 report the second highest average annual household consumption expenditure item – after housing, and essential utilities – was food and non-alcoholic beverages. Food and non-alcoholic drinks contributed 19.3% to total household consumption expenditure (StatsSA 2012b).

In South Africa it generally appears that individual and household savings are low with a high debt rate. It is important to avoid excessive consumption – which includes food over-consumption – in order to make future savings and secure a good quality life. Urbanisation also has negative effects (such as rates payments, unemployment and food prices) on household savings seeing as a large part of the SA community still exhibits a lifestyle of consuming for immediate survival whereas the income growth indicates that this should have been modified. However, in viewing that there is a great use for more available credit it is possible that households are in fact consuming just to survive. This has led to higher consumption rates than would have been possible previously (Cronjé and Roux 2011).

According to Cruwys, Bevelander and Hermans (2015: 3, 15) the eating behaviour of people is influenced by social factors mostly, including social modelling. This involves the fact that humans tend to directly emulate the food intake of a companion. The belief is that what people consume is built up by standards provided by others. Social modelling also occurs when a person wants to get a better understanding regarding certain behavioural customs and also to gain social affiliation. Healthy or unhealthy eating behaviours may be explained by the human perception formed by social influence. According to Drewnowski, Moudon, Jiao, Aggarwal, Charreire and Chaix (2014:

8) in a study in Paris and Seattle, shopping at low-cost supermarkets was connected to the risk of obesity being higher in both the regions. Shopping in supermarkets where the prices were higher yielded a positive effect on the risk of obesity. The distance travelled to a primary supermarket, however, did not have an impact on the prevalence of obesity. Roberto and Kawachi (2014) reported that research shows that people struggle with comprehending health communications presented numerically, the main reasons being that numbers tend to be contextual and are not applied in the same way for all calculations related to nutrition. It appeared that traffic light labelling, however, could have better effects as the red (stop), amber (caution) and green (go) indications are more familiar. It is important to be cognisant that public health messages also influence what people believe and consequently act out. Compensation for changed eating cultures is seen when people tend to feel one can consume more of a product simply because it is labelled as 'low fat' etc. In addition, substitution is another behaviour exhibited by people. Once people have broken a 'diet' they may feel it has already been broken and therefore they can continue with consumption of that product.

Roberto and Kwachi (2014) state that as the environment has more unhealthy food available it makes consumers more prone to desiring to acquire instant gratification rather than weighing up the costs and benefits of healthier choices. Many consumers also have difficulty in following through on good intentions in the future such as commitment to 'exercising tomorrow'. Another psychological factor involves the mindless and automated nature of food consumption channelled by default choices available in food establishments. When served a large portion of food it appears as though it would be a reasonable amount of food to eat whereas on the contrary it wouldn't be. This applies, similarly, to packaging sizes.

2.4.8 Culture and society

Preparation methods

Home-prepared meals and the consumption thereof should be considered when it comes to health matters. Hartmann, Dohle and Siegrist (2013) identified that some populations previously suffered from poor health due to inadequate food practices and nowadays 'cooking skill' is associated with bad diet quality and overnutrition. Factors affecting daily meal preparation include household finances, ease of transportation, availability of kitchen equipment and the skill

required to utilise and apply all this. In a Swiss study 'cooking skills' was defined as the ability to prepare different foods to remove any application of a cultural context to the research conducted. It was found that many more women than men were responsible for the household meal preparation and had higher skill sets in older age groups. Men's skills were most likely manifested when the preparation of meals was incorporated as a fun activity whereas women felt it was obligatory. Women also built self-confidence and self-worth into their ability to prepare meals in addition to preventing unhealthy eating that is typical of men. Monsivais, Aggarwal and Drewnowski (2014) observed that people who did not spend a lot of time preparing food were working adults who prioritised convenience. Much more time expended on preparing food in the home was concomitant with indicators of better quality diet, including higher rates of fruits, vegetables, fruit juices and salad consumption. The population that spent less time (< 1 hour per day) on food preparation presented with a significant relationship with more money being used for food outside of the home. More money was used in restaurants in comparison to those who spent more time making food in the household.

Perceptions

The way individuals view body image or health may be contrary to the standards placed for a healthy image and healthy cut-off points. For instance, there are studies that have reported that only a few black overweight and obese women view themselves as being overweight. The moderately overweight women are considered by some societies as attractive and attributed it to respect, dignity and affluence. It is for this reason that many South African women who are overweight may not want to lose the 'weight' regardless of being aware of the health implications (Senekal, Mchiza and Booley 2008: 491). A study conducted in Ghana also revealed that women preferred an overweight but not obese body size. Appiah, Otoo and Steiner- Asiedu (2012) gathered that large body size is attributed to eating well, affluence and high social value. Regardless of associating a normal body size with health, the women still preferred a larger body size. Another view of culturally accepted body size is that discovered in women of Morocco. Batnitzky (2011: 348) found that the women interviewed had the notion that once one has entered motherhood one will be obese. The religious practices and cultural attitudes seemed to form a basis on which the adult women comprehended their health and obesity status and were seen to influence the day-to-day labour in the home. In addition, Malhotra *et al* (2008) also

reported that gender and the marriage status of respondents is associated with overweight and obesity as well as abdominal obesity.

Scaglioni, Salvioni and Galimberti (2006) stated that adults play a major role in the development of children and ultimately their eating practices also determine the habits of the child. What the child chooses to eat, what they prefer and the development of tastes are learned behaviours. It is therefore imperative that adults in the home create an environment for healthy eating behaviour. It is the adult caregiver's responsibility to also make a variety of foods accessible. Aleksejeva (2008) explored consumers' perceptions and responses to technologies applied in food production. Results indicated that the populations of four European countries, namely, Spain, France, Germany and Great Britain reported perceiving beef processing technologies as worthy choices for consumers who value convenience. Less demanding consumers perceived beef processing technologies as important for health and quality.

2.5 MALNUTRITION IN ADULTS

As humans go through the life cycle and enter adulthood, catabolic and degenerative processes start to manifest. The risk of developing overweight, obesity and abdominal obesity increases as natural physiological progressions of adulthood in conjunction with particular genetic disposition. Furthermore, life occurrences that bring about stress, imbalances in mental health and sleep patterns as well as illness, injuries and a build-up of toxins play a major role in the results of adulthood. It is the environment in which the body is placed and interacts with that influences certain behaviours together with social conditioning leading to certain health outcomes. Some of the modifiable risk factors include body size perceptions, food consumption, smoking and alcohol intake and stress which may all influence the development of malnutrition in adults in the form of non-communicable diseases (Senekal, Mciza and Booley 2008: 480).

Previously malnourishment would be used to refer to undernutrition. However, through developments over time it is agreed that malnutrition is simply defined as any nutrition imbalance. Although it has been viewed as a condition that may be more prevalent in poor communities experiencing food insecurity, malnutrition is also presented as overnutrition which links obesity and overweight to poverty and food insecurity due to a diet of low quality. This leads to an inadequate targeting of health necessary to limit lifelong diseases. Adults who

experience lack of energy intake, protein and other significant nutrients are said to have undernutrition. There is an impairment of processes of absorption, nutrient utilisation and transportation associated also with weight loss (Tanumihardjo, Anderson, Kaufer-Horwitz, Bode, Emenaker, Haqq, Satia, Silver and Stadler 2007: 1966; and White, Guenter, Jensen, Malone, Schofield, the Academy Malnutrition Work Group; the American Society of Parenteral and Enteral Nutrition (ASPEN) Malnutrition Task Force; and the ASPEN Board of Directors 2012: 275).

Letamo and Navaneetham (2014) found that in a Botswana study (n=9023 adults between the ages of 20 and 49 years) lower BMI's indicating undernutrition were synonymous with no education and low socioeconomic groups. Among women low BMIs were most prevalent among women who hadn't watched TV at least once a week and were younger. Higher rates of low BMI were found in men who were not married. Underweight and undernutrition appears not to be a serious issue in South Africa among the adult population. Prevalence of overweight and obesity have more cause for concern especially for the urbanised population, particularly black women and white men (Senekal, Mchiza and Booley 2008: 484).

The escalating number of deaths from diabetes, chronic kidney disease and cancers is indicative of the burden of non-communicable diseases in South Africa. It is rising in rural societies and among the poor in urban areas too. This has implications for the demand for support for persons afflicted and for the country as a whole (Mayosi, Flisher, Lalloo, Sitas, Tollman, Bradshaw 2009). The disease profile of low and middle income countries is transforming at a fast rate. The non-communicable diseases, also referred to as chronic diseases of lifestyle, include diabetes mellitus, cardiovascular disease and hyperlipidaemias have risk factors that are recognised as modifiable. Risk factors of chronic diseases of lifestyle include an unhealthy diet and the level of physical activity. There are underlying factors outside of the individual's control which may be social and structural e.g. globalization, urbanisation and population ageing (Steyn, Blaauw, Lombard and Wolmarans 2008: 695).

2.6 POPULATION NUTRIENT INTAKE GOALS FOR PREVENTING DIET RELATED CHRONIC DISEASES

According to the WHO (2015g) in order to be protected against malnutrition and NCDs a healthy diet is needed. Some of the most prominent risks to health include unhealthy diets and lack of physical activity, therefore healthy lifestyles need to be practiced throughout all the life stages. Although dietary consumption varies according to each individual, cultural background and norms as well as availability of food, there are basic principles guiding what a healthy diet should include.

The years before reaching adulthood put major demands on the life processes of development, growth, reproduction and maturing which cause an increase in terms of nutrient requirements. Dire repercussions are faced in later life should these needs not be met. The adult years of 19–65 years of age signify the life stage where the majority of negative consequences of insufficient nutritional intake and poor health behaviours begin to emerge as diseases. As there are no longer demands to keep up with growth and maturation in adulthood the nutrient requirements decrease from adolescence. A nutrient dense diet becomes most crucial where energy requirements tend to become less through lower levels of activity and body development depending on body size, gender and state of health as well as environment, genetics, ethnicity, adaptation and accommodation (Langley-Evans 2015: 219-220 and Institute of Medicine (IoM) 2006). The dietary reference intake focuses on nutrient requirements and the food based dietary guidelines present practical advice on actual food intake.

In order to have a standard form of dietary information the South African Food Based Dietary Guidelines was a tool developed to educate and promote a healthy lifestyle for consumers. These guidelines can be an effective tool for dealing with public health problems in SA. The evidence based promotion messages for South Africans above the age of 5 years are:

- Enjoy a variety of foods.
- Be active.
- Make starchy foods part of most meals.
- Eat plenty of vegetables and fruits every day.
- Eat dry beans, split peas, lentils and soya regularly.

- Have milk, maas or yoghurt every day.
- Fish, chicken, lean meat or eggs can be eaten daily.
- Drink lots of clean, safe water.
- Use fats sparingly. Choose vegetable oils rather than hard fats.
- Use sugar and foods and drinks high in sugar sparingly.
- Use salt and food high in salt sparingly. (Vorster, Badham and Venter 2013: S5)

2.6.1 Recommended Dietary Reference Intake (DRI)

The DRIs are a benchmarking tool to achieve optimal nutrition by providing guidelines on nutrient intake that avoid deficiency and capitalize on healthy lifestyle and overall enhancement of living. The DRI term denotes a collection and refers to a set of at least four nutrient-based reference values. A nutrient requirement can be described as the minimum frequent consumption rate of a nutrient that, for a particular indicator of sufficiency, will maintain a standard of nutrition in a person (NICUS 2003). The DRI framework covers: the aim to create recommendations to equal variable practices, the role of nutrients in reducing the likely threat of chronic diseases, the insertion and review of other components of food, the use and rationale for functional end points as well as the calculation of estimates of upper safe levels of nutrient intake.

An average daily nutrient intake is taken into consideration and it is to be noted that a certain amount of deviation regarding the average value over a number of days would be anticipated. Therefore, it is the average mean intake over a period of time that is the nutritionally key reference value.

The four reference values are:

Estimated Average Requirement: Refers to intake that meets the projected needs of a nutrient of every one in two (50%) individuals in a specified gender group at the given age. The EAR is a dietary consumption amount and includes an adjustment for an assumed bioavailability of that respective nutrient. The RDA is set using the EAR and if insufficient proof is found to determine an EAR, no RDA is set.

Recommended Dietary Allowance: This intake is sufficiently met by most (97-98%) of the persons in that gender group at the known age. This reference applies only to individuals and is what the individual should aspire to achieve in dietary intake.

Adequate Intake: If the scientific evidence to set an EAR is not up to standard the AI is used as opposed to the RDA. The AI is determined accordingly from experiments whereby intake levels or estimations of mean nutrient intakes have been witnessed in a group of healthy persons who have typical circulating plasma concentrations, growth or other efficient indicators of health.

Tolerable Upper Intake Level: Defined as the maximum nutrient intake by an individual that could possibly pose a risk of unhealthy effects in almost 97-98% of individuals in an identified sample (NICUS 2003 and IoM 2000).

2.6.2 Macronutrients

The three macronutrients namely carbohydrates, protein and fat can substitute for one another to meet the body's kilojoule requirements. AMDRs were set to meet these needs and limit the possibility of developing chronic diseases. Adults are required to consume: 45-65% of total energy from carbohydrates, 10-35% from protein and 20-35% from fat. Although fibre may be considered a macronutrient an AMDR was not set for it. Physical inactivity, energy imbalance and excessive and deficient intake of macronutrients are linked to diabetes, obesity, coronary heart disease, cancer, dental caries and skeletal health (IoM 2006: 81 and NICUS 2003: 13).

2.6.2.1 Energy

Energy is needed to sustain the body's functioning of respiration, circulation, metabolism and the production of protein as well as to enable it to do physical work. The Estimated Energy Requirement (EER) may be defined as the average dietary energy intake that is expected to maintain energy balance in a healthy adult specific to age, gender, weight, height and a level of physical activity that is consistent with good health (IoM 2006:83). Table 2.1 illustrates the different categories of physical activity.

Table 2.1: Physical activity level (PAL) categories (NICUS 2003)

Physical Activity Level Categories	
Sedentary	PAL ≥ 1.0 - < 1.4
Low active	PAL ≥ 1.4 - < 1.6
Active	PAL ≥ 1.6 - < 1.9
Very active	PAL ≥ 1.9 - < 2.5

The energy requirements for adults with an 'active' physical activity level (PAL) are as follows:

Table 2.2: Estimated energy requirement (EER) (NICUS 2003)

Men 19-50 years	12 881 kJ
Men 51+ years	12 881 kJ
Women 19-50 years	10 093 kJ
Women 51+ years	10 093 kJ

2.6.2.2 Carbohydrates

There are three kinds of carbohydrate categories i.e. sugars, starches and fibres. The main function of carbohydrates is to provide energy to body cells. Carbohydrates are recommended at an EAR of 100g per day (NICUS 2003 and Slavin and Carlson 2014: 760). This recommendation is founded on the minimum glucose needs for use by the brain. A diet that is too low in carbohydrates manifests in the increased synthesis of keto-acids. This diet can cause bone mineral loss, cholesterolemia, risk of developing stony concretions in the bladder or urinary tract known as urolithiasis, and compromised growth and function of the spinal cord and brain (IoM 2006: 109;121).

Table 2.3: Sources of carbohydrates (IoM 2006: 109; 121)

SUGAR	STARCH	FIBRE
Soft drinks, sugars, sweets, sweetened grains, concentrated fruit juices, sweetened dairy products, breakfast cereals	Maize, tapioca, wheat flour, cereals, popcorn, pasta, rice, potatoes, crackers and vegetables,	Fruits, vegetables, legumes and grains

2.6.2.3 Fibre

Fibre is considered a complex carbohydrate as it includes a number of substances from cell walls of plants that pass through the digestive tract mostly unchanged. These substances are cellulose,

hemicellulose, pectin and lignin also known as non-starch polysaccharides. Further characteristics of fibre are that firstly, some fibres are soluble and affect glucose and fat absorption in the stomach. Secondly, some fibres are insoluble and they gradually and incompletely ferment, having noticeable effects on bowel movements. It has been reported that the consumption of complex carbohydrates could reduce the risk of some cancers (Langley-Evans 2015: 255 and FAO 1998). The adequate intake for fibre is based on the mean intake level to attain the lowest risk in coronary heart disease (CHD). The recommended dietary intake for men19-50 years, women 19-50 years, men 51+ years and women 51+ years is 38g, 25g, 30g and 21g AI per day respectively (NICUS 2003). The main functions and benefits of fibre include adding bulk to the diet and yielding a sense of satiety that minimises appetite. Fibre holds water and forms a gel in the digestive process allowing carbohydrate to be trapped and reducing the absorption rate of glucose therefore regulating blood sugar levels and cholesterol. Heart disease and metabolic syndrome risk may be minimised by an adequate intake of fibre which can also facilitate improvement of constipation. Through the balancing of intestinal pH, fibre allows for the fermentation of short-chain fatty acids which may reduce colorectal cancers (Dhingra, Michael, Rajput and Patil 2012: 261).

2.6.2.4 Protein

The RDA for protein is 0.5g per kilogram of body weight with additionally 10g and 15g recommended for lactating and pregnant women respectively. The quality of proteins differs in their ability to supply nitrogen and amino acid requirements that are vital for the growing body and its maintenance and reparation. In adults a deficiency of protein may lead to the loss of lean body mass and consequently towards a high risk of susceptibility to diseases. Protein is found in all the cells of the human body. Also, the amino acids (which are most important) that form proteins act as precursors for molecules, vitamins, hormones and nucleic acids (Watford and Wu 2011: 62 and IoM 2006: 154).

The best sources of protein to consume are meat, poultry, fish, eggs, cheese and yoghurt which offer all the amino acids and are known as ‘complete proteins’. From plants there are incomplete proteins found in legumes, nuts, seeds and vegetables. The reason for plants being considered

incomplete is that not all nine essential amino acids may be found in plant sources (IoM 2006: 154).

2.6.2.5 Fat

The function of fat is to help in the development of tissue and the absorption of Vitamins A, D, E and K (fat soluble vitamins). Fat also aids in the absorption of components such as carotenoids. Fatty acids are contained in dietary fat as saturated fatty acids, mono-unsaturated, polyunsaturated and trans-fatty acids. A diet that is high in fat may yield excessive energy leading to obesity. Links have also been made between high fat consumption and a heightened possibility of CHD, cancer and insulin resistance. However, the fatty acid intake must be considered in these links. It is recommended that trans-fatty acids and saturated fatty acids be limited.

Sources of fat include:

- Butter and margarine
- Vegetable oils
- Visible fat on meat and meat products, whole milk and egg yolks
- Nuts (NICUS 2003).

2.6.3 Micronutrients

Vitamins and minerals are called micronutrients as they are required in very small amounts. These very small amounts required do, however, have dire consequences if not met as good nutrition and health are dependent on micronutrients. Micronutrients are essential in the production of enzymes, hormones and other substances necessary for growth and development. The most common deficiencies observed are of iodine, vitamin A, iron, zinc and folate which may be caused by various factors and micronutrient deficiencies are usually interconnected. At the basic level, deficiencies occur due to an inadequate diet which would need a long-term turnaround strategy taking into consideration the population's income, food security status and better health services delivery as well as feeding practices (WHO 2016b and Strang 2009).

2.6.3.1 Minerals

Minerals are inorganic elements that are indestructible and yield no energy. There are 16 essential minerals which are required by the body and may be categorised into either macro-minerals or micro-minerals (trace elements). These inorganic elements can be bound by other substances that interfere with the absorption into the body. All minerals are vital and mainly function to maintain the fluid balance in the body (Whitney, Cataldo and Rolfes 2002).

- **Sodium**

The macro-mineral sodium is also commonly known as salt. The electrolyte aids the body to control fluid balance in cells as well as muscle flexing and the flow of nerve impulses. The regulation of salt intake is vital as high consumption has implications for someone being at risk of stroke and high blood pressure whereas lower sodium consumption appears to decrease blood pressure in adults. Salt is found in high proportions in table salt, smoked, canned and cured meats, cheese and soy sauce. Naturally, it is also found in milk and shellfish and in low quantities in fruit and vegetable intake; a high consumption of processed foods is also often associated with a high sodium intake. A strong recommendation is made by the WHO to maintain salt consumption at 5g per day which translates to <2g of sodium per day. This is to limit elevated blood pressure and the possibility of cardiovascular disease, stroke and coronary heart disease in adults (IoM 2005 and WHO 2012). In Sub-Saharan Africa an issue remains that a large percentage of the population is suffering from hypertension but it is not diagnosed or treated. In effect the burden of cardiovascular disease continues to rise. Furthermore, the awareness and control of the condition is not adequate, which calls for interventions and strategies to address the hypertension matter (Ataklte, Erqou, Kaptoge, Taye, Echouffo-Tcheugui and Kengne 2014).

- **Potassium**

This nutrient is found as a positive molecule within the cells in the body, the main functions being similar to that of sodium by assisting muscle contraction, regulation of fluids and mineral stability. Potassium facilitates the maintenance of normal blood pressure by moderating the effect of sodium. In the elderly years potassium has the potential to decrease the risk of intermittent kidney stones and bone loss. The recommended AI is 4.7g/ 120mmol/day for people

above the age of 16 years. Hypokalemia – a serum potassium concentration of less than 3.5 mmol/ L – is characteristic of severe potassium deficiency manifesting as weakened muscles, irregular heartbeat and glucose intolerance. Moderate deficiency is presented with high blood pressure, elevated salt sensitivity, higher risk of kidney disease and increased bone turnover. CVD, and more specifically stroke, is heightened by an insufficient intake of potassium. To meet the body's potassium needs foods to be consumed include: green leafy vegetables such as 1 cup of cooked spinach which provides 840 mg of potassium, tomatoes, zucchini, baked potato (which consumed with the skin on contains approximately 926 mg), meat products as well as banana, which can yield an estimated 425 mg of potassium (IoM 2005: 186-187 and Kohn 2014).

Table 2.4: Minerals

Nutrient	Sources and functions of nutrient	DRI Men and women 19-50 years	DRI Men and women >51 years
Calcium (mg/day)	Found primarily in dairy foods and helps with building strong bones and teeth, assisting the heart to beat as well as keeping the muscles healthy and helping them contract (Weaver and Peacock 2011: 290 and NICUS 2016a)	♂ 1000 AI ♀ 1000 AI	♂ 1200 AI ♀ 1200 AI
Iron (mg/day)	Haem-iron is found in meat, organ meat, seafood and poultry. Non-haem-iron is found in iron enriched or fortified foods such as cereals. The function of iron is to promote healthy blood by helping red blood cells carry oxygen. Iron plays a role in the maintenance of a healthy immune system as well as brain development and function. Also, iron forms part of enzyme reactions that carry messages from one nerve cell to another (McDermid and Lönnerdal 2012:533 and NICUS 2016b)	♂ 6.0 EAR ♀ 8.1 EAR	♂ 6.0 EAR ♀ 5.0 EAR
Magnesium (mg/day)	Found in fruits, vegetables, whole grains, legumes, nuts, milk, meat, fish and fortified cereals. Forms part of more than 300 enzymes in the body that help regulate many bodily functions, including the production of energy, body protein and muscle contractions. It also plays a role in maintaining healthy bones and a healthy heart (Costello, Wallace and	♂ *340 EAR ♀ *260 EAR	♂ 350 EAR ♀ 265 EAR

	Rosanoff 2016: 199 and Academy of Nutrition and Dietetics 2014).		
Phosphorous (mg/day)	Milk and dairy are the best sources followed by meat and poultry. Phosphorous is present in the structure of bones and teeth and DNA and allows the bipolarity of lipid membranes and circulating lipoproteins. It buffers blood, regulates gene transcription, active enzyme catalysis and enables signal conversions (Calvo and Lamber- Allardt 2015).	♂ 580 EAR ♀ 580 EAR	♂ 580 EAR ♀ 580
Zinc (mg/day)	The richest food sources are shellfish and red meat, with beans, nuts and whole grain products considered as good sources as well. Zinc promotes immunity and proper growth and development of the nervous system, and is integral to successful pregnancy (Huang, Drake and Ho 2015 and CDC 2015).	♂ 9.4 EAR ♀ 6.8 EAR	♂ 9.4 EAR ♀ 6.8 EAR
Selenium (µg/day)	Brazil nuts, seeds, green vegetables and white shiitake and button mushrooms. Fish, sea food, beef, poultry and bread are also good sources of selenium. Selenium has antioxidant properties which protect cells against damage and help maintain their health (Prabhu and Lei 2016: 416 and NICUS 2016c).	♂ 45 EAR ♀ 45 EAR	♂ 45 EAR ♀ 45 EAR
Iodine (µg/day)	Marine foods have a high iodine content and iodized salt used in the household provides additional iodine. Iodine is an essential component of the thyroid hormones which regulate many key biochemical reactions, especially protein synthesis and enzymatic activity with the main target organs being the developing brain, muscle, heart, pituitary, and kidney (Zimmermann and Trumbo 2013 and Institute of Medicine 2001: 258).	♂ 95 EAR ♀ 95 EAR	♂ 95 EAR ♀ 95 EAR

2.6.3.2 Vitamins

According to NICUS (2016d) ‘vitamins are essential nutrients required in very small amounts and serve as facilitators for normal metabolism, growth and physical well-being. Most vitamins are not made in the body so they must be obtained from the diet. The 13 major vitamins are

found in a wide range of foods and each has a different function in the body. Many are essential for the biochemical processes within our cells and tissues. Vitamins are either fat soluble or water soluble. Fat soluble means they dissolve in fat and unused supplies can be stored in the body. Water soluble vitamins dissolve in water and cannot be stored in the body. Therefore we need a daily supply from the diet.'

Water soluble vitamins

Table 2.5: Water soluble vitamins

Nutrient	Sources and functions of nutrients	DRI Men and women 19-50 years	DRI Men and women >51 years
Thiamin (mg/day)	Thiamin also known as Vitamin B1 is found in pork, green peas and whole-grain and enriched-grain products including bread, rice and pasta. It forms part of a coenzyme used in energy metabolism, supports normal appetite and functioning of the nervous system (Marcason 2015 and NICUS 2016e).	♂ 1.0 EAR ♀ 0.9 EAR	♂ 1.0 EAR ♀ 0.9 EAR
Riboflavin (mg/day)	Riboflavin functions as a coenzyme for various oxidation–reduction reactions in several metabolic pathways and in the production of energy. Most plant and animal tissue contains at least small amounts of riboflavin. Milk and milk products, whole-grain or enriched bread and cereals are good sources of riboflavin including organ meats (IoM 2006: 275 and Whitney, Cataldo and Rolfes 2002: 314).	♂ 1.1 EAR ♀ 0.9 EAR	♂ 1.1 EAR ♀ 0.9 EAR
Niacin (mg/day)	Found in corn, nuts and legumes, fish and meats. Mainly functions in energy transfer reactions especially in the breakdown of fat, glucose and alcohol (Meyer-Ficca and Kirkland 2016 and Whitney, Cataldo and Rolfes 2002: 316)	♂ 12 EAR ♀ 11 EAR	♂ 12 EAR ♀ 11 EAR
Vitamin B6 (mg/day)	Rich sources include ready-to-eat cereals, fish, liver and offal, potatoes and other starchy vegetables, legumes, nuts, bananas, avocado, egg yolks and whole grains. Vitamin B6 functions as a coenzyme in the metabolism of amino acids and glycogen (Stover and Field 2015 IoM 2006: 183).	♂ 1.1 EAR ♀ 1.1 EAR	♂ 1.4 EAR ♀ 1.3 EAR
Folate (µg/day)	Green leafy vegetables and dark green vegetables (such as broccoli and Brussels sprouts), orange juice, beans and other	♂ 320 EAR	♂ 320 EAR

	legumes are considered excellent sources. Folate is a vitamin that is essential in the early days of foetal growth for healthy development of the brain, spinal cord and skull therefore making it important to achieve sufficient levels of folate in women prior to conception to reduce neural tube defects. Supplementation of women 15-49 years with folic acid and fortification of foods such as wheat flour with folic acid are effective interventions for the reduction of birth defects, morbidity, and mortality in new-borns (Chan, Bailey and O' Connor 2013 and CDC 2015)	♀ 320 EAR	♀ 320 EAR
Vitamin B12 (µg/day)	Naturally only found in animal sources e.g. meat, eggs, fish and shellfish. Needed for the formation of proteins and red blood cells, and for the functioning of the nervous system. Vitamin B12 participates in a variety of cellular reactions to release energy from carbohydrates, fats and protein, folate metabolism and healthy nervous system by maintaining the myelin sheath that separates nerve fibres from each other (Allen 2012 and NICUS 2016f).	♂ 2.0 EAR ♀ 2.0 EAR	♂ 2.0 EAR ♀ 2.0 EAR
Pantothenate (mg/day)	Found in beef, poultry, whole grains, potatoes, tomatoes and broccoli. Involved in the production of lipids, neurotransmitters, steroid hormones and haemoglobin (Whitney, Cataldo and Rolfes 2002: 320).	♂ 5.0 AI ♀ 5.0 AI	♂ 5.0AI ♀ 5.0 AI
Biotin (µg/day)	Found in egg yolk, liver, whole cereals and some vegetables. Plays an integral role in metabolism as it carries activated carbon dioxide. Used in energy absorption, fat synthesis, amino acid metabolism and glycogen production (Zempleni and Kuroishi 2012 and Whitney, Cataldo and Rolfes 2002: 319).	♂ 30 AI ♀ 30 AI	♂30 AI ♀ 30 AI
Vitamin C (µg/day)	Found in citrus fruit, kiwi, mango and vegetables such as broccoli, tomatoes and peppers. Acts as an antioxidant with a number of functions: as a forager of free radicals; as a co-factor for several enzymes involved in the biosynthesis of carnitine, collagen, neurotransmitters, and in vitro processes (Lykkesfeldt, Michels and Frei 2014 and IoM 2006: 203).	♂ 75 EAR ♀ 60 EAR	♂ 75 EAR ♀ 60 EAR

Fat soluble vitamins

Table 2.6: Fat soluble vitamins

Nutrient	Sources and functions of nutrients	DRI Men and women 19-50 years	DRI Men and women >51 years
Vitamin A (µg/day)	Found in liver, kidney, fortified margarine, yellow and dark green leafy vegetables and fruit and apricots. The main function of vitamin A is to promote healthy eyesight and normal growth and development, helping the body's immune and reproductive systems (NICUS 2016g).	♂ 625 EAR ♀500 EAR	♂ 625 EAR ♀ 500 EAR
Vitamin D (µg/day)	Although few foods naturally contain vitamin D the richest sources are cod liver oil, fatty fish e.g. salmon, tuna or mackerel with modest sources being found in beef liver, eggs and sardines. The significant role of vitamin D is to maintain the balance of calcium and phosphorous, normal cell growth and functioning as well as the functioning of organs such as the skin, pancreas, muscles, nerves and the immune system (Brannon and Fleet 2011 and NICUS 2016h).	♂ 5.0 AI ♀ 5.0 AI	♂ 10 AI ♀ 10 AI
Vitamin E (mg/day)	Vitamin E has an antioxidant effect which helps maintain healthy cells and protects against conditions such as ageing, air pollution, arthritis, cancer, cardiovascular disease, cataracts, diabetes and infection. It is mainly found in fortified ready-to-eat cereals, almonds, seeds like sunflower seeds, spinach and vegetable oils and egg yolk (NICUS 2016i and Traber and Manor 2012).	♂ 12 EAR ♀ 12 EAR	♂ 12 EAR ♀ 12 EAR
Vitamin K (µg/day)	The main function of vitamin K is the synthesis of proteins that clot blood and regulate blood calcium levels. It is found in most green vegetables and in addition to spinach, broccoli, kale and collards, it is also present in soybean oil and canola oil (NICUS 2016 and Suttie and Booth 2011).	♂ 120 AI ♀ 90 AI	♂ 120 AI ♀ 90 AI

2.7 NUTRITIONAL ASSESSMENT OF ADULTS

Nutritional assessment is defined as 'a comprehensive approach to diagnosing nutrition problems that uses a combination of the following: medical, nutrition and medication histories; physical examination; anthropometric measurements; and laboratory data' (Mueller, Compher, Ellen and ASPEN Board of Directors 2015: 16).

In order to conduct a holistic nutritional situational analysis of a community certain procedures and evaluations may be administered. Included in this study are dietary surveys and anthropometric measurements. Keeping in mind that the assessments need to be appropriate to the population so as to yield relevant and valid information in relation to the size of the population, clinical, laboratory and ecological methods may also be used. Nutritional assessment systems are used to provide an overview to advise nutrition screening, surveillance and interventions that may need to be applied in a community.

2.7.1 Anthropometric measurements

This is the measurement of the physical scope and combined make-up of the human body structure. These measurements may vary with age, gender, race and level of nutrition. Anthropometric data is useful to identify if long-term imbalances of protein and energy have occurred. In addition, the advantages of anthropometric measurements are the provision of past nutritional history, and that it can be performed quickly, easily, and reliably using standardized procedures and portable calibrated tools (Gibson 2005: 6).

- **Waist circumference**

  The measurement of the waist circumference is a good indicator of abdominal fat. It is associated with gross body fat. It is a cheap and simple method unrelated to height and also reliable in the pre- and post-weight loss treatment of a subject (Gibson 2005: 284). The cut-off points for the risk of excessive abdominal fat are: men: ≥102cm and women ≥88cm. A non-stretchable tape measure is used to measure the distance just above the uppermost lateral border of the right uppermost and largest bone of the pelvis. The tape measure is then extended in a loop around the waist (Center for Disease Control 2007).

- **Waist-hip circumference ratio**

The waist-hip ratio is calculated by dividing the waist circumference by the hip circumference. It is used as an assessment as central obesity is recognised as a risk factor in the existence of some diseases. This is a simplified method for determining adiposity in the lower body and adiposity in the waist and abdomen areas. Fatness in the hip area is referred to as gynoid obesity. Upper body fatness is called android obesity and is most prevalent in men. Waist-hip ratio is related to total body fat mass (Gibson 2005: 279).

- **Waist-to-height ratio**

This is a measure of fat distribution and primarily identifies those with abdominal obesity. A person is considered obese if their waist circumference is over half their height (threshold of 0.5) (National Institute of Health Research 2013: 5). In an effort to ascertain the accuracy of waist circumference and WHtR thresholds in determining risks of cardiometabolic factors it was found that both measurements significantly predicted all cardiometabolic risk factors after five years. The study included adult men and women (n=1519) in the North West province (Ware, Rennie, Kruger, Kruger, Greef, Fourie, Huisan, Scheepers, Uys, Kruger, Van Rooyen, Schutte and Schutte 2014). Similarly, Millar, Perry and Phillips (2015) state that BMI and WHtR combined also provide a better means to determine cardiometabolic risk. On the other hand, however, Ashwell and Gibson (2016) suggest that the waist-to-height ratio singularly identified more people at 'early health risk' as opposed to a matrix including BMI and WC.

- **Body Mass Index**

BMI is also known as obesity index. It is a weight-to-height ratio giving a measure of overweight and obesity in adult populations. It is most popular as it is unbiased and matches well with lab based measures of adiposity (Gibson 2005: 259). It is commonly used in large nutritional surveys and epidemiological studies as it is also more accurate than skin fold thickness assessment. The only disadvantage is that BMI does not take into account muscle and weight associated with body fat nor does it provide an indication regarding the distribution of fat. Discrepancies may be found in some populations depending on athleticism, having individuals that are very short or with leaner body composition. This may lead to some populations being classified incorrectly as overweight or obese (Gibson 2005:

260). The BMI cut-off points do not differ by age or gender; however, due to varying proportions of body size the level of fatness might not be the same in a range of populations. BMI is a basic guide of weight-for-height usually used to categorise underweight, overweight and obesity in adulthood. The calculation is weight (kg) divided by height in metres squared (kg/m^2) (WHO 2006).

Table 2.7: The international classification of adult underweight, overweight and obesity according to BMI

Classification	**BMI(kg/m^2)**	
	Principal cut-off points	**Additional cut-off points**
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004.

- **Skinfold thickness**

This measurement involves the obtaining of the extent of subcutaneous fat found directly under the skin by clutching a fold of skin and subcutaneous fat and measuring it using callipers. It is used mainly to determine relative fatness and the percentage of body fat (Public Health England 2016). According to the National Institute of Health Research (2013) skinfold thickness is a direct anthropometric measurement of adiposity. Dimension measurements may be taken from the subscapular and the triceps, chest, underarm, abdomen, suprailium and thigh. Ranges of skinfold thickness may be adjusted for age and gender. Adult women and men with body fat of 32% and 26% or higher respectively are classified as obese. One of the limitations of skinfold

thickness is that fat in the abdominal cavity is not determined (National Institute of Health Research 2013: 5).

2.7.2 Laboratory assessment

Table 2.8 Laboratory methods (Gibson 2005)

Static tests	Functional tests
Nutrients in biological fluids or tissues	Two types: functional biochemical tests and functional physiological/ behavioural tests
Urinary excretion rate of the nutrient or its metabolite	Used to detect later stages in the development of nutritional deficiencies
Useful for identifying the second and third stage in the development of a nutrient deficiency	Measures nutrient status linked with optimal health and reduction in the chronic disease.
	Examples: Papillary and visual threshold for Vitamin A and taste acuity for zinc

2.7.3 Tools for measuring Dietary Intake

- **24-Hour Recall**

In the administration of the 24-hour recall the participant is interviewed by open-ended questioning and the information provided indicates daily habitual food intake. The recall requires information regarding the previous day's consumption including type of food and quantities in detail. Descriptive tools such as food models may be used to assist participants in recalling food intake. In dietary analysis several 24-hour recalls are used to provide a more holistic view of the intake. Since 24-hour recalls are indicative of short-term food consumption it may be used in conjunction with other assessments such as the Food Frequency Questionnaire. The time-consuming nature and repetition of interviews may, however, potentially be a burden on the respondent's memory. Recollection about food preparation, ingredients in mixed dishes and brand names becomes important in assisting to extract accurate details and this requires extensive training for data enumerators (Shim, Oh and Kim 2014: 2-3).

- **Food Frequency and Quantitative Food Frequency Questionnaire (QFFQ)**

This is a list of foods that may be customised to be relevant to the study population provided for the respondents to select from and indicate a retrospective review of food intake rate per day, week or month. A qualitative food frequency questionnaire includes portion size

consumed and specification on how often consumed over a certain period of time, which yields more accuracy and validity. Food frequency questionnaires are most preferred for groups rather than single assessment and are suitable in studies seeking to describe diet-disease relations. The limitations of the food frequency questionnaires are that it does not provide meal pattern data and needs the respondent to be literate should it be self-administered (Walsh and Joubert 2010: 294).

- **Nutritional knowledge**

According to FAO (2014c) knowledge, attitude and practices are used to collect information at the situational assessment stage of research and to evaluate nutrition education intervention. The main objectives are to evaluate people's orientation regarding nutrition and health concerns. The South African National Health and Nutrition Examination Survey-1 used a general nutrition knowledge questionnaire. It consisted of 9 questions; scores between 0-3, 4-6 and 7-9 out of 9 correct answers were rated as low, medium and high respectively (Shisana *et al* 2013: 178). There are, however, longer questionnaires such as the 45-item general nutrition knowledge questionnaire used in a study of adults in Limpopo. Current dietary advice, nutrient sources and diet-disease relationships were covered. Basically, the questions gave guidance and ascertained whether or not people were able to make healthy food choices (Peltzer 2004). Similarly, a 60-item questionnaire was developed for adolescents (Whati, Senekal, Steyn, Nel, Lombard and Nel 2005), which may be adapted and it is important to remember that such a questionnaire requires that it be used with several other measurement tools to inform nutrition education interventions.

- **Food diary or record**

For the food diary or record study respondents are trained on how to record all that was eaten and the amounts commonly measured in household units. Respondents can be provided with a food scale and booklets with pictorial depictions of food portions for accuracy. Respondent burden is, however, high for this method. According to Smolin and Grosvenor (2013: 62) the food diary recording is usually done between 2 to 7 days with inclusion of at least one weekend day. Intake of food may, however, be affected due to respondents opting not to consume foods one would usually consume in order to avoid recording it.

2.8 METHODS TO ADDRESS THE EFFECTS OF THE NUTRITION TRANSITION

For prolonged and sustainable progress in the reduction of malnutrition (especially micronutrient deficiency), enhancing livelihoods, educational empowerment and economic productivity, as well as collaborative approaches at national level are vital. In the short term, however, populations can be saved and lives improved through a range of economical interventions, including supplementation and fortification (Strang 2009).

The newly developed sustainable development goals (SDGs) are a global initiative to assist the human population in achieving quality life. Although these targets are not completely focused on food and the nutrition transition it is significant to note that a number of issues to be addressed by the goals are closely linked to the global diet transformation. Battersby (2016) argues that the SDGs associated with food do not address urban food security in Africa. The researcher suggests that the SDGs have neglected the urbanisation of food insecurity and the nutrition transition. The nature of food and nutrition security has been insufficiently appreciated as its functions are based on predisposed forms of development plans. Sustainable development as defined by the Bruntland Commission in 1987 remains as ‘ability to meet the needs of the present without compromising the ability of future generations to meet their own needs’ (Kosciulek 2015).

The goals stem from achievements made through the MDGs and encompass the need to achieve various factors that are counter-productive to general human well-being. The 17 goals administered through the United Nations Development Programme are as follows:

1. No poverty
2. Zero hunger
3. Good health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry, innovation and infrastructure
10. Reduced inequalities

11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Life below water
15. Life on land
16. Peace, justice and strong institutions
17. Partnerships for the goals (UNDP 2017).

The UNDP further emphasises that the SDGs will serve as a guideline for the following 15 years (2016-2030) for global action pertaining to the economics, social factors and the environment in which the world population exists (UNDP 2017 and Institute of Development Studies 2016). According to the Kosciulek (2015) and the South African Department of Environmental Affairs, the Department of International Relations and Cooperation (DIRCO) was tasked with negotiating for SA throughout the process of establishing the SDGs. The SA National Development Plan has aligned South Africa's stance to the SDGs as it focuses on unemployment, prolonged poverty and inequalities challenging the South African population.

2.8.1 Dietary diversification and modification

The primary objective of dietary diversification and modification is to improve the availability, access and usage of foods containing high content and bioavailability of micronutrients all year round. Transformation occurs in the food production practices, food selection patterns and traditional household methods for preparing and processing indigenous foods. To ensure successful implementation of these methods it is significant that cognisance be taken of the local dietary patterns and food beliefs, preferences and taboos, as well as the ability to change outlooks and customs. Dietary diversification/ modification may be more sustainable, economically reasonable and socially acceptable than supplementation or fortification and can be used to alleviate several micronutrient deficiencies concurrently without risk of antagonistic exchanges. Indigenous wild plants typically rich in micronutrients may be modified to survive conditions of extreme dry weather and heat, seeing as these crops are easy to grow and are usually accepted by local rural communities. Other strategies involve fertilizing soil to increase content of some trace elements, plant-breeding and gene alteration (Gibson 2001: S160).

2.8.2 Fortification

WHO states that the objective in fortification of food is to enhance the quality of the diet by the addition of nutrients at quantities higher than what the original food would naturally provide (WHO and FAO 2006: xxvii; 13). According to Kruger, Hendricks and Puoane (2008: 683) it is a cheap and viable medium- to long-term method which can improve the dearth of micronutrients in populations. The foods to which the nutrients are added is required to be consumed in large amounts by the targeted population and must have good retention through processes of cooking and storage as well as undergoing limited changes in appearance or taste. Quality control is essential in maintaining micronutrient quantities especially to ensure levels are kept until time of consumption. In South Africa a law regulating the fortification of staple foods was passed in 2003 (Act no. 54 of 2003) and one regulating iodation of salt in 1995 (Act no. 54 of 1972, 2000) (Labadarios, Dhansay and Hendricks 2008: 138).

2.8.3 Supplementation

Supplementation may be defined as the provision of relatively large doses and sufficient amounts of particular micronutrients, usually in the form of pills, capsules or syrups (WHO and FAO 2006: 13). The strategy of supplementation is commonly used to address direct shortfalls of nutrients in vulnerable groups; for instance, iron and folate supplements are provided to all pregnant mothers attending antenatal clinics in primary health care centres in several developing countries (Shetty 2011: 31).

2.8.4 Vegetable gardens

A crop-based approach to addressing malnutrition complements well other strategies such as supplementation and fortification and can provide the home with direct access to foods rich in vitamins that would otherwise not be affordable. This would have a direct impact on improving the diet quality and food security. However, to yield optimal results it is important to provide sufficient training in vegetable gardening and to make sound decisions regarding food choices. Vegetable gardening may also supplement household income into the household. Improved farming methods and consumption of vegetables is a direct low-cost and direct strategy for the enhancement of dietary micronutrient intake in poor urban and rural populations. The Asian

population makes use of the international Asian Vegetable Research and Development Centre (AVRDC) that has a directive to work on vegetable crops including beans and pulses. The same programme (AVRDC - Africa Regional Programme) in Arusha, Tanzania, expands the same mission to the continent of Africa. Nutritionists from the SA-MRC and agriculturists from the Agricultural Research Council (ARC) have embarked on an initiative to address and improve vitamin A status through a crop-based method. The initiative is founded on supporting the Ndunakazi project that had established existing community-based growth monitoring activities that were developed as a policy for the advancement and application of home gardening (Faber, Laurie, Ball and Andrade 2013: 11; Chadha and Oluoch 2003 and Faber, Witten and Drimie 2011: 21-24).

2.8.5 Nutrition and physical activity education

The objective of nutrition education programmes is to improve nutritional knowledge and effect positive dietary intake. The focus of nutrition education should be on process knowledge or useful applicable skills as opposed to ones where only factual information and declarative knowledge is provided. A systematic review of articles found that there was a positive relationship between nutrition knowledge and some aspects of dietary intake such as the higher intake of fruits and vegetables (Spronk, Kullen, Burdon and O' Connor 2014: 1722). The probable information source for nutrition differs among socio-demographic groups and may influence differing levels of knowledge (Grunert *et al* 2012). One of the nutrition education tools used are the FBDGs. The main aim of the FBDGs is to promote a prudent, balanced diet (Vorster and Bourne 2008).

In the workplace it is easy to influence the individual through practical applications of good nutrition. The organisation is also an ideal environment to incorporate smart walkways around the worksite (Quinitiliani 2007). Successful workplace interventions exhibit the following characteristics: they focus on both nutrition and physical activity; information dissemination is conducted by nutrition specialists such as dietitians; modifications to the eating area are made rendering a demand for nutritious menu choices; staff receive feedback on assessments conducted; employees participate in the programmes through co-ordination and monitoring; and healthy food discounts in vending machines are available motivating the purchase of these foods.

Furthermore, workplace health programmes that are effective also have these programmes connected to organisational agendas with management wholly involved, a combination of widespread communication channels and incentivising (Steyn, Parker, Lambert and Mchiza (2009) and Quintiliani (2007)). The policy of physical activity should be developed with treatment and prevention of diseases at the forefront. Addressing the topic of duration, type of exercise and rate of physical activity are also significant. Programmes should now focus on providing clarity and communicate comprehensible messages regarding the issue of physical activity (Botha, Wright, Moss and Kolbe- Alexander 2013).

2.8.6 Disease management

Management of a disease such as diabetes may be achieved by diet management and medication. A balanced eating culture should be adopted by the entire family and they should not consider a diabetic diet as a special diet per se. The main aim of modifying the diet of an individual with diabetes is to aspire to healthy weight loss and maintaining an equitable body weight as it should be for any individual (Steyn, Blaauw, Lombard and Wolmarans 2008: 704). Another aspect of disease management involves the need for appropriate and timely screening for disease. As, for instance, it was found that when comparing low and high HDI countries, the incidence of cancer was found to be higher in the high HDI countries but lower in mortality compared to low HDI countries and it is mortality that is higher in low HDI countries with low incidence rates. This speaks to the capacity of low income countries' ability to detect cancer early enough to prevent death (Vineis and Wild 2014).

2.9 CONCLUSION

The literature review has provided further knowledge into the issues introduced in the first chapter. The broader understanding of challenges facing the global community at large, have implications for the longevity and quality of life of populations. The nutrition transition, as it occurs at different frequencies in different regions, is ultimately affecting individual well-being and health policy. From the macro-environmental factors it is highlighted that transformation is imminent. Similarly, in order to address non-communicable diseases and the declining quality of life, populations need to collectively and individually participate in the modification of diet and other behaviours.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

Adult populations are affected by the environments in which they grow up, reside and work as well as the structures administered to deal with disease and illness. These environments also include day-to-day living set-ups and material conditions where the power to make decisions and have control over one's involvement in the decision making plays a major role (UNDP 2013: 17). Each person and society as a whole needs to make responsible decisions and changes in the quest towards better nutritional status. These decisions need to be geared for the long term and towards viable nutrition security (Nordin, Boyle and Kemmer 2013). Before a nutrition intervention is implemented, a nutrition assessment has to be conducted. According to Mueller *et al* (2011), nutrition interventions may be implemented as a result of nutritional assessments.

In order to adhere to the objectives of the study a collection of measurement strategies was implemented. A socio-demographic questionnaire and FFQ were used, anthropometric measurements (height, weight and waist circumference) were taken and 24-hour food recalls were administered. This chapter summarises the ethical considerations, planning and administration, study design, data and analysis, and statistical methods undertaken.

3.2 ETHICAL CONSIDERATIONS

The study was ratified by the Durban University of Technology (DUT) Institutional Research Ethics Committee (IREC) (Research Ethics number: IREC 49/12) (Annexure A) and data collection commenced in December 2013 to December 2014. Permission to conduct research in Ward 84 was requested and granted to the researcher by the ward councillor. Respondents were informed about the study and the confidentiality of all information collected verbally and by way of an information letter in English or isiZulu (Annexure B and Annexure C). Each of the participants signed a consent form agreeing to voluntarily participate in the study. The respondents were thereafter issued with a letter of information and given verbal details about the study and proceeded to sign informed consent forms to participate in the study. The respondents were reminded that their participation was voluntary and assured that they could withdraw at any point with no penalties imposed. Respondents were made to understand that no financial compensation

was offered for participation. It was also explained that all information would be confidential and that participant numbers would be used since no names would be used in the study. Personal information would be stored in the Department of Food and Nutrition in a locked cupboard and would be destroyed after a five year period by use of a shredding machine. Only the researcher and supervisor would have access to the information.

3.3 PLANNING AND ADMINISTRATION

The researcher approached the ward councillor to obtain permission (Annexure D) to conduct research in the community. The ward councillor granted permission (Annexure E) in May 2013.

Prior to the commencement of the data collection the researcher held two focus groups in order to establish which relevant food items should be included in the Food Frequency Questionnaire list (Annexure F). Ten women from the AA Section of Ward 84 and 10 women from the BB section of Ward 84 formed part of the focus group discussions. The women that participated in the group discussions were excluded from the overall study. The research commenced in December 2013.

Figure 3.1: Food Frequency Questionnaire focus group discussion

3.4 STUDY DESIGN

The research is a descriptive study of cross-sectional design for which questionnaire-based data was obtained through interviews in combination with health measurements. The following definitions are provided in order to further comprehend the terms referred to in this section (StatsSA 2014c: 69).

Formal dwelling refers to a structure that is built based on plans that have been approved. For instance, a house on a separate site, or a rented apartment, townhouse, flat, back room, or room.

A **household** is regarded as two or more people who reside together and support themselves conjointly with sustenance or other necessities for living, or a single person who lives by themselves. It is emphasized that a household does not necessarily denote a family.

Family Caregiver Alliance (2016) defines a **caregiver** as any person who gives unpaid help or care to anyone in the household/ home. The care given may be inclusive of help with personal needs, feeding, housework, procurement, paperwork, medical attention, transportation, or visiting regularly to monitor the well-being of the care receiver. For the purposes of the study a caregiver was also identified as the person in the household who owns the home, or has inherited the home or has been left with the responsibility to be the household head usually due to the parents or original owners having been deceased.

The person or organisation that answers the questions or completes the questionnaire is referred to as a **respondent** (StatsSA 2007: 91) and in this case would also be the primary caregiver.

3.4.1 Context of the study

The research was conducted in Umlazi, a township south of Durban.

Figure 3.2: Map showing Durban and Umlazi Township (Mapdata©2016 AfriGIS (Pty) Ltd 2016).

Umlazi has a population of approximately 404 811 and has 104 914 households translating to an average household size of 3.8 persons (Frith 2011).

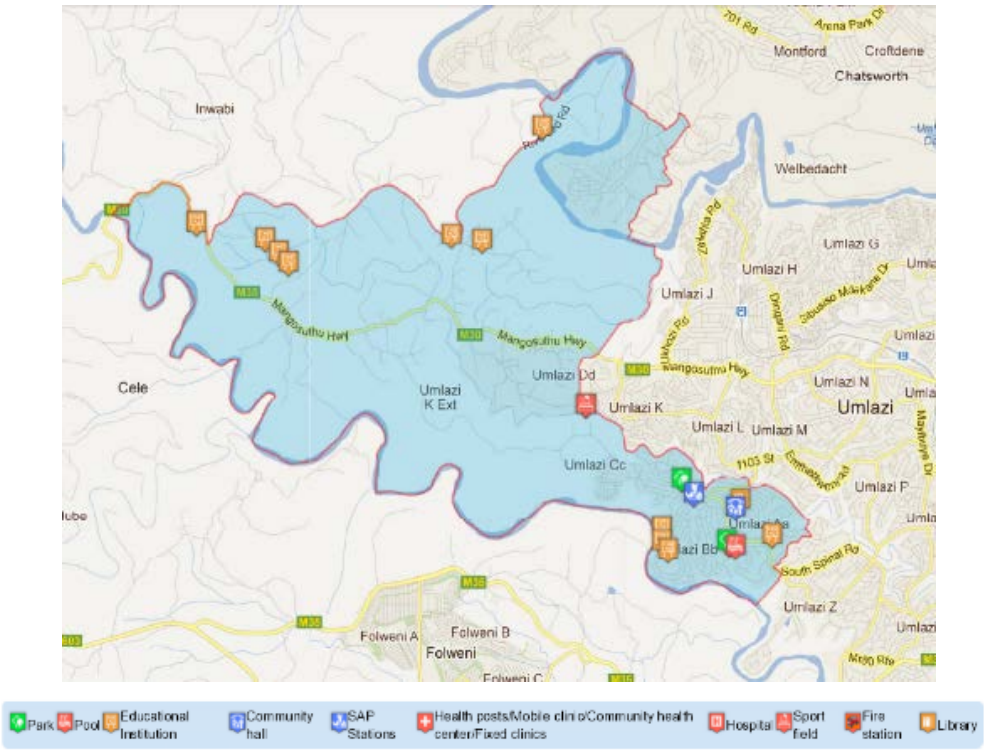

Figure 3.3: Ward 84 community map (eThekwini Municipality 2012).

Ward 84 makes up 12.15% (49 194 people) of Umlazi Township according to the community profiles of the eThekwini Municipality. Ward 84 includes Umlazi sections AA, BB, CC and parts of K section. There are approximately 49 000 people and 6 841 (13.9%) formal dwellings out of a total of 9 541 households. It is estimated that females make up53% of the Ward 84 population. A large number (41%) of the residents are aged between fifteen and thirty-four years followed by a quarter (25%) of the population in this ward being 35-64 years old. This means that 66% of the population are of working age. Ward 84 boasts a number of public services such as a clinic in the AA section, schools and a police station. There is also a library, swimming pool, sports field and community hall that can be utilised by the general public (eThekwini Municipality 2012). The following figures represent the current landscape and depict the kind of housing that can be seen in Ward 84.

Figure 3.4: Housing in BB section of Ward 84

Figure 3.5: Fast food and tuck shop containers in Ward 84

3.4.2 Study population and sampling

Umlazi Township has 14 electoral wards in total. The researcher selected the qualifying ward on the basis of the information available on household income data. Twelve of the wards had 'no data' available on household income and thus only Ward 82 and Ward 84 remained eligible for participation. Ward 84 was then selected according to the proportion of households with a middle income (R76 000.00 per annum and above) that was greater. This information was provided by the municipal Ward profile available (eThekwini Municipality 2012) although the methodology was not specified by the municipality. Ward 82 had 9% of households with a middle income and Ward 84 had thirteen percent (13%).

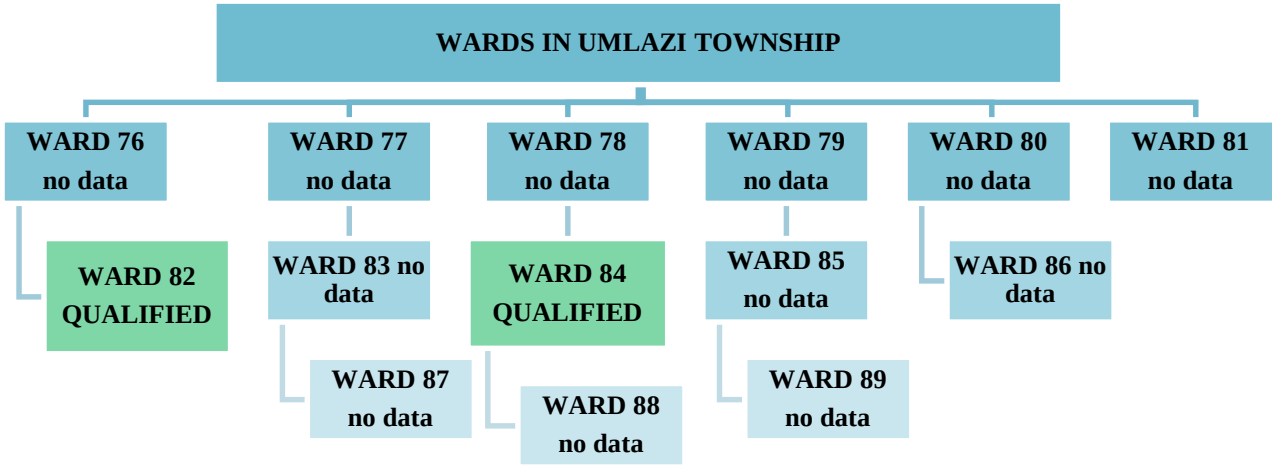

Figure 3.6: Umlazi ward numbers

The study commenced in the summer holidays of December 2013 at a time when many residents were at home and available to participate. Data was also collected in April 2014 and June 2014 and the final collection occurred in December 2014.

This study was conducted in households earning more than R100 000.00 per annum (>R8000.00 per month) which is the minimum amount classifying a household as emerging middle income according to the Personal Income Estimates for South Africa 2011 (University of South Africa 2011). The households were approached and only one caregiver per home was required to give consent to participate in the study.

Sampling strategy

The sample size was decided on using a Power calculation indicating that 257 households (translating to 257 participants) will present a reliable sample (Cole 2005), 95% confidence level. The sample was based on the number of formal households (n=6821) in Ward 84 (eThekwini Municipality 2012). This translated to 3.7% of the formal households being approached. The community was selected based on its geographical location as it is a peri-urban community with middle income households. Seven participants did not complete the full database and were removed from the final sample; 250 participants were included (97.28%).

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
(.5 used for sample size needed)
c = confidence interval, expressed as decimal(e.g., .06 = ±6)

The inclusion criteria were the following:

- All men and women primary caregivers above the age of 19 years
- All households with a total income of more than R100 000.00 per annum/ more than R8000.00 per month
- Permanent residents of Ward 84.

The exclusion criteria were the following:

- All children
- Households with a total income of less than R100 000.00 per annum/ R8000.00 per month
- Men and women household assistants
- Men and women visiting Ward 84.

The researcher employed simple random sampling of 'formal dwelling' households to include in the study. The response from a primary caregiver was then requested. The researcher and fieldworkers asked a series of questions beforehand to verify eligibility regarding the criteria of a household income of R8000.00 or more. Questions asked were whether or not there was an income in the household and what kind of job did at least one person have. If the first occupant did not meet the income of at least R8000.00 per month for one person, the researcher and fieldworkers probed further to establish if there was perhaps a second or third income to add on to the first.

The population was categorised according to the nutrient requirements per age group as per the NICUS (2003) which was adapted from the IoM (2000).

The sample population included a total of 194 women and 56 men from 250 households (one participant or head of household per household). Table 3.1 displays the different age groups included according to NICUS DRI classification to facilitate the accurate comparison of nutrient intake.

Table 3.1: Sample population age groups % (n)

	19-50 years old	≥51 years old	Total % (n)
Men	50 (28)	50 (28)	22.4 (56)
Women	41.23 (80)	58.76 (114)	77.6 (194)

3.5 DATA ENUMERATORS

Students of the DUT Food and Nutrition Department were approached and trained to conduct the fieldwork for the study. Three unemployed young people from the Ward 84 community were also requested to assist in the data collection and fieldwork. The DUT 3rd year students (n=2) and unemployed fieldworkers (n=3) were required to be fluent in the command languages of English and isiZulu. Consent to be a fieldworker was obtained from the fieldworkers (Annexure G). Training manuals (Annexure H) were printed and given to the fieldworkers. The training session consisted of guidelines on the general approach of households, code of conduct and administration of questionnaires. The fieldworkers were shown how to obtain anthropometric measurements according to the World Health Organisation standards and adapted Department of Food and Nutrition manual; and how to use the food samples to depict portion sizes and help respondents identify unfamiliar foods. The importance and sensitivity of the study was discussed with the fieldworkers to ensure they understood the objectives of the research.

Figure 3.7: Trained data enumerators

3.6 ADMINISTRATION OF MEASURING INSTRUMENTS

3.6.1. Socio-demographic questionnaire

The socio-demographic questionnaire developed and validated by Napier (2006) (Annexure I) was used in the study. The income ranges and amount spent on food range of amounts provided by the socio-demographic questionnaire were revised to be more relevant to the study. Furthermore, the minimum HH income ranges were revised. A one-on-one interview consisting of closed questions as detailed in the questionnaire was conducted by a trained fieldworker with the respondent. Fieldworkers addressed respondents in isiZulu where this was necessary. An English socio-demographic questionnaire was completed and used to collect the following information: personal demographic information, accommodation and family composition, work status and income, education and language, food practices in the house and assets owned by the household. The socio-demographic questionnaire was also used to derive the multi-dimensional poverty index to determine deprivation based on Alkire and Santos (2010) method. A total of two hundred and fifty questionnaires were completed.

3.6.2 Anthropometric measurements

The anthropometric dimensions taken were weight, height and waist circumference (Annexure J).

3.6.2.1 Weight

Fieldworkers were tasked with measuring and recording the weight, height and waist circumference of each participant. Respondents were asked to remove shoes and any heavy clothing. A standardised calibrated scale was used with measurements recorded to the nearest 0.1kg. All measurements were taken twice and the average recorded.

Weight measurement was conducted as follows:

- Electronic scales 2000, Model: Portable Physician Scale (PPS) were used and calibrated after each day.
- The scale was placed on an even surface.

- The scale was switched on and the fieldworker waited for the zero indication to appear on the display screen.
- The respondent was requested to step onto the scale with both bare feet, stand upright, facing straight ahead and arms held at the sides.
- The respondents were requested to stand still until the measurement was recorded.
- The respondent was asked to step down and then the above process was repeated for a second recording.
- The two recorded weights were rounded off to the nearest 0.1 kg and an average of the two measurements was recorded if there was a variance.

3.6.2.2 Height

The height measurements were conducted as follows:

- A stadiometer was used to measure height.
- The respondent was asked to remove their shoes.
- The respondent was placed in-between the stadiometer measurement bar and spine. The fieldworker positioned the respondent with arms relaxed at the sides, legs straight, knees together, buttocks touching the spine of the stadiometer and heels flat and placed together against the horizontal floor stadiometer bar.
- The respondent looked straight ahead before the vertical headpiece was placed on top of the head. The headpiece was placed in the centre of the crown of the head.
- The fieldworker recorded the reading in metres and rounded it off to the nearest 0.05 metre (m)
- The process was repeated to obtain a second reading. An average of the two readings was recorded if the readings were not identical.

3.6.2.3 Waist circumference

Waist circumference was measured by the fieldworker using a non-stretchable measuring tape. The waist circumference was measured with the measuring tape from the navel all around the body in a horizontal position.

The waist circumference measurements were conducted as follows:

- Respondents were asked to remove any coats and other heavy clothing.
- Respondents stood upright and pointed out the navel position using a finger.
- The measuring tape was held to ensure the horizontal position. The tape was held loosely enough to allow the fieldworker to place one finger between the tape and respondent's body and the measurement was recorded in centimetres (cm).
- This procedure was conducted twice and the average of the two measurements was recorded.

3.6.3 24-hour recall

Three 24-hour food recall questionnaires (Annexure K) were used to ascertain the actual food items that were consumed. Two of the recalls were for week day consumption and one for weekend day consumption. Respondents informed the researcher and fieldworkers about food consumed and the portion sizes using food models and requests to present utensils used. Food models of average and required portion sizes were used in conjunction with what the respondents indicated they had eaten in order to obtain more accurate portion size estimates and food intake data. Respondents were requested, if willing, to write down food intake for a follow-up visit to the home as only two days' intake at most was recalled in one sitting. Fieldworkers would then reconfirm the foods and portion sizes with the respondents at the second visit agreed upon with the respondent.

3.6.4 Food Frequency Questionnaire

A validated Food Frequency Questionnaire used by Oldewage-Theron and Kruger (2008) was adapted by the researcher after focus group discussions with community members. The questionnaire was completed in a one-on-one interview with a trained fieldworker. Food items that had been consumed in the last seven days prior to the interview were recorded. Minimum intake levels were not considered.

3.7 DATA ANALYSIS AND STATISTICS

The socio-demographic and food frequency questionnaires were captured on Excel® spreadsheets by the researcher and one trained data-capturer and then analysed for descriptive statistics using the Statistical Package for the Social Sciences (SPSS) version 22.0 with the assistance of a statistician. Anthropometric measurements were recorded on Excel® and means and percentages calculated. The Food Finder 3 Software programme was used to analyse dietary nutrient intake and the results compared to world standards of the Institute of Medicine recommendations in dietary assessment application.

3.7.1 Socio-demographic questionnaire

The socio-demographic data was sorted and checked for completeness and accuracy by the researcher of which n=250 were usable. Descriptive statistics including frequencies, means and standard deviations were determined. Results were depicted in tables of frequencies and percentages, and graphs for the variables were included in the questionnaire. The socio-demographic data was used to calculate the Multi-dimensional Poverty Index (MPI).

Calculation of MPI:

The calculation of the total MPI for Ward 84 was based on the Alkire and Santos (2010) cross-dimensional cut-off points of indicators and weighting. Deprivation is identified as follows:

Education:

a) If no household member has completed five years of schooling/education including children.
b) If any school-aged child is not attending school (grades 1 to 8).

Health:

a) If any child (at any age) has died in the family.
b) If any adult for whom there is nutritional information is malnourished, where an adult is considered malnourished if BMI is below 18.5.

Standard of living:

a) If the household has no access to electricity.
b) If the household's sanitation facility has not been upgraded or is shared with other households.
c) If the household does not have access to clean drinking water, or the source of clean drinking water is more than 30 minutes' walking distance from home.
d) If the household has a dirt, sand or dung floor.
e) If the household cooks with dung, wood or charcoal.
f) If the household does not own more than one radio, TV, telephone, bike or motorbike, or refrigerator; and does not own a car or tractor.

These indicators were then given percentages according to the socio-demographic results and multiplied by the relative weights between dimensions; also refer to table 3.1.

Weights were based on the criteria that a household had to be deprived in at least the equivalent of 30% of the weighted indicators (3 indicators) in order to be considered multi-dimensionally poor. This amounts to six asset indicators or two health or education indicators.

A household is considered to be multi-dimensionally poor if the weighted indicators in terms of which they are deprived amount to 30%.

Therefore, since there are 10 indicators:

Weight of Health = 3.33 divided by 2 indicators
= 1.6 for each indicator
= 1/6 (of 10 indicators).

Weight of Education = 3.33 divided by 2 indicators
= 1.6 for each indicator
= 1/6 (of 10 indicators).

Weight of Standard of living = 3.33 divided by 6 indicators
= 0.55 for each indicator
= 1/18 (of 10 indicators).

The Standard of living dimension has 6 indicators; however the 6th indicator which is Assets included 6 variables. Therefore:

In the case of the Assets indicator = 1/18 for 6 cut-offs (variables)

= 1/18 ÷ 6

= 0.009

= 1/108 (of 10 indicators).

Therefore the calculation for each indicator was as follows:

Table 3.2: MPI Calculation

MPI measure	**Results of emerging middle income community in Umlazi (n=250)**	**Weight**	**MPI Score**
Health			
Child mortality	% households that indicated that a child had died in the past	x 1/6	
Nutrition	% respondents presented with being in the underweight classification of BMI	x 1/6	
Education			
Years of schooling	% None	x 1/6	
Child enrolment	% children of school-going age not attending school	x 1/6	
Standard of living			
Electricity	% have no access	x 1/18	
Drinking water	% have no access	x 1/18	
Sanitation	% have no access	x 1/18	
Flooring	% of households that had dung, sand, mud as floor	x 1/18	
Cooking fuel	% households that used wood or charcoal to prepare food	x 1/18	
Assets	**% Owning <2**		
Radio Television Telephone/ mobile phone Motorbike Refrigerator	% % % % %	x 1/108 x 1/108 x 1/108 x 1/108 x 1/108	
Assets	**% not owning a vehicle**		
Car	%	x 1/108	
TOTAL			

The sum total of the calculations (%) was then used to compare deprivation against the 30% cut-off point. The calculations were also used to calculate the percentage contribution of each dimension to multi-dimensional poverty.

3.7.2 Anthropometric measurements

The average height and weight were captured on an Excel® spreadsheet and the body mass index (BMI) (kg/m^2) was calculated as the weight (kg) divided by height squared (m^2). The BMI categories were presented according to the World Health Organisation BMI classification (WHO, 1995) as follows:

Table 3.3: BMI Classifications

Parameter	**Range (**kg/m^2)
Underweight	<18.5
Normal weight	18.50 – 24.99
Overweight	25.00 – 29.99
Obesity Class 1	30.00 – 34.99
Obesity Class 2	35.00 – 39.99
Obesity Class 3	>40.00

The waist circumference and height measurement cut-off points described by Gibson (2005) were used to identify respondents at risk of metabolic syndrome. The waist circumference measurements for increased risk for women is a waist circumference of >88 cm and for men >102 cm. Data were captured on an Excel® spreadsheet by the researcher with calculations done to yield means and standard deviation.

Waist-to-Height Ratio (WHtR) was calculated by dividing waist measurement by height measurement in centimetres. A WHtR >0.5 indicates possible risk of cardiovascular disease (WHO 2005).

3.7.3 24-hour recall

The 24-hour recall data for one weekend day and two week days were captured and analysed by the researcher using the MRC Food Finder® version 3.0 Software based on the South African Food Composition Tables of South Africa. Fortified maize and bread were manually added as food items using the Medical Research Council nutrient breakdown. This programme was developed to analyse the nutrient content of food items consumed (Wolmarans, Kunneke and Laubscher 2009).

The nutrient intake and top 20 foods consumed by the respondents were compiled from the data and presented in the form of an Excel® spreadsheet. The mean nutrient intake for the three days was calculated and nutrient adequacy ratios (NARs) were established by comparing the mean intake and dietary reference intake and presented as a percentage. The top 20 foods were presented with analysed (from calculations of mean intake) information about the frequency (average number of times a food was consumed in one day by the group) at which a food was consumed and how much each person would consume per day (per capita intake). Macronutrient intake was determined for comparison to the Adequate Macronutrient Dietary Requirements (AMDR) and fruit and vegetable intakes were also obtained from the 24-hour recall data. The use of supplements was not established.

Tables and graphs illustrated the results by means and standard deviation for interpretation of the prevalence of nutrient deficiencies that were indicated by the determined intake level. The association of the nutrient intake and nutritional status was compared to 100% of the DRIs (IoM 2000) for adults 19 years and older accordingly by age groups.

3.7.4 Food Frequency Questionnaire

The food frequency questionnaires were sorted and checked for completeness and accuracy and n=250 were found to be usable. The data were captured on an Excel® spreadsheet by the researcher and analysed using the SPSS for windows version 22.0 software programme and with the assistance of a statistician would be further utilised to draw correlations.

The different dietary diversity measures, referred to as dietary diversity (DD) were calculated as follows: (1) overall variety score (simple count of food items), (2) variety score between all nine food groups and (3) a variety score within every food group (Hatloy, Torheim and Oshaugh 1998). These scores were calculated for a reference period of seven days for this study.

The nine nutritious food groups recommended by the FAO were used for the classification of broad food intakes as adapted from the Women's Dietary Diversity Questionnaire (FAO 2013: 6) as the study did not measure dietary diversity but only FV and FGD. A low variety was indicated when less than 30 foods were consumed in a period of seven days, compared to a medium variety with 30 to 60 foods or high variety with more than 60 foods consumed in the same period

(Matla 2008). All the diversity scores (food variety score and food group diversity score (FVS and FGDS) were calculated from the seven-day FFQ (n= 250). Descriptive statistics including frequencies, means and standard deviations were determined. Tables were drawn up with percentages of the different variables included in the questionnaire. Data were presented in terms of frequencies and percentages for the various categories.

3.8 CORRELATIONS

Bivariate correlations were determined using the Pearson statistical test (2-tailed):

r=0 indicates no relationship while negative associations are indicated by r= -1 and positive associations are indicated by r=1 (Gelman 2013).

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. However, 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 result is said to be statistically significant (Gelman 2013).

Table 3.4: Correlations run for statistically significant relationships

Variables	
FVS and education	BMI and energy
Total income and FVS	BMI and FVS
Age and BMI	energy and FVS
BMI and WHtR	energy and FGDS
BMI and WC	energy NAR and FGDS
All amount spent on food and number of people in the household	calcium NAR and FGDS
BMI and food security (frequency of not having enough money to buy food)	vitamin A NAR and FGDS
BMI and CHO	

Table 4.33 in chapter 4 details the correlations where statistical significances were found.

3.9 CONCLUSION

This chapter has provided an overview of the research methodology applied in the study in order to meet the objectives. The procedures and principles were outlined and a detailed account of the

fieldwork undertaken to retrieve data was reported. Furthermore, the process in which the data collected was described and reported on was specified. The use of measuring equipment, the purpose and administration of questionnaires and ethical considerations involved in the study were also highlighted. The following chapter will depict the interpretation of the results of the study.

CHAPTER 4: RESULTS AND FINDINGS

4.1 INTRODUCTION

The objective of the study was to provide a situational analysis of an emerging middle income community in Umlazi. The Ward 84 community was assessed for socio-demographics, anthropometric measurements, and dietary intake and food variety. In this chapter the results will be presented in the form of tables and statistical figures and supplemented with a descriptive discussion.

4.2 STUDY RESULTS ON WARD 84 IN UMLAZI TOWNSHIP, SOUTH AFRICA – AN EMERGING MIDDLE INCOME COMMUNITY

In total the number of respondents amounted to 250 adults (in 250 households) above the age of 19 years. The respondents were made up of 56 men and 194 women. It is important to note that in this community all the respondents were owners of their residences including those that had inherited the house. All members of the sample lived in a formal structure made of brick with a tarred road in front of the house. Respondents also had access to electricity, municipal waste removal, flush toilets and access to water from a tap inside the house.

4.3 SOCIO-DEMOGRAPHIC RESULTS

Figures 4.1 and 4.2 depict the percentage age distribution of women and men within the study group. The sample size consisted of a majority of women (77.6%) whereas men made up 22.4% of the sample size. Men and women respondents above the age of 51 years made up 50% and 59% respectively.

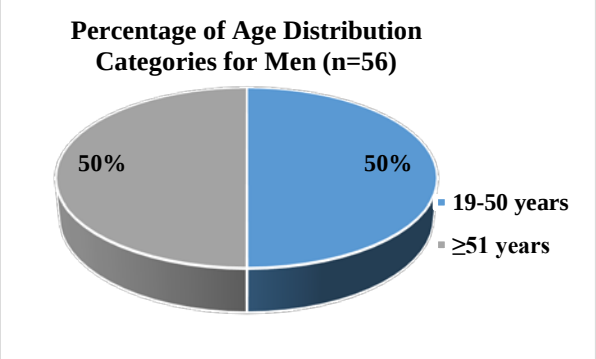

Figure 4.1: Age distribution of men

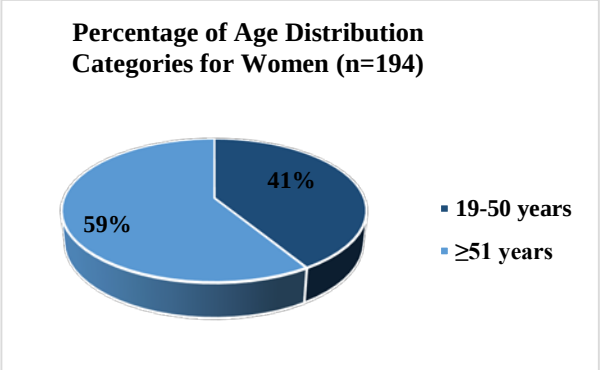

Figure 4.2: Age distribution of women

4.3.1 Family composition and accommodation

Table 4.1 indicates that the majority (66.8%; n=67) of the respondents were the mother in the family. There were 47 (18.8%) fathers out of the 56 men; however, there were no grandfathers whereas there were 10 (4.0%) grandmothers. Other respondents in the community of Ward 84 were aunts, and at times sisters and brothers who had inherited the responsibility of the head of the household.

Table 4.1: The role in the family

Variable	Number (n=250)	Percentage (%)
Mother	167	66.8
Grandmother	10	4.0
Father	47	18.8
Other	26	10.4
Total	**250**	**100**

Table 4.2 below illustrates that all the respondents were living with other people and slightly more than half (57.6%; n=144) had between one and five permanent residents in the household. Those with 6-10 permanent residents amounted to 35.6% (n=89). Of the 250 respondents, one third (n=85) indicated having other buildings or shacks within the yard although it was not determined if any rent was accrued form these dwellings almost all (92.8%; n=232) had more than five rooms and flooring of tiles (95.6%; n=239). The majority (90%; n=225) of the respondents have been living permanently in the household for more than five years. Respondents reported they experience some problems with pests and highlighted were geckos, mosquitoes, ants and cockroaches at 72.4% (n=181), 66.0% (n=165), 64.4% (n=161) and 59.6% (n=149) respectively.

Table 4.2: The family composition and residential situation

Variable	Number (n=250)	Percentage (%)
Other people living in the house		
Yes	250	100
Number of permanent resident members		
1-5	144	57.6
6- 10	89	35.6

>10	17	6.8
Total	**250**	**100**
Duration of permanent residence		
< 1 year	2	0.8
1-5 years	23	9.2
> 5 years	225	90
Total	250	100
Number of rooms per household		
2 rooms	2	0.8
3 rooms	2	0.8
4 rooms	14	5.6
>5 rooms	232	92.8
Total	**250**	**100**
Other houses/ shacks within the yard		
Yes	85	34
No	165	66
Total	**250**	**100**
Reported problems with pests and insects		
	Yes	**Percentage**
Mice/Rats	30	12.0
Cockroaches	149	59.6
Ants	161	64.4
Flees	115	46
Mosquitoes	165	66.0
Geckos	181	72.4
Frogs	63	25.2
Snakes	55	22.0
Bed bugs	11	4.4
Type of floor material in the home		
Cement	7	2.8
Tiles	239	95.6
Carpet	4	1.6
Total	**250**	**100**

Results of the employment status (Table 4.3) shows that slightly less than half (48.4%; n=121) of the respondents were employed with 40.8% (n=102) having permanent positions. Retired participants amounted to 27.2% (n=68).. Over a third (34.4%; n=89) of the respondents have not been working for a period of more than three years and 25 (10%) of the respondents between one

to three years; 14.4% (n=36) of the respondents are actively looking for a job and 4.8% (n=12) are doing weekend and part-time work. Housewives made up 10.4% (n=26) of the unemployed respondents. It was found that education and FVS (Food Varity Score) had a positive statistically significant relationship at p=0.008 using Pearson's statistical test (2-tailed).

Table 4.3: Employment status

Variable	Number (n)	Percentage (%)
Currently employed	**n=250**	
Yes	121	48.4
No	129	51.6
Current status of unemployed participants	**n=131**	
Unemployed	27	10.8
Retired	68	27.2
Housewife	26	10.4
Student	5	2.0
Other (self- employed)	5	2.0
Actively looking for employment		
Yes	36	14.4
No	96	38.4
Period of unemployment	**n=124**	
< 6 months	6	2.4
6- 12 months	7	2.8
1-3 years	25	10.0
>3 years	86	34.4
Current job status of employed participants	**n=121**	
Permanent	102	40.8
Temporary position	15	6.0
Fixed term contract	3	1.2
Other	1	0.4
Other weekend /part-time work (2nd job)		
Yes	12	4.8
No	238	95.2
Total	**250**	**100**

4.3.2 Income and expenditure

Approximately two thirds 60.4% (n=151) of the households have an income of above R10 000 per month. Also, almost a quarter (22.8%) of the respondents earned between R8000 and R9000 per month as depicted in Figure 4.3.

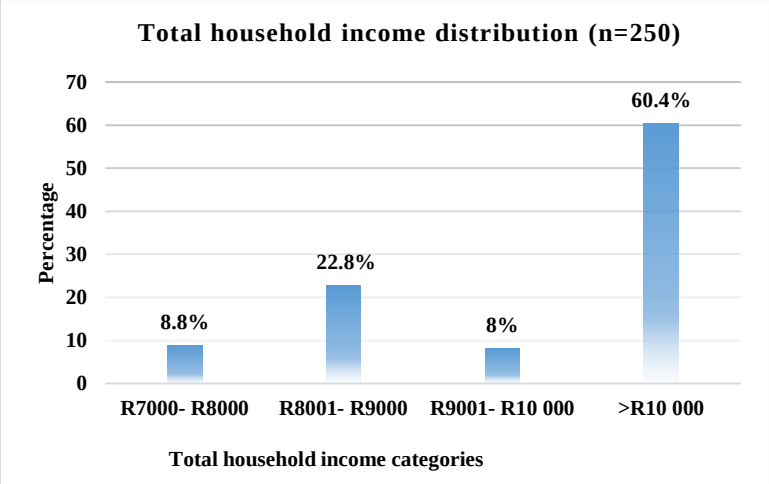

Figure 4.3: Total household income

Figure 4.4 indicates that the majority (80%; n=200) of the households have between one to three people contributing to the household income, which could indicate affordability and food security. A statistical significance of a positive relationship was found between FVS and income (p=0.007) using Pearson's statistical test (2-tailed).

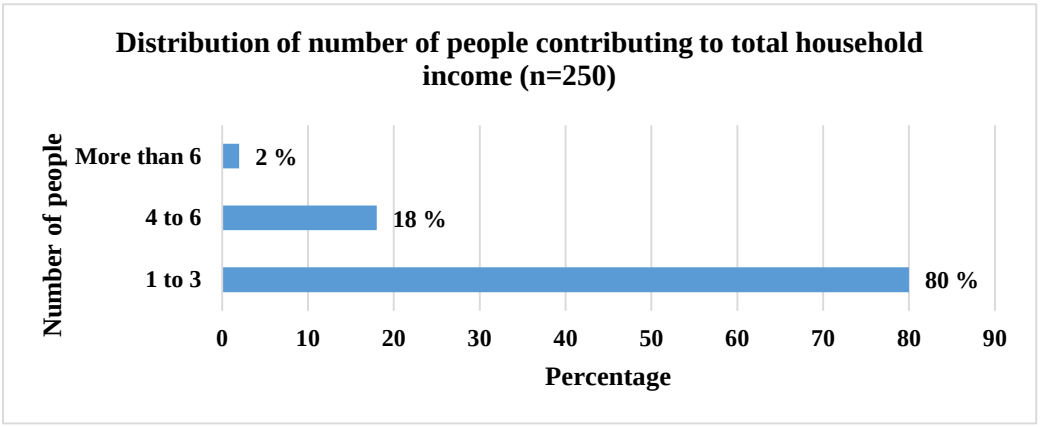

Figure 4.4: Percentage distribution of people contributing to household income

Figures 4.5 and 4.6 show that most (80%) of the respondents shopped once a month for food and mostly (91.8%) from supermarkets. Respondents who cited 'other' as a frequency specified that food is bought twice a month.

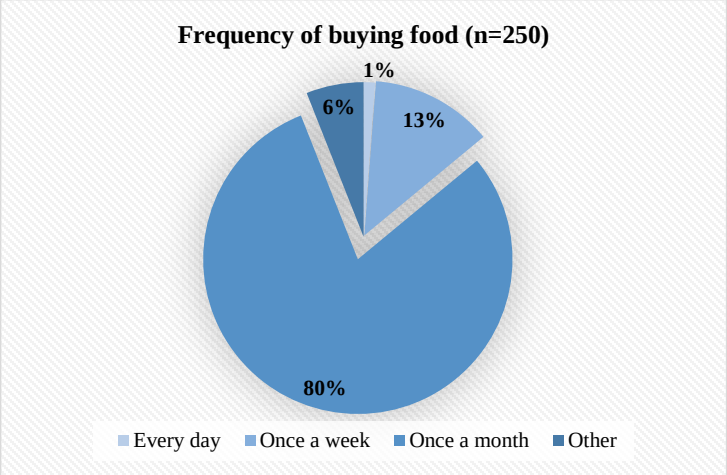

Figure 4.5: Frequency of buying food

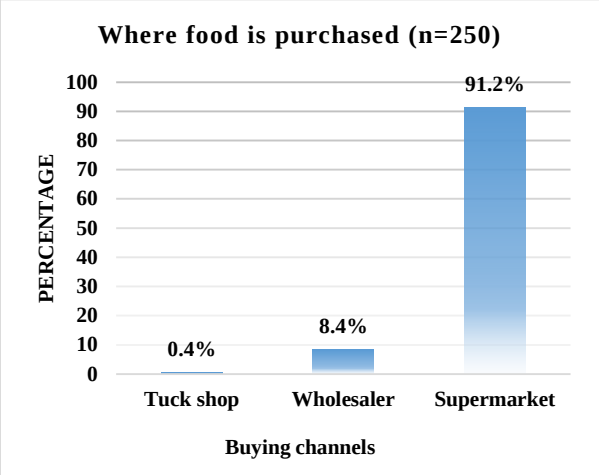

Figure 4.6: Food purchasing channels

Figure 4.7 indicates the number of households who always have enough money for food (70.4%; n=176) with 16.8% (n=42) citing 'seldom' and 10.0% (n=25) citing 'sometimes' not having enough money to buy food. It is shown in figure 4.8 that approximately 10% of the respondents spend between R400 to R1000 p/m on food. At the highest end 67.6% (n=169) of the respondents spend between R1800–R2000 and above R2000 p/m on food. Statistical significance of a positive relationship was found between the amount of money spent on food and the number of people in the household at p=0.003. A positive relationship was also statistically significant

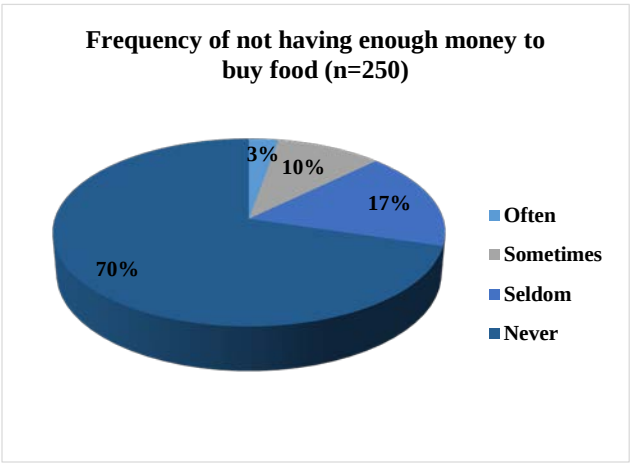

Figure 4.7: Insufficient funds to purchase food

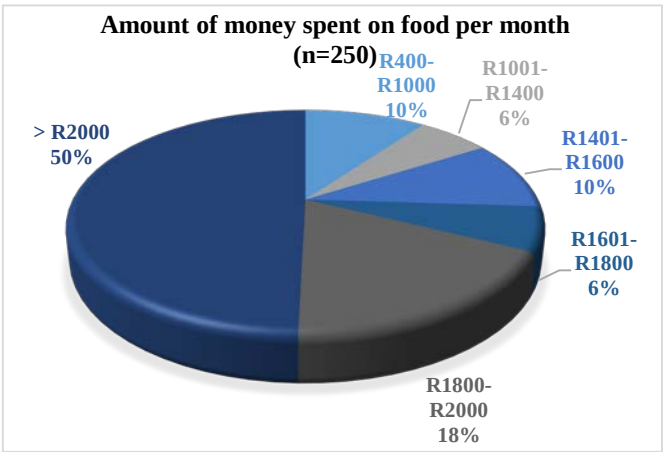

Figure 4.8: Distribution of amount of money spent on food

between BMI and not having enough money to buy food at *p*=0.029. Both correlations were determined using Pearson's statistical test (2-tailed).

The results in figure 4.9 illustrate that slightly more than half (55.6%; n=139) of the respondents use personal vehicles to get around indicating ease of access to commodities with 38% (n=95) relying on public transport/ taxis.

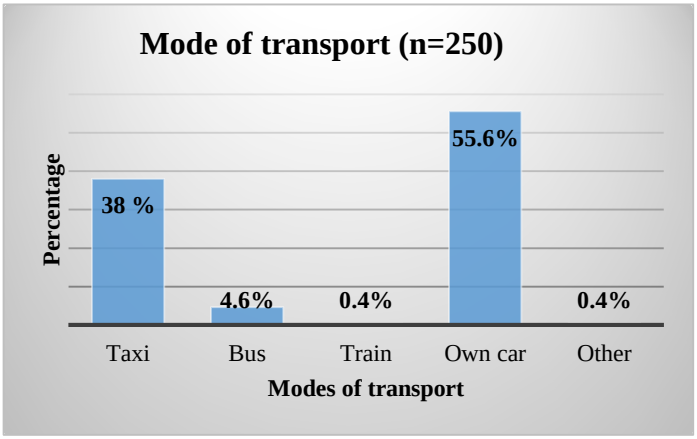

Figure 4.9: Mode of transport

4.3.3 Education and language spoken

The level of education varied with the highest three levels being Standard 10 (matric), other post-school (e.g. university, university of technology) and college or Further Education and Training (FET) distributed as 26.4% (n=66), 25.2% (n=63) and 23.6% (n=59) respectively. Six, 23 and 33 of the respondents indicated having no schooling, primary schooling and standard 8 (Grade 10) respectively. The language that is spoken at home by most (96.8%; n=242) of the respondents is isiZulu.

Table 4.4: Level of education and language of caregivers

Variable	Number (n=250)	Percentage (%)
The highest education level		
None	6	2.4
Primary school	23	9.2
Standard 8	33	13.2
Standard 10	66	26.4
College/FET	59	23.6

Other post-school	63	25.2
Total	250	100
The language spoken at home		
Zulu	242	96.8
Xhosa	3	1.2
English	1	0.4
Afrikaans	2	0.8
Other	2	0.8
Total	250	100

More than half (60.3%) of the respondents indicated that all children had birth certificates. Respondents reported that 35.2% (n=88) of them had at least 1 to 3 children who had completed immunization programmes and 42.1% (n=104) said all their children had been fully immunized. Seventy-five (30.9%) of the respondents said at least one child had died in the past, some citing stillborn births, others citing illness and car accidents as a cause of death. Respondents that have children in the home were found to have mostly (63.0%; n=150) one to three children attending school. Children using a bus or taxi to get to school amounted to 34.6% (n=63) and 34.6% (n=63) respectively. The six respondents that mentioned 'other' forms of transport indicated 'umalume' or 'uncle' as a means of how children go to school. This refers to a car pooling transport system used in the township.

Table 4.5: Children's records (n=247)

Number of children with birth certificates (n=247)	Number	Percentage (%)of households
No children in the household	21	8.5
1-3	57	23.1
4-6	20	8.1
All	149	60.3
Number of children who have completed immunization (n=247)		
None	38	15.4
1-3	87	35.2
4-6	16	6.5
7-9	2	0.8
All	104	42.1
Have any children in the household died in the past (n=243)?		
Yes	75	30.9

No	168	69.1
Number of children attending school in the home (n=238)		
Children below or above school-going age	56	23.5
1-3	150	63.0
4-6	20	8.4
7-9	2	0.8
All	10	4.2
Type of transportation for the children (n=182)		
Walk	23	12.6
Bus	63	34.6
Taxi	63	34.6
Parents car	27	14.8
Other	6	3.3

Table 4.6 illustrates that mothers are mostly responsible for food preparation (64.8%), deciding on the type of food bought (77.2%), feeding the children (71.2%) and deciding on how much is spent on food (69.6%). However, half (50.8%; n=127) of the respondents cited fathers as the head of the household and mothers came in second at 40.4% (n=101). There were no grandfathers in the sample and they also did not appear in any of the household food practices. The home was the highest choice selected where most meals are eaten by both respondents (80.0%; n=200) and children (82.4%; n=206) as reported by the respondents that participated in the study. One in six (n=45) respondents reported eating most meals at work and one in nine (n=28) children consumed most meals at school. Slightly more than 85% of the respondents made up those who eat between two (29.2%; n=73) and three (56.4%; n=141) meals per day.

Table 4.6: Food practices

Variables	Number (n=250)	Percentage (%)
Person responsible for preparing food in the house		
Father	9	3.6
Mother	162	64.8
Sibling	60	24.0
Grandmother	6	2.4
Aunt	10	4.0
Other (helper, all members)	3	1.2
Total	**250**	**100**

Person who decides what type of food is bought		
Father	8	3.2
Mother	193	77.2
Sibling	37	14.8
Grandmother	4	1.6
Aunt	3	1.2
Other (all members, sister)	5	2.0
Total	**250**	**100**
Person mainly responsible for feeding/ serving children		
Father	9	3.6
Mother	178	71.2
Sibling	46	18.4
Grandmother	4	1.6
Aunt	7	2.8
Other (all members, helper)	6	2.4
Total	**250**	**100**
Head of the house		
Father	127	50.8
Mother	101	40.4
Sibling	11	4.4
Grandmother	8	3.2
Grandfather	1	0.4
Aunt	1	0.4
Other (uncle)	1	0.4
Total	**250**	**100**
Person responsible for deciding how much to spend on food		
Father	36	14.4
Mother	174	69.6
Sibling	27	10.8
Grandmother	5	2.0
Grandfather	0	0
Aunt	2	0.8
Other (all members)	6	2.4
Total	**250**	**100**
Number of meals eaten per day by caregivers		
1	13	5.2
2	73	29.2
3	141	56.4
>3	23	9.2

Total	**250**	**100**
Place of consumption of most meals by caregivers		
Home	200	80.0
Friends	1	0.4
Work	45	18.0
School	1	0.4
Other (both work and home)	3	0.4
Total	250	100
Place of consumptions of meals by children		
Home	206	82.4
Friends	2	0.8
School	28	11.2
Other (after- care, both home and school)	1	0.4

4.3.4 Assets

Table 4.7 illustrates that all households had at least one means of communication (telephone or cellphone) and access to information via a television. Most respondents' households had an electric stove (99.2%; n=248), a microwave oven (96.4%; n=241), a radio (90%; n=225), a refrigerator (99.2%; n=248), a bed with mattress (99.2%; n=248), an electric iron (98.8%; n=247) and an electric kettle (97.6%; n=244). Seventy percent (n=175) of the respondents have superior means to move around due to ownership of at least one car.

Table 4.7: Assets within the household

Variables	Number	Percentage (%)
Electric stove	248	99.2
Gas stove	88	35.2
Primus or paraffin stove	29	11.6
Microwave oven	241	96.4
Hot plate	68	27.2
Radio	225	90
Television	250	100
Refrigerator	248	99.2
Freezer	184	73.6
Telephone/ cell phone	250	100

Bed with mattress	248	99.2
Mattress only	43	17.2
Lounge suite	223	89.2
Dining room suite	173	69.2
Electric iron	247	98.8
Electric kettle	244	97.6
Car	175	70.0
Bicycle	30	12.0
Motorbike	6	2.4

Table 4.8 illustrates that the most common (98.8%; n=247) fuel used to make meals is electricity. Although most (94.4%; n=236) respondents use stainless steel pots, some indicated using both stainless steel as well as aluminum pots.

Table 4.8: Fuel and material used for food preparation

Variables	Frequency	Percentage (%)
Type of fuel used to prepare food		
Electricity	247	98.8
Gas	3	1.2
Total	**250**	**100**
Type of material used to make pots		
Aluminum	14	5.6
Stainless steel	236	94.4
Total	**250**	**100**

4.3.5 Multi-dimensional Poverty Index

According to the multi-dimensional poverty index (MPI) the three dimensions used to reflect deprivation are health, education and standard of living. Child mortality, nutrition, years of schooling, child enrolment, electricity, drinking water, sanitation, flooring, cooking fuel and assets may determine rudimentary services and core human functioning for people. Table 4.9 summarizes how the Umlazi community fared when compared to these criteria.

Table 4.9 indicates that the Umlazi community had a score of 9.09 out of 30. The score achieved by the Umlazi study community (9.09) indicates minimal multi-dimensional poverty. The

community is well serviced in terms of basic services provided by the municipality and enjoys an improved standard of living.

Table 4.9: MPI Score of emerging middle income community

MPI Measure	Results of emerging middle income community in Umlazi (n=250)	Weight	MPI Score
Health			
Child mortality (n=243)	30.9% of the households indicated that a child has died in the past	x 1/6	5.15
Nutrition	0% of the respondents presented with being in the underweight classification of BMI	x 1/6	0
Education			
Years of schooling	2.4% had no schooling	x 1/6	0.4
Child enrolment (n=238)	0% children of school-going age not attending school	x 1/6	0
Standard of living			
Electricity	0% have no access	x 1/18	0
Drinking water	0% have no access	x 1/18	0
Sanitation	0% have no access	x 1/18	0
Flooring	0% of households had dung, sand, mud as floor	x 1/18	0
Cooking fuel	0% households used wood or charcoal to prepare food	x 1/18	0
Assets	**% Owning <2**		
Radio	92.8%	x 1/108	0.86
Television	78.8%	x 1/108	0.73
Telephone/ mobile phone	6.8%	x 1/108	0.06
Motorbike	98.2%	x 1/108	0.91
Refrigerator	89.2%	x 1/108	0.83
Assets	**% not owning a vehicle**		
Car	16.4%	x 1/108	0.15
TOTAL			**9.09**

Table 4.10 presents the contribution of indicators to MPI.

In table 4.10 it can be seen that more than a third (38.94%) of deprivation is seen in the assets deficit.

Table 4.10: Contribution of the dimensions to MPI indicators of deprivation

Deprivation index	Total score	Contribution (%)
Health	5.15	56.66
Education	0.40	4.40
Assets	3.54	38.94
Total	**9.09**	**100%**

4.4 ANTHROPOMETRIC AND HEALTH INDICATORS

4.4.1 Introduction

The anthropometric indices described below provide an overview of the risk and prevalence of non-communicable diseases. Tables and figures indicating BMI as well as waist circumference and waist-to-height ratio have been utilized to present this data. The results are presented separately for men and women and in relevant age group categories (19-50 and 51+ years) to facilitate appropriate comparison with the nutrient analysis results in section 4.5.

4.4.2 Anthropometric findings

Table 4.11 summarizes the mean anthropometric measurements of the total number of respondents. It shows that the women are on average slightly older (52.28 years old) than the men (49.82 years old). The mean weight in kilograms for the whole group averaged at 89.27 kg of which the women averaged slightly above the men (86.77 kg). The men's mean weight averaged slightly below the total population average by 2.5 kg. The combination of men and women presented an average BMI category of obese class II (34.87). Women had an average BMI of 36.31 and men fell into the overweight category with a mean BMI of 29.91. A statistically significant positive relationship was observed for BMI between the two genders (p=0.01) when comparing the mean BMI of the genders. The mean waist circumference amounted to 97.04 cm and it is important to keep in mind that the cut-off points are 102 cm and 88 cm for men and women respectively. Other correlations made showed positive relationships between age and BMI (p=0.007); BMI and WHtR (p=0.00) using Pearson's test.

Table 4.11: The mean and standard deviation for age, height, weight, BMI and waist circumference of the respondents (n=250)

Variable	Mean age ±SD (n=250)	Mean height (m) ±SD (n=250)	Mean weight (kg) ±SD (n=250)	*Mean BMI ±SD (n=250)	Mean waist (cm) ±SD (n=250)
Total group (men and women)	51.73±14.015	1.60±0.090	89.27±21.940	*34.87±8.833	97.04±25.707
Men (n= 56)	49.82±13.709	1.70±0.059	86.77±24.928	29.91±7.698	98.09±13.119
Women (n=194)	52.28±14.088	1.58±0.077	89.99±21.015	36.31±8.635	96.74±28.340

* Statistically significant at p<0.01between the men and women

Of the men below the age of 50 years, 39.29% (n=11) were overweight and a quarter (25%; n=7) fell into the obese I class category. Combining the obesity classes presents that 67.5% (n=54) of the women aged 19-50 years fell into at least one of these classes. Both age groups of men and women 19-50 years old did have respondents in the normal BMI range, with 25.87% (n=8) of men and 15.00% (n=12) of women falling into this category.

Table 4.12: Summary of BMI of men and women 19-50 years old

Body Mass Index classification (WHO 2003)	Men 19-50 years (n=28)	Mean± SD	Percentage (%)	Women 19-50 years (n=80)	Mean± SD	Percentage (%)
Normal weight (18.50- 24.99)	8	23.01 ± 1.627	25.87	12	22.28 ± 1.956	15.00
Overweight (25.00-29.99)	11	27.73 ± 1.751	39.29	14	28.39 ± 1.181	17.50
Obese I (30.00- 34.99)	7	32.90 ± 1.296	25.00	23	32.56 ± 1.255	28.75
Obese II (35.00- 39.99)	0	0	0	14	37.53 ± 2.143	17.50
Obese III (≥40)	2	53.56 ± 17.886	7.14	17	49.19 ± 7.093	21.25

Most of the women fell within the BMI category of being overweight. The majority (83.33%; n=95) of the women 51 years and above were in at least one of the obese categories. A few (3.51%; n=4) women were of normal BMI. The high BMI scores indicate serious implications for health and lifestyle diseases. A large number (42.86%; n=12) of men above the age of 50 years also fell into the overweight BMI classification and 32.14% (n=9) were in the obese class I category and a statistically significant relationship was found between BMI and WHtR at p=0.002 for both men and women above the age of 50 years.

Table 4.13: Summary of BMI of men and women 51+ years old

Body Mass Index classifications (WHO 2003)	Men 51+ years (n=28)	Mean± SD	Percentage (%)	Women 51+ years (n=114)	Mean± SD	Percentage (%)
Normal weight (18.5- 24.99)	4	22.36 ± 1.851	14.29	4	22.73 ± 2.14	3.51

Overweight (25.00-29.99)	12	27.54 ± 1.267	42.86	15	27.90 ± 1.816	13.16
Obese I (30.00- 34.99)	9	32.37 ± 1.720	32.14	24	32.78 ± 1.539	21.05
Obese II (35.00- 39.99)	1	37.79 ± 0	3.75	36	37.50 ± 1.635	31.58
Obese III (≥40)	2	49.71 ± 4.372	7.14	35	46.33 ± 1.818	30.70

Waist circumference is used as a determinant of abdominal fat distribution. Figure 4.10 depicts that approximately two-thirds (63.75%; n=51) of the women 19-50 years old had a risk of excessive abdominal fat distribution. Women 51+ years old showed the highest (78.07%; n=89) number of 'at risk' respondents. Men aged 19-50 had the lowest (17.86%; n=5) percentage of respondents found to be at risk of excessive abdominal fat distribution.

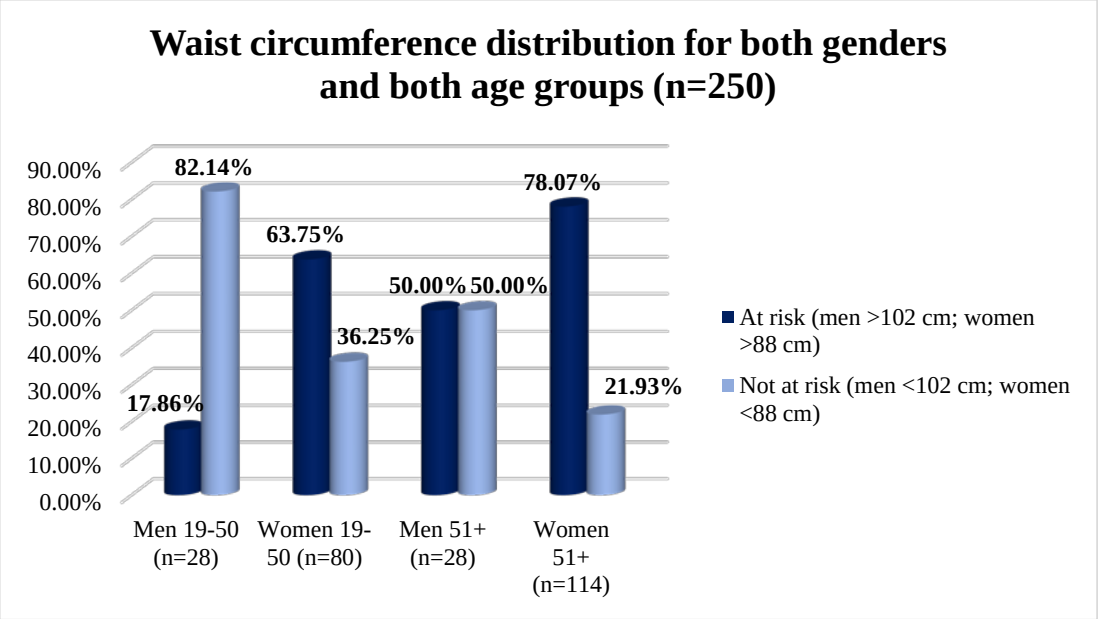

Figure 4.10: Waist circumference of men and women separately

It is illustrated in figure 4.11 that across all the groups more than half of the respondents were at risk of metabolic syndrome. Women aged 51+ years old showed to be the most (81.58%; n=93) at risk respondents. The mean WHtR for men 19-50, women 19-50, men 51+ and women 51+ years old was 0.51, 0.58, 0.52 and 0.64 respectively; all above the 0.5 cut-off point.

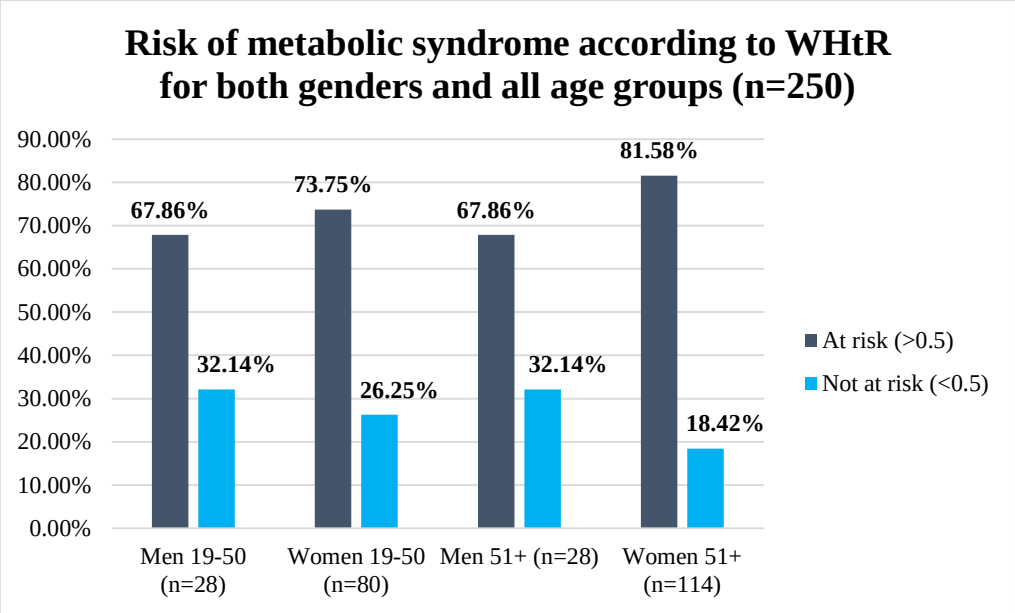

Figure 4.11: Waist-to-height-ratio (WHtR) score (n=250)

4.5 DIETARY INTAKE NUTRIENTS ANALYSIS AND TOP 20 FOOD ITEMS

As shown in table 4.14 both the groups of men and women 19-50 years old did not meet the energy requirement of 12 881kJ and 10 093kJ respectively. An exceeded intake of carbohydrates was seen in both the groups; men consumed 201.33% and women 184.06% of the DRIs although five (6.25%) women did not meet the 100g requirement. A positive relationship was observed between BMI and carbohydrate intake for men 19-50 years old (p=0.001) for Pearson's test correlation. The men and women met the DRI for protein with men having consumed an average (±SD) of 63.35g (±23.358) and women 54.56g (±18.253). All (100%) of the men did not meet the requirement of magnesium (340mg) and women met approximately two-thirds (63.68%) of the magnesium estimated average requirement. Approximately 1/3 of the calcium DRI (1000mg) was consumed by both men (30.33%) and women (30.88%).

Table 4.14: The dietary intake analysis of macronutrients and minerals for men and women 19-50 years old, measured using the average of three 24-Hour Recalls (IoM 2003)

Nutrients p/day	Men 19-50 years (n=28) Mean ±SD	DRIs	Men's % of DRI consumed	% (n) Men 19-50 years with <100% NARs	Women 19-50 years (n=80) Mean ±SD	DRIs	Women's % of DRI consumed	% (n) Women 19-50 years with <100% NARs
Energy (kJ) EER	6609.57±1826.748	**12 881**	51.31%	100%	5975.85±2014.054	**10 093**	59.20	93.75 (75)
Carbohydrates (mg) EAR	201.13±59.035	**100**	201.33%	0 (0)	184.06±59.747	**100**	184.06	6.25 (5)
Total Dietary Fibre (g/day) AI	15.90±8.785	**38**	41.84%	96.43 (27)	14.13±7.192	**25**	56.54	96.25 (77)
Protein (g) RDA	63.25±23.358	**56**	112.94%	46.43 (13)	54.56±18.253	**46**	118.60	31.25 (25)
Fat (g)	49.87±29.291	**-**	-	-	45.37±19.886	**-**	-	-
Calcium (mg) AI	303.34±189.273	**1 000**	30.33%	96.43 (27)	308.81±228.433	**1 000**	30.88	97.5 (78)
Iron (mg) EAR	12.85±6.429	**6**	214.10%	3. 57 (1)	11.48±5.907	**8.1**	141.67	21.25 (17)
Magnesium (g) EAR	190.94±65.718	**340**	56.16%	100% (28)	165.56±58.950	**260**	63.68	93.75 (75)
Phosphorus (mg) EAR	823.97±301.476	**580**	142.06%	28.57 (8)	728.07±305.657	**580**	125.53	33.75 (27)
Zinc (mg) EAR	10.56±4.608	**9.4**	112.37%	42.86 (12)	9.33±3.503	**6.8**	137.25	17.5 (14)
Selenium (µg/day)EAR	32.09±18.583	**45**	71.32%	75 (21)	27.68±30.233	**45**	61.51	91.25 (73)
Iodine (µg/day) EAR	41.06±25.815	**95**	43.22%	96.43 (27)	28.00±17.432	**95**	29.48	98.75 (79)

EER: Estimated Energy Requirement (Institute of Medicine, 2003) **AI:** Adequate Intake
EAR: Estimated Average requirement **RDA**: Recommended Dietary Allowance

Results in table 4.15 show that the mean vitamin intake for both groups was sufficient for vitamin A but there were still 78.57% (n=22) of the men and of the 70.00% (n=56) of the women who did not reach 100% of the DRIs of 625mg and 500mg respectively. Similar results are seen for riboflavin where there were slightly more than 50% of the respondents in each group who did not meet the riboflavin daily requirement even though the total group consumed more than the 1.1mg requirement for men and 0.9mg for men. Niacin (198.60%), vitamin B6 (295.45%), vitamin B12 (204.39%), pantothenate (126.65%) and biotin (119.70%) were all consumed in excess of the average requirement for men. Women 19-50 years old did not completely consume 100% of the DRI's for folate (82.79%), biotin (98.59%), vitamin C (87.48%), vitamin D (59.01%), vitamin K (78.68%) and vitamin E (66.46%).

Table 4.15: The dietary intake nutrients analysis of vitamins for men and women 19-50 years old, measured using the average of three 24-Hour Recalls (IoM 2003)

Nutrients p/day	Men 19-50 years (n=28) Mean ± SD	DRIs	Men's % of DRI consumed	% Men 19-50 years with <100% NARs (n)	Women 19-50 years (n=80) Mean ± SD	DRIs	Women's % of DRI consumed	% Women 19-50 years with <100% NARs (n)
Vitamin A RE (µg/day) EAR	659.06±887.689	**625**	105.45	78.57 (22)	866.84±2265.140	**500**	173.37	70.00 (56)
Thiamin (mg) EAR	1.18±0.539	**1**	118.00	46.43 (13)	1.06±0.483	**0.9**	117.32	38.75(31)
Riboflavin (mg) EAR	1.17±0.670	**1.1**	106.36	53.57 (15)	1.21±1.201	**0.9**	133.99	53.75 (43)
Niacin (mg) EAR	23.83±10.019	**12**	198.60	0.00 (0)	19.86±8.294	**11**	180.55	7.50 (6)
Vitamin B6 (mg) EAR	3.25±1.637	**1.1**	295.45	0.00 (0)	2.65±1.240	**1.1**	241.02	5.00 (4)
Folate (µg/day) EAR	316.93±184.628	**320**	99.04	60.71 (17)	264.94±153.517	**320**	82.79	73.75 (59)
Vitamin B12 (µg/day) EAR	4.09±4.860	**2**	204.39	50.00 (14)	7.30±24.499	**2**	365.12	41.25 (33)
Pantothenate (mg) AI	6.33±3.719	**5**	126.65	46.43 (13)	5.03±2.689	**5**	100.70	52.50 (42)
Biotin (µg/day) AI	35.91±36.890	**30**	119.70	53.57 (15)	29.58±24.003	**30**	98.59	72.5 (58)
Vitamin C (mg) EAR	52.82±52.806	**75**	70.43	82.14 (23)	52.49±46.302	**60**	87.48	70.00 (56)
Vitamin D (µg/day) AI	4.18±3.981	**5**	83.66	64.29 (18)	2.95±3.092	**5**	59.01	86.25 (69)
Vitamin K (mcg) AI	57.96±112.001	**120**	48.30	89.29 (25)	70.82±138.379	**90**	78.68	81.25 (65)
Vitamin E (mg) EAR	9.84±4.999	**12**	82.00	75.00 (21)	7.97±4.639	**12**	66.46	85.00 (68)

EER: Estimated Energy Requirement (Institute of Medicine, 2003) **AI:** Adequate Intake
EAR: Estimated Average requirement **RDA**: Recommended Dietary Allowance

Table 4.16 illustrates that both men and women 51+ years did not meet the requirement (12 881 kJ and 10 093 kJ respectively) for energy (47.84% and 54.45% respectively); however, carbohydrates were consumed in excess of the 100g requirement and men 51+ years had a mean intake (±SD) of 192.45g (±46.802) with women taking in a mean (±SD) of 172.55g (±58.551). Although men and women took in protein sufficiently, there were 42.86% (n=12) of men and 42.98% (n=49) of women who did not meet the requirement (56g and 46g respectively). Both men and women consumed iron in excess of 100% amounting to 200.71% and 204.41% respectively. A deficient intake of magnesium (50.22%), selenium (61.13%) and iodine (29.56%) was seen for men 51+ years old and also women 51+ years old who consumed 61.37%, 50.25% and 26.95% respectively.

Table 4.16: The dietary intake nutrients analysis of macronutrients and minerals for men and women 51+ years old, measured using the average of three 24-Hour Recalls (IoM 2003)

Nutrients p/day	Men 51+ years (n=28) Mean ±SD	DRIs	Men's % of DRI consumed	% Men 51+ years with <100% NARs (n)	Women 51+ years (n=114) Mean ±SD	DRIs	Women's % of DRI consumed	% Women 51+ years with <100% NARs (n)
Energy (kJ) EER	6161.90±1718.682	**12881**	47.84	100.00 (28)	5504.64±1902.955	**10093**	54.54	96.49 (110)
Carbohydrates (mg) EAR	192.45±46.802	**100**	192.84	7.14 (2)	172.55±58.551	**100**	172.55	5.26 (6)
Total Dietary Fibre (g/day) EAR	15.44±6.174	**30**	51.48	96.43 (27)	14.62±6.450	**21**	69.64	85. 09 (97)
Protein (g) RDA	59.65±21.478	**56**	106.52	42.86 (12)	49.51±17.640	**46**	107.64	42.98 (49)
Fat (g)	43.63±17.396	**-**	-	-	40.02±19.633	**-**	-	-
Calcium (mg) AI	259.72±124.440	**1200**	21.64	100.00 (28)	297.32±190.376	**1200**	24.78	99.12 (113)
Iron (mg) EAR	12.04±3.461	**6**	200.71	7.14 (2)	10.22±4.320	**5**	204.41	3.51 (4)
Magnesium (g) EAR	175.77±50.542	**350**	50.22	100 (28)	162.63±55.739	**265**	61.37	94.74 (108)
Phosphorus (mg) EAR	751.09±243.935	**580**	129.50	21.43 (6)	683.37±250.813	**580**	117.82	33.33 (38)
Zinc (mg) EAR	11.28±3.833	**9.4**	120.03	39.29 (11)	8.76±3.519	**6.8**	128.82	33.33 (38)
Selenium (µg/day) EAR	27.51±16.028	**45**	61.13	85.71 (24)	22.61±13.065	**45**	50.25	94.74 (108)
Iodine (µg/day) EAR	28.08±19.095	**95**	29.56	100 (28)	25.60±17.640	**95**	26.94	99.12 (113)

EER: Estimated Energy Requirement (Institute of Medicine, 2003) **AI:** Adequate Intake
EAR: Estimated Average requirement **RDA**: Recommended Dietary Allowance

As seen in table 4.17 even though vitamin A was consumed sufficiently by the group, a majority of the men (85.71%; n=24) and the women (74.56%; n=84) did not meet the requirement of 625µg and 500µg respectively. There were participants that consumed above the requirement and those that did not meet the requirement still did consume most of what was required. Men consumed more niacin (188.76%), vitamin B6 (242.69%) and vitamin B12 (381.51%) than the DRIs placed at a recommended intake of 12mg, 1.4mg and 2µg respectively. Women also took in excess niacin, vitamin B6 and vitamin B12 and on average their intake amounted to 17.77mg (±7.072 SD), 2.28mg (±1.055 SD) and 3.05µg (±4.285 SD) respectively. Fat soluble vitamin D (30.89%), vitamin K (30.70%) and vitamin E (60.16%) were consumed insufficiently by the men. Similarly, the women did not take in enough fat soluble vitamins D (25.75%), vitamin K (76.64%) and vitamin E (59.58%).

Table 4.17: The dietary intake nutrients analysis of vitamins for men and women 51+ years old, measured using the average of three 24-Hour Recalls (IoM 2003)

Nutrients p/day	Men 51+ years (n=28) Mean ±SD	DRIs	Men's % of DRI consumed	Men 51+ years with <100% NARs % (n)	Women 51+ years (n=114) Mean ±SD	DRIs	Women's % of DRI consumed	Women 51+ years with <100% NARs % (n)
Vitamin A RE (µg/day) EAR	743.75±1182.647	**625**	119.00	85.71 (24)	492.21±530.183	**500**	98.44	74.56 (85)
Thiamin (mg) EAR	1.19±0.385	**1**	118.92	25.00 (7)	1.00±0.415	**0.9**	110.92	47.37 (54)
Riboflavin (mg) EAR	1.04±0.450	**1.1**	94.97	60.71 (17)	0.87±0.450	**0.9**	96.49	59.65 (68)
Niacin (mg) EAR	22.65±7.528	**12**	188.76	7.14 (2)	17.77±7.072	**11**	161.53	14.91 (17)
Vitamin B6 (mg) EAR	3.40±1.444	**1.4**	242.69	7.14 (2)	2.28±1.055	**1.3**	175.54	14.91 (17)
Folate (µg/day) EAR	316.04±106.484	**320**	98.76	53.57 (15)	255.65±118.984	**320**	79.89	77.19 (88)
Vitamin B12 (µg/day) EAR	7.63±12.156	**2**	381.51	21.43 (6)	3.05±4.285	**2**	152.62	53.51 (61)
Pantothenate (mg) AI	4.62±2.420	**5**	92.35	64.29 (18)	4.80±2.575	**5**	95.90	62.28 (71)
Biotin (µg/day) AI	27.95±30.098	**30**	93.16	71.43 (20)	26.30±13.637	**30**	87.65	75.44 (86)
Vitamin C (mg) EAR	72.12±62.786	**75**	96.16	67.86 (19)	63.20±68.734	**60**	105.34	66.67 (76)
Vitamin D (µg/day) AI	3.09±2.413	**10**	30.89	100 (28)	2.57±2.588	**10**	25.72	98.25 (112)
Vitamin K (mcg) AI	36.84±46.452	**120**	30.70	92.86 (26)	68.97±115.410	**90**	76.64	83.33 (95)
Vitamin E (mg) EAR	7.22±2.994	**12**	60.16	92.86 (26)	7.15±3.998	**12**	59.58	87.72 (100)

EER: Estimated Energy Requirement (Institute of Medicine, 2003) **AI:** Adequate Intake
EAR: Estimated Average requirement **RDA**: Recommended Dietary Allowance

Table 4.18 presents the top 20 foods consumed in mean intake over three days, per frequency consumed and per capita intake. The table shows that there are six foods that could contribute mostly to energy that appear within the top 10 foods consumed, namely: bread (26 times), sugar (26 times), rice (15 times), maize meal porridge (12 times), carbonated cold drink (10 times) and margarine (8 times) at numbers one, two, four, six, eight and ten. The most consumed drink according to mean intake per frequency was coffee (ranked 9th) and averaged at 297.41g per frequency. However, squash cold drink appears at number five consumed 12 times (mean intake per frequency of 274.72ml) compared to carbonated cold drink which was consumed at a mean frequency of 10 times (295ml) therefore appearing at number eight. The four animal protein foods that appear in the top 20 are chicken (stewed), egg (fried), beef (stewed), beef (roasted) and chicken (roasted), which had a mean intake per frequency by the whole group of 180.15g, 90.42g, 165.83g, 164.44g and 150.56g respectively. Plant proteins are baked beans that appear at number 16 with a mean portion size of 75.56g consumed only on three occasions. Dairy or dairy products appear as milk and cheese at number three and 14 respectively but were consumed in mean portions of 87.11g and 11.33g per frequency. The two vegetables that appear on the top 20 foods consumed are coleslaw salad at number 15 and butternut at number 19 with a per capita intake of 5.71g and 5.48g.

Table 4.18: The Top 20 food items ranked by the frequency of consumption by men 19-50 years old as measured by three 24-Hour Recalls (n=28)

TOP 20 FOOD CONSUMED BY MEN 19-50 YEARS OLD (n=28)					
Rank	**Item**	**Mean Intake (g)**	**Frequency consumed over 1 day**	**Mean Intake per frequency (g)**	**Mean per capita Intake (1 day) (g)**
1	Bread/ rolls	3 178.33	26	122.24	113.51
2	Sugar	373.00	26	14.35	13.32
3	Milk	1 655.00	19	87.11	59.11
4	Rice	2 426.33	15	161.76	86.65
5	Diluted squash cold drink	3 296.67	12	274.72	117.74
6	Maize meal porridge	3 303.33	12	275.28	117.98
7	Chicken curry/ stew	1 981.67	11	180.15	70.77
8	Carbonated cold drink	2 950.00	10	295.00	105.36
9	Coffee	2 676.67	9	297.41	95.60
10	Margarine	75.00	8	9.38	2.68
11	Tea	2 166.67	8	270.83	77.38
12	Egg, fried	723.33	8	90.42	25.83
13	Beef, curry/ stew	995.00	6	165.83	35.54

14	Cheese	56.67	5	11.33	2.02
15	Coleslaw salad	160.00	4	40.00	5.71
16	Peanut butter	102.00	4	25.50	3.64
17	Beef, roasted/ fried	493.33	3	164.44	17.62
18	Chicken, roasted	451.67	3	150.56	16.13
19	Butternut	153.33	3	51.11	5.48
20	Baked beans	226.67	3	75.56	8.10

Table 4.19 illustrates that sugar was consumed the most number of times (66) at an average of 12.03g each time. Carbonated cold drink was the most consumed source of energy with a mean intake per frequency amounting to 300.36ml every time it was consumed, followed by maize meal porridge (223.92g), bread (100.33g) and rice (140.82g). Milk is ranked third on the top 20 list with a mean intake of 59.95g per capita intake. The other dairy product is cheese and it appeared at number 14. Tea at number five was consumed more times (ranked 5th) by this group than coffee that ranked 13th. Margarine averaged an intake of 9.48g per frequency and ranked at number eight. The mean intake per frequency of four animal proteins (chicken (149.40g) beef (144.12g), egg (73.83g) and sausage (94.83g)) appeared in the top 20 foods consumed by women aged 19-50 years old at numbers 10, 11, 14 and 19 respectively. The first fruit or vegetable appeared at number 12 as butternut with a mean per frequency intake of 37.09g followed by beetroot salad 24.44 g (15^{th}), apple 144.70g (16^{th}) and coleslaw salad 26.97g (17^{th}).

Table 4.19: The mean top 20 food items ranked by the frequency of consumption by women 19-50 years old as measured by three 24-Hour Recalls (n=80)

TOP 20 FOODS CONSUMED BY WOMEN 19-50 YEARS OLD (n=80)					
Rank	**Item**	**Mean Intake (g)**	**Frequency consumed over 1 day**	**Mean Intake per frequency (g)**	**Mean per capita Intake (1 day) (g)**
1	Sugar	793.67	66	12.03	9.92
2	Bread/ rolls	6 421.00	64	100.33	80.26
3	Milk	4 796.33	55	87.21	59.95
4	Rice	6 196.17	44	140.82	77.45
5	Tea	8 963.33	35	256.10	112.04
6	Maize meal porridge	7 613.33	34	223.92	95.17

7	Carbonated cold drink	9 611.67	32	300.36	120.15
8	Margarine	275.00	29	9.48	3.44
9	Diluted squash cold drink	7 154.33	28	255.51	89.43
10	Chicken curry/ stew	4 183.33	28	149.40	52.29
11	Beef curry/ stew	2 450.00	17	144.12	30.63
12	Butternut, boiled	556.33	15	37.09	6.95
13	Coffee	3 796.67	14	271.19	47.46
14	Cheese	277.67	12	23.14	3.47
15	Beetroot salad	293.33	12	24.44	3.67
16	Apple	1 591.67	11	144.70	19.90
17	Coleslaw salad	296.67	11	26.97	3.71
18	Egg, fried in sunflower oil	738.33	10	73.83	9.23
19	Sausage	948.33	10	94.83	11.85
20	Corn flakes	421.33	9	46.81	5.27

According to table 4.20 in the top 20 foods consumed list for men 51+ years there are no fruit or vegetables that appear within the top 10 but mean intakes per frequency of apple (128.61g), fruit juice (285.00g), tomato and onion, stewed (111.00g) and coleslaw salad (33.75g) were ranked at numbers 12, 13, 14 and 16 respectively. Bread (112.86g), sugar (14.39g), maize meal (272.08g), carbonated cold drink (304.00g) and margarine (7.85g), which are high contributors of energy, appeared in the top 10 having been eaten 28, 25, 16, 14, 10 and 9 times on average respectively each day by the 28 men aged 51+ years old. On average each person could have consumed 37.22g per capita intake of the chicken (curried or stewed).

Table 4.20: The mean top 20 food items ranked by the frequency of consumption by men 51+ years old as measured by three 24-Hour Recalls (n=28)

TOP 20 FOODS CONSUMED BY MEN 51+ YEARS OLD (n=28)					
Rank	**Item**	**Mean Intake (g)**	**Frequency consumed over 1 day**	**Mean Intake per frequency (g)**	**Mean per capita Intake (1 day) (g)**
1	Bread/rolls	3 160.00	28	112.86	112.86
2	Sugar	359.67	25	14.39	12.85
3	Milk	931.67	18	51.76	33.27
4	Tea	4 700.00	17	276.47	167.86
5	Maize meal, porridge	4 353.33	16	272.08	155.48
6	Rice	1 959.00	14	139.93	69.96
7	Carbonated cold drink	3 040.00	10	304.00	108.57

8	Margarine	70.67	9	7.85	2.52
9	Diluted squash cold drink	1 893.33	8	236.67	67.62
10	Chicken curry/ stew	1 045.00	7	149.29	37.32
11	Beef curry/ stew	918.33	7	131.19	32.80
12	Apple	771.67	6	128.61	27.56
13	Fruit juice	1 425.00	5	285.00	50.89
14	Tomato and onion, stewed	555.00	5	111.00	19.82
15	Coffee	1 150.00	4	287.50	41.07
16	Coleslaw salad	135.00	4	33.75	4.82
17	Baked beans	346.67	4	86.67	12.38
18	Egg, fried	351.67	4	87.92	12.56
19	Sausage	286.67	3	95.56	10.24
20	Cheese	67.00	3	22.33	2.39

Table 4.21 illustrates that energy dense foods appeared six times in the top 20 foods consumed, namely: sugar, bread, maize meal, rice and margarine and carbonated cold drink. On average every time the foods were consumed a mean amount of 12.59g, 85.48g, 224.18g, 114.72g, 1.11g and 278.43g was consumed respectively. Chicken (curried/ stewed), beef (curried/ stewed), roasted chicken and egg (fried) appear at numbers 8, 10, 18 and 20 respectively. The per capita intake per day and ranking for the group of women 51+ for fruit and vegetables was 29.77g for apples which appeared at number 11, 6.49g for butternut ranked 12th, 6.01g for mixed vegetables and ranking at number 13, 3.50g for beetroot salad at number 15, 3.96g for vegetable curry at number 17, and fruit juice 30.26g ranking at number 19.

Table 4.21: The mean top 20 food items ranked by the frequency of consumption by women 51+ years old as measured by three 24-Hour Recalls (n=114)

TOP 20 FOODS CONSUMED BY WOMEN 51+ YEARS OLD (n=114)					
	Item	**Mean Intake (g)**	**Frequency consumed over 1 day**	**Mean Intake per frequency (g)**	**Mean per capita Intake (1 day) (g)**
1	Sugar	1 523.83	121	12.59	13.37
2	Milk	8 470.00	101	83.86	74.30
3	Tea	22 988.33	89	258.30	201.65
4	Bread	7 266.00	85	85.48	63.74
5	Maize meal porridge	17 261.67	77	224.18	151.42
6	Rice	7 456.67	65	114.72	65.41

7	Margarine	47.67	43	1.11	0.42
8	Chicken curry/ stew	5 836.67	41	142.36	51.20
9	Diluted squash cold drink	8 703.33	34	255.98	76.35
10	Beef curry/ stew	4 261.67	29	146.95	37.38
11	Apple	3 393.33	22	154.24	29.77
12	Butternut	739.50	21	35.21	6.49
13	Mixed vegetables	685.00	18	38.06	6.01
14	Carbonated cold drink	4 733.33	17	278.43	41.52
15	Beetroot salad	399.33	15	26.62	3.50
16	Cheese	220.00	14	15.71	1.93
17	Vegetable curry	451.67	14	32.26	3.96
18	Chicken, roasted	1 590.00	14	113.57	13.95
19	Fruit juice	3 450.00	13	265.38	30.26
20	Egg, fried	1 001.67	13	77.05	8.79

Table 4.22 shows that the total fat percentage that contributed to energy for men 19-50, women 19-50 and men 51+ was in a similar range of 27.92%, 28.10% and 26.20% respectively. However, for women 51+ years old it was 15.29% which is at the lower range of the requirement of 15-30% contribution to energy (WHO 2003). Women 51+ years old exceeded with 26.90% being the percentage contribution of protein to total energy intake when the requirement is 10-15%. All the groups met the required percentage contribution of carbohydrates and fibre to energy (55-75%) with percentages of 55.82% for men 19-50, 56.39% for women 19-50, 57.36% for men 51+, and 57.81%. None of the gender groups and age categories met the fruit and vegetables intake of >400g per day according to WHO goals.

Table 4.22: Percentage of energy distribution of macronutrients and fruit and vegetables intake from the average of three 24-Hour recalls (WHO 2003)

Macronutrients	Mean ± SD	Mean % Energy	WHO Goal
Men 19-50 years old (n=28)			
Total fat (g)	49.87±22.291	27.92	**15-30%**
Protein (g)	63.25±23.358	16.26	**10-15%**
Carbohydrate (g) + Fibre (g)	217.03±32.564	55.82	**55-75%**
Fruit and vegetables (g/day)	82.85±55.351		**>400g**
Women 19-50 years old (n=80)			

Total fat (g)	45.37±19.886	28.10	**15-30%**
Protein (g)	54.56±18.253	15.52	**10-15%**
Carbohydrate (g) + Fibre (g)	198.19±31.112	56.38	**55-75%**
Fruit and vegetables (g/day)	119.44±68.809		**>400g**
Men 51+ years old (n=28)			
Total fat (g)	43.63±17.396	26.20	**15-30%**
Protein (g)	59.65±21.478	16.45	**10-15%**
Carbohydrate (g) + Fibre (g)	207.89±25.249	57.35	**55-75%**
Fruit and vegetables (g/day)	109.90±59.141		**>400g**
Women 51+ years old (n=114)			
Total fat (g)	40.02±19.633	15.29	**15-30%**
Protein (g)	49.51±17.640	26.90	**10-15%**
Carbohydrate (g) + Fibre (g)	187.18±31.927	57.81	**55-75%**
Fruit and vegetables (g/day)	134.32±55.754		**>400g**

4.6 FOOD VARIETY SCORE, FOOD GROUP DIVERSITY SCORE AND NUTRIENT ADEQUACY

4.6.1 Introduction

The food variety score (FVS) consists of the number of individual foods categorized by main and similar nutrient composition indicated as consumed in seven days. Food Group Diversity Score (FGDS) indicates the number of food groups taken in over a seven day period as collated from the food frequency questionnaire.

4.6.2 Food Variety (FV) consumed

Table 4.23 reveals that men 19-50 years in total consumed 66 different food items and achieved a medium FV score (maximum 55 individual foods consumed by a single person among 22 men). The maximum number of items consumed in the fruit group for men was 10. A larger number of respondents consumed between three to eight items.

Table 4.23: Summary of food access as measured by food variety within the food consumed over a period of one week by men 19- 50 years (n=28)

Cereals Group n=9	Legumes Group n= 4	Meat Products Group n= 8	Eggs Group n=1	Dairy Group n= 6	Vegetables Group n= 14	Fruits Group n= 10	Vitamin A Rich Group n= 8	Fats Group n= 6	Total Individual Food Items Eaten from all Groups n= 66
0-2=0 3=2 4=2 5=4 6=10 7=7 8=2 9=1	0=6 1=10 2=8 3=3 4=1	0-1=0 2=1 3=0 4=6 5=7 6=11 7=2 8=1	0=4 1=24	0=2 1=5 2=3 3=6 4=5 5=5 6=2	0-2=0 3=1 4=1 5=2 6=3 7=3 8=6 9=2 10=3 11=1 12=3 13=1 14=2	0-1=0 2=2 3=3 4=6 5=4 6=2 7=5 8=3 9=2 10=1	0=1 1=1 2=1 3=8 4=5 5=6 6=4 7=1 8=1	0=0 1=3 2=2 3=9 4=7 5=6 6=1	1-30=6 31-55=22

Low = 0-3 food groups or <30 individual foods. **Medium** = 4-5 food groups or 30-60 individual foods. **High** = 6-9 food group or >60 individual food (Matla 2008).

As presented in table 4.24 women 19-50 years consumed 84 different foods. For women the highest number (n=26) of respondents consumed seven different foods from the cereals group. At least one woman consumed 23 different items from the fruits group. Many of the respondents consumed between three to eight items. A positive relationship of statistical significance was found between energy and FVS for women 19-50 years old at p=0.015 when correlations were made using Pearson's test.

Table 4.24: Summary of food access measured by FVS within the food consumed over a seven day period by women 19-50 years (n=80)

Cereals Group n= 10	**Legumes Group n= 4**	**Meat Products Groups n= 11**	**Eggs Group n=1**	**Dairy Group n= 6**	**Vegetables Group n= 15**	**Fruits Group n= 23**	**Vitamin A Rich Group n= 8**	**Fats Group n= 6**	**Total Individual Food Items Eaten from all Groups n=84**
0-2=0 3=2 4=6 5=12 6=20 7=26 8=10 9=3 10=1	0=24 1=30 2=19 3=6 4=1	0-1=0 2=3 3=7 4=17 5=16 6=17 7=12 8=5 9=2 10=0 11=1	0=13 1=67	0=3 1=11 2=11 3=24 4=16 5=11 6=4	0-1=0 2=1 3=3 4=6 5=3 6=9 **7=3** 8=10 9=12 10=5 11=8 12=9 13=7 14=1 15=3	1=0 2=4 3=3 4=6 5=7 6=6 7=5 8=8 9=7 10=9 11=9 12=5 13=2 14=2 15=3 16=1 17=2 23=1	0=6 1=8 2=11 3=19 4=11 5=11 6=9 7=3 8=2	0=0 1=2 2=12 3=25 4=24 5=14 6=3	1-30=13 31-60=64 61- 84=3

Low = 0-3 food groups or <30 individual foods. **Medium =** 4-5 food groups or 30-60 individual foods. **High =** 6-9 food group or >60 individual food (Matla 2008)

Table 4.25 shows that men 51+ years had a number (n=7) of respondents that did not eat at all from the legumes and nuts group (25%). Men achieved a high FVS as indicated by the consumption of up to 71 foods by the whole group. The highest number of items eaten by most respondents was between three and eight items per food group.

Table 4.25: Summary of food access as measured by FVS within the food consumed over a period of one week by men 51+ years (n=28)

Cereals Group n= 9	Legumes and Nuts Group n= 4	Meat Products Group n= 8	Egg s Group n=1	Dairy Group n= 6	Vegetables Group n= 14	Fruits Group n= 15	Vitamin A Rich fruit & Veg Group n= 8	Fats Group n= 6	Total Individual Food Items Eaten from all Groups n=71
0-3=0 4= 5 5= 6 6= 4 7= 7 8= 5 9= 1	0= 7 1= 9 2= 8 3= 3 4= 1	0-1=0 2= 1 3= 3 4= 3 5= 8 6= 8 7= 4 8= 1	0= 3 1= 25	0= 0 1= 4 2= 9 3= 5 4= 5 5= 0 6= 4	0-2=0 3= 1 4= 2 5= 4 6= 2 7= 2 8= 6 9= 2 10= 3 11= 1 12= 3 13= 0 14= 2	0= 0 1= 2 2= 1 3= 6 4= 3 5= 6 6= 4 7= 1 8= 2 9= 1 10= 0 11= 1 12= 0 13= 0 14= 0 15= 1	0= 0 1= 1 2= 6 3= 6 4= 6 5= 3 6= 3 7= 0 8= 3	0= 0 1= 2 2= 5 3= 6 4= 9 5= 4 6= 2	1-30=0 31-60=7 61-71=21

Low = 0-3 food groups or <30 individual foods. **Medium =** 4-5 food groups or 30-60 individual foods. **High =** 6-9 food group or >60 individual food (Matla 2008)

Table 4.26 shows that women 51 years and above consumed 74 different food items indicating achievement of a high FVS. The women, however, had a number (n=27) of respondents who did not eat at all from the legumes and nuts group (18.75%). Between two to six different fruits were eaten by the majority (63.16%) of the women.

Table 4.26: Summary of food access measured by FVS within the food consumed over a seven day period by Women 51+ years (n=114)

Cereals Group n= 10	Legumes Group n= 4	Meat Products Group n= 8	Eggs Group n=1	Dairy Group n= 6	Vegetables Group n= 15	Fruits Group n= 16	Vitamin A Rich Group n= 8	Fats Group n= 6	Total Individual Food Items Eaten from all Groups n= 74
0= 0 1= 1 2= 0 3= 2 4= 6 5= 19 6= 24 7= 32 8= 24 9= 5 10= 1	0= 27 1= 39 2= 38 3= 9 4= 1	0= 0 1= 1 2= 6 3= 20 4= 21 5= 24 6= 20 7= 16 8= 5	0= 27 1= 87	0= 3 1= 15 2= 20 3= 34 4= 25 5= 9 6= 8	0= 0 1= 1 2= 1 3= 2 4= 5 5= 8 6= 9 7= 22 8= 8 9= 15 10= 13 11= 10 12= 7 13= 5 14= 6 15= 1	0= 7 1= 2 2= 13 3= 17 4= 14 5= 15 6= 13 7= 8 8= 9 9= 5 10= 6 11= 3 12= 1 13= 0 14= 0 15= 0 16= 1	0= 3 1= 5 2= 11 3= 17 4= 26 5= 21 6= 15 7= 12 8= 4	0= 3 1= 10 2= 21 3= 36 4= 23 5= 17 6= 4	0-30= 27 31-60= 86 61-74= 1

Low = 0-3 food groups or <30 individual foods. **Medium =** 4-5 food groups or 30-60 individual foods. **High =** 6-9 food group or >60 individual food (Matla 2008)

4.6.3 FVS within food groups

It is shown in Table 4.27 that men 19-50 years achieved a mean (±SD) food variety score of 38.43 (±8.846). The maximum number of foods consumed by the men was 57 different foods with the highest mean per food group being the cereals, roots and tubers group for men 19-50 years old (6.00 ±1.389)

Table 4.27: Summary of FVS of men (19-50 years) within the food groups (n=28)

Food Group	Mean	SD	Range of Scores
Cereals, Roots and Tubers	6.00	1.414	3-9
Other Vegetables	4.57	2.937	3-14
Vitamin A rich Fruits and Vegetables	4.30	1.589	1-8
Flesh Foods meat, poultry, fish	5.32	1.219	2-8
Fats and Oils	3.50	1.319	1-6
Dairy	3.31	1.594	1-6
Other Fruits	5.57	2.218	2-10
Legumes and Nuts	1.77	0.869	1-4

Eggs	1.00	0.00	1-1
Total Food Items	**38.43**	**8.846**	**23-57**

As seen in Table 4.28 the mean (±SD) food variety score of 41.38 (±11.629) for women 19-50 years old is a medium rating.The least number of foods consumed was 20 and the most by one individual was 84 different foods. The highest mean per food group was for other vegetables (8.86 ±3.221).

Table 4.28: Summary of FVS of women 19-50 years within the food groups (n=80)

Food Group	Mean	SD	Range of Scores
Cereals, Roots and Tubers	6.36	1.389	3-10
Other Vegetables	8.86	3.221	2-15
Vitamin A rich Fruits and Vegetables	3.74	1.798	1-8
Flesh Foods meat, poultry, fish	5.37	1.738	2-11
Fats and Oils	3.56	1.135	1-6
Dairy	3.22	1.392	1-6
Other Fruits	8.69	4.046	2-23
Legumes and Nuts	1.61	0.755	1-4
Eggs	1.00	0.00	0-1
Total Food Items	**41.38**	**11.629**	**20-84**

Table 4.29 indicates that the minimum number of food items consumed by men 51+ years was 39. The highest mean of different foods consumed from one group was 8.14 ±3.015 for other vegetables.

Table 4.29: Summary of FVS of men 51+ years within the food groups (n=28)

Food Group	Mean	SD	Range of Scores
Cereals, Roots and Tubers	6.14	1.508	4-9
Other Vegetables	8.14	3.015	3-14
Vitamin A rich Fruits and Vegetables	4.00	1.944	1-8
Meat products, poultry, fish	5.25	1.430	2-8
Fats and Oils	3.50	1.347	1-6
Dairy	3.00	1.593	1-6
Other Fruits	5.21	3.011	1-15
Legumes and Nuts	1.81	0.873	1-4
Eggs	1.00	0.000	0-1
Total Food Items	**71.29**	**19.830**	**39-122**

In table 4.30 the results showed that women 51 years and older had a medium FVS (37.49). The mean number of items consumed in the fats and oils group exceeds (3.25 ±1.283) that of legumes and nuts (1.68 ± 0.707). After Pearson's test correlation were done a positive

relationship was found between energy consumption and FVS at p=0.007 and between BMI and FVS (p=0.020).

Table 4.30: Summary of FVS of women (51+ years) within the food groups (n=114)

Food Group	Mean	SD	Range of Scores
Cereals, Roots and Tubers	6.50	1.477	1-10
Other Vegetables	8.53	2.946	1-15
Vitamin A rich Fruits and Vegetables	4.44	1.751	1-8
Flesh Foods meat, poultry, fish	4.82	1.663	1-8
Fats and Oils	3.25	1.283	1-6
Dairy	3.1	1.383	1-6
Other Fruits	5.44	2.822	1-16
Legumes and Nuts	1.68	0.707	1-4
Eggs	1.000	0	0-1
Total Food Items	**37.49**	**10.216**	**10-74**

4.6.4 Food group diversity

Table 4.31: Summary of FGDS of men 19-50 years (n=28)

Number of Food Groups Consumed n=28	Frequency	Percentage
0-6	0	0
7	2	7.1
8	9	32.1
9	17	60.7
Total	**28**	**100**

In table 4.31 and 4.32 it can be seen that there is good food group diversity in both men and women aged 19-50 years old. Both groups consumed foods from at least seven to nine food groups as categorized by main nutrients and similar nutrients indicating a high food group variety score. In both men (60.7%) and women (53.8%) more than half of the respondents consumed from all nine food groups.

Table 4.32: Summary of FGDS of women 19-50 years (n=80)

Number of Food Groups Consumed n= 80	Frequency	Percentage
0-5	0	0.0
6	2	2.5
7	5	6.3
8	30	37.5
9	43	53.8
Total	**80**	**100**

Tables 4.33 and 4.34 illustrate that both the men and the women had a high food group diversity score. Although there were some respondents who took in between zero to six food groups for women (n=4), the majority consumed from either eight or nine food groups (85.1%; n=97). More than 96% (n=27) of the men consumed from between eight and nine food groups.

Table 4.33: Summary of FGDS of men 51+ years (n=28)

Number of Food Groups Consumed n=28	Frequency	Percentage
0-6	0	0
7	1	3.6
8	9	32.1
9	18	64.3
Total	28	100

Table 4.34: Summary of FGDS of women 51+ years (n=114)

Number of Food Groups Consumed n=114	Frequency	Percentage
0-5	0	0.0
6	4	3.5
7	13	11.4
8	30	26.3
9	67	58.8
Total	**114**	**100**

4.6.5 Nutrient adequacy ratio (NAR) compared to food group diversity scores (FGDS)

In this section the researcher aimed to determine whether a relationship existed between the NARs and the FGDS of the population.

As indicated in figure 4.12 there is no distinct relationship between NARs for energy, calcium, protein, iron and zinc and FGDS. It is noted, however, that iron and zinc fall above the 100% DRIs.

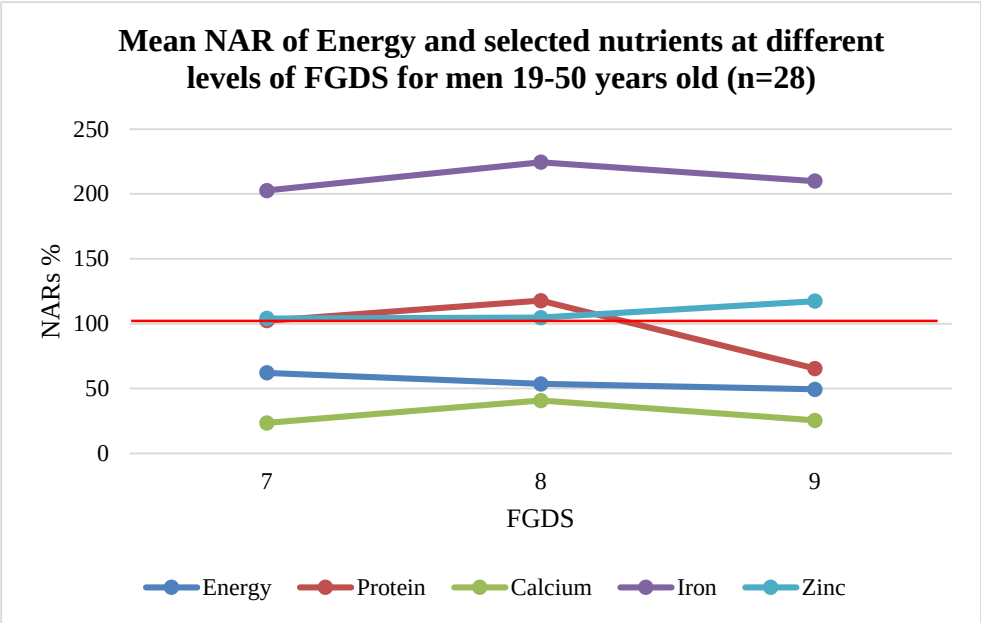

Figure 4.12: Mean Nutrient Adequacy Ratio (NAR expressed as %) of energy and selected nutrients at different levels of the Food Group Diversity Score (FGDS) for men 19-50 years old.

Figure 4.13 illustrates no relationship between NARs of zinc, protein and iron and food group diversity score. The graph should also be read with caution as there were two respondents who consumed from six food groups.

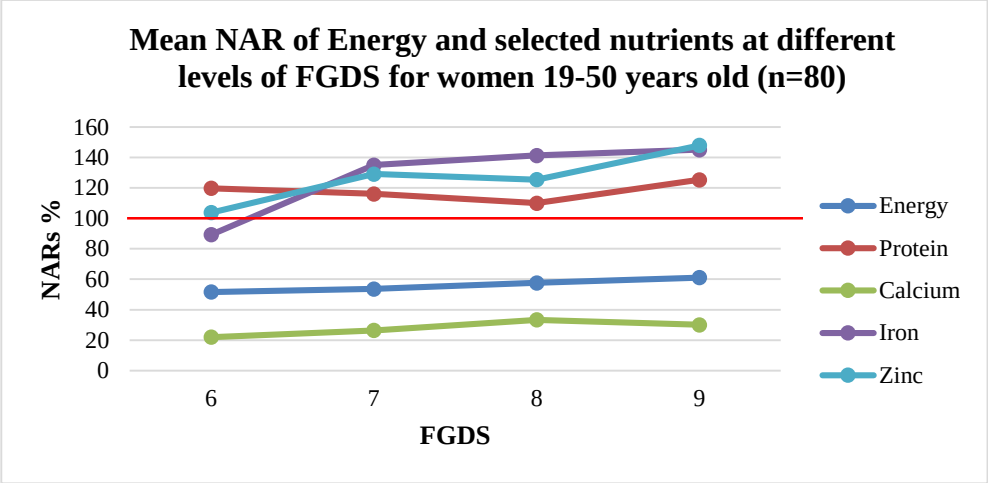

Figure 4.13: Mean Nutrient Adequacy Ratio (NAR expressed as %) of energy and selected nutrients at different levels of the Food Group Diversity Score (FGDS) for women 19-50 years old.

Figure 4.14 shows that the iron, zinc and protein NARs remained above the 100% mark with mean NARs for the nine food groups consumed being 203.99%, 124.52% and 112.90% respectively. One respondent who consumed from seven food groups was not included in the graph. No clear relationship can be seen between the increased NARS and increasing FGDS.

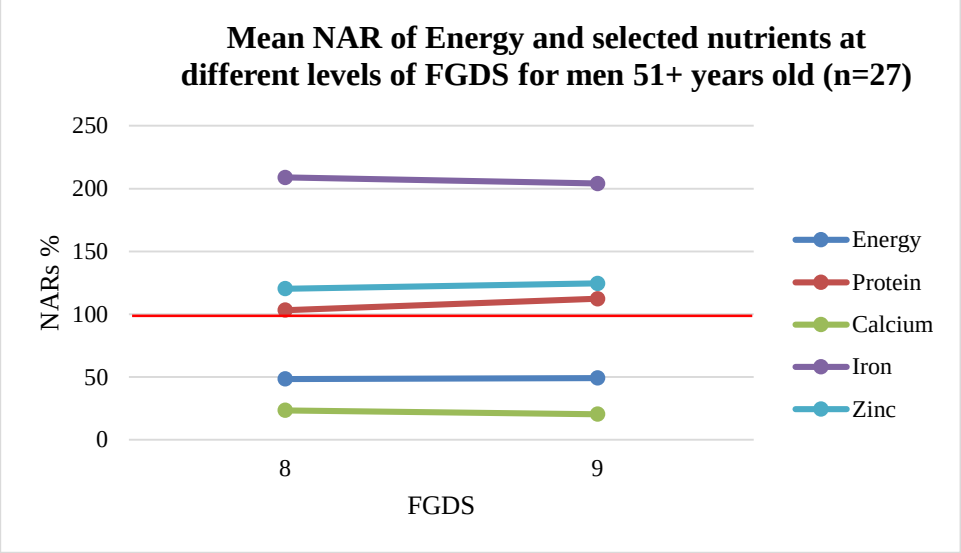

Figure 4.14: Mean Nutrient Adequacy Ratio (NAR expressed as %) of energy and selected nutrients at different levels of the Food Group Diversity Score (FGDS) for men 51+ years old.

In figure 4.15 it is seen that women aged 51+ years adequately consumed protein, zinc and iron. No significant relationship can be seen between the selected nutrients and the FGDS. One respondent consumed from three food groups; however, is not shown in the graph. A positive relationship were observed for energy and FGDS at p=0.01 and calcium and FGDS at p=0.05 using Pearson's test.

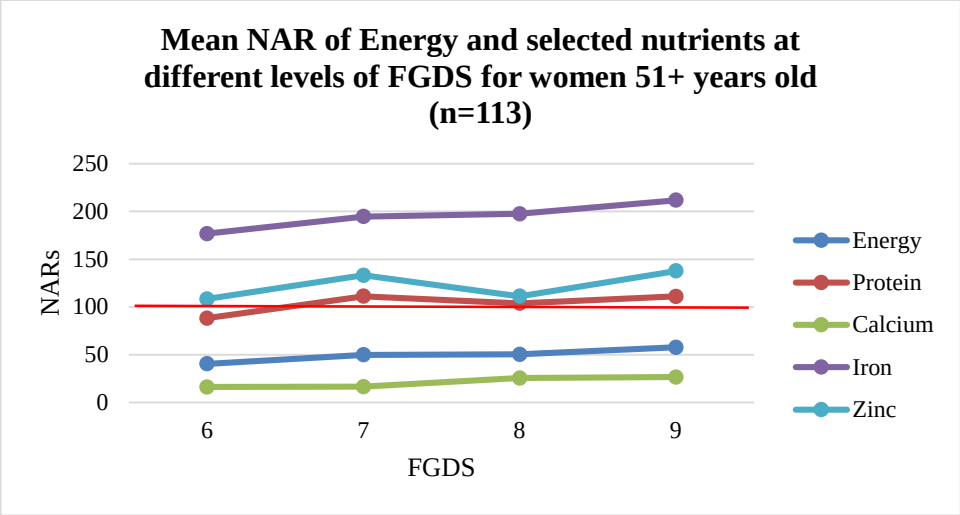

Figure 4.15: Mean Nutrient Adequacy Ratio (NAR expressed as %) of energy and selected nutrients at different levels of the Food Group Diversity Score (FGDS) for women 51+ years old.

In figure 4.16 men 19-50 years old clearly consumed vitamin B6 above the requirement and peaked at 389.70% in the consumption of seven groups. No relationship was observed between the NARs and the FGDS.

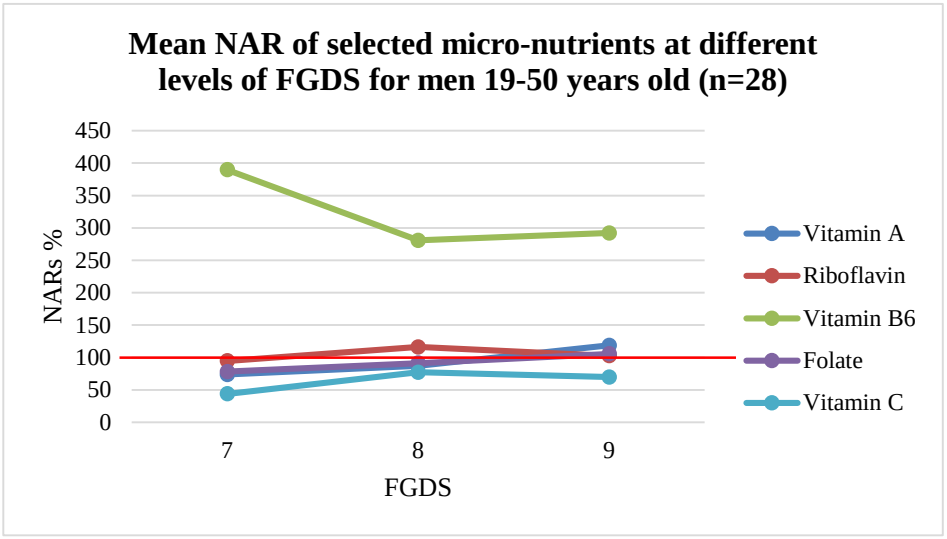

Figure 4.16: Mean Nutrient Adequacy Ratio (NAR expressed as %) of selected micro-nutrients at different levels of the Food Group Diversity Score (FGDS) for men 19-50 years old.

Figure 4.17 depicts that although there seems to be a visible relationship between the FGDS and the nutrients vitamin B6, riboflavin and vitamin A for women 19-50 years old; it is not a statistically significant relationship. These nutrients also fell above the DRIs.

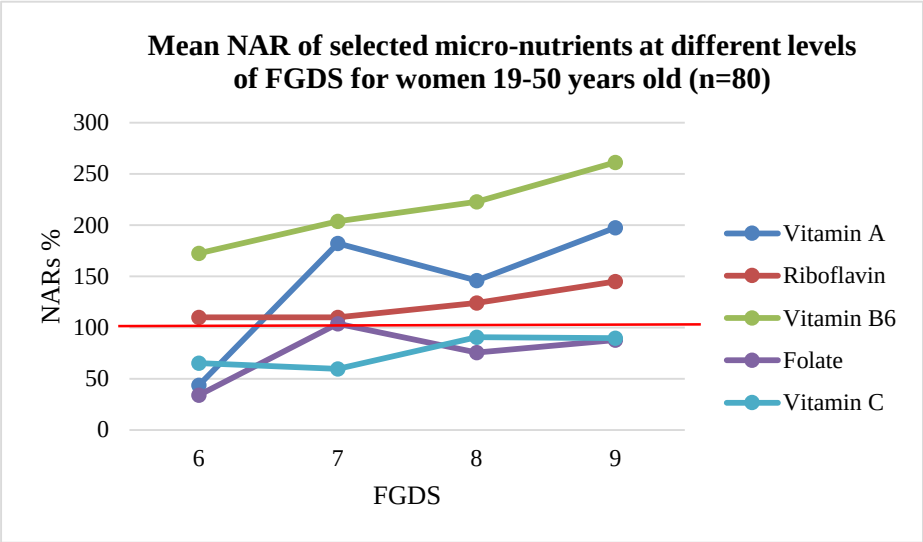

Figure 4.17: Mean Nutrient Adequacy Ratio (NAR expressed as %) of selected micro-nutrients at different levels of the Food Group Diversity Score (FGDS) for women 19-50 years old

Figure 4.18 shows that the mean vitamin B6 NARs for the men 51+ years old was high at approximately 248.915% for the consumption of eight food groups and 248.56% for nine groups consumed.

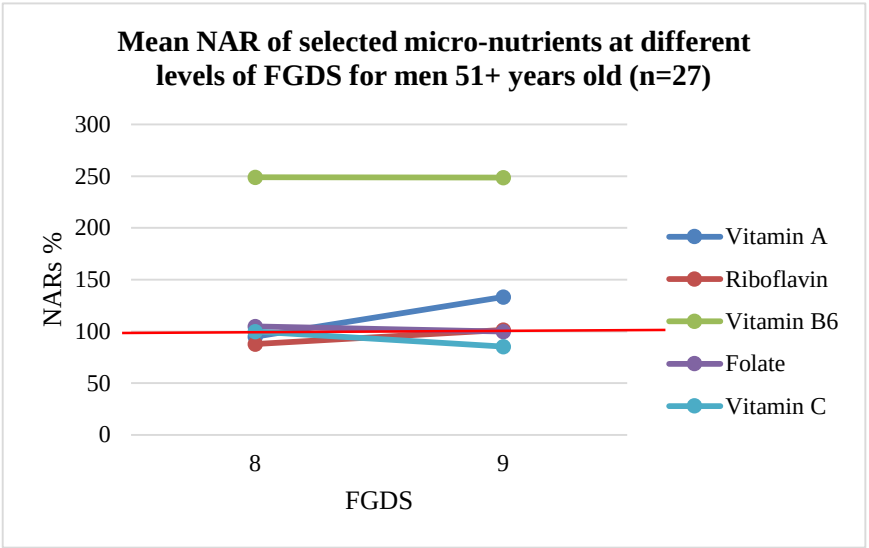

Figure 4.18: Mean Nutrient Adequacy Ratio (NAR expressed as %) of selected micro-nutrients at different levels of the Food Group Diversity Score (FGDS) for men 51+ years old.

Figure 4.19 illustrates that the nutrients that reached and exceeded the 100% mark were vitamin C, riboflavin and Vitamin B6 however no statistically significant relationships were observed using Pearson's test

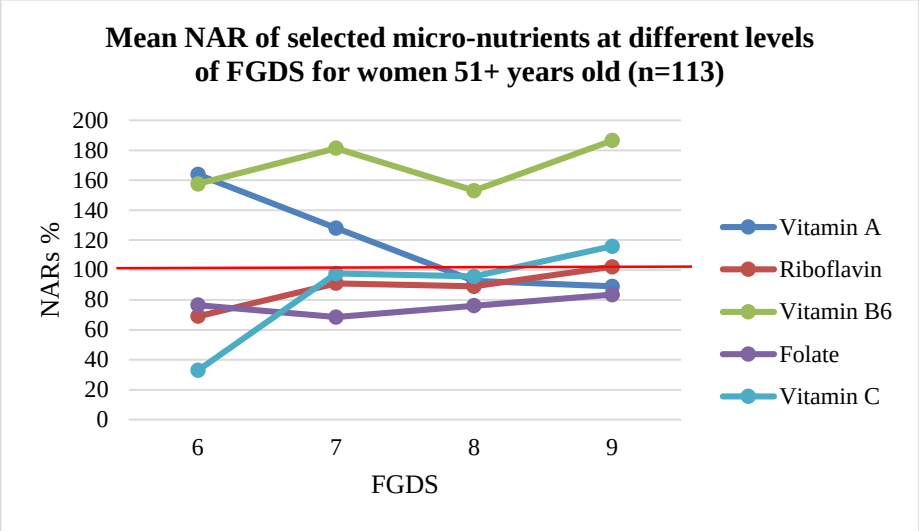

Figure 4.19: Mean Nutrient Adequacy Ratio (NAR expressed as %) of selected micro-nutrients at different levels of the Food Group Diversity Score (FGDS) for women 51+ years old.

4.3 CORRELATIONS

Bivariate correlations were drawn for a number of variables and the following table details the relationship found to be statistically significant.

Table 4.35: Relationship between variables where statistical significance was found

Variable	Relationship (r value)	Significance (*p* value)
Total population		
FVS and education	0.168	0.008
Total income and FVS	0.170	0.007
Age and BMI	0.171	0.007
BMI and WHtR	0.391	0.000
BMI and WC	0.348	0.000
Amount spent on food and no. of people in the house	0.188	0.003
BMI and food security (frequency of not having enough money to buy food)	-0.120	0.029
Men 19-50 years old		
BMI and WC	0.438	0.020
BMI and CHO	0.599	0.001
BMI and energy	0.503	0.006
Women 19-50 years old		
BMI and WHtR	0.357	0.001
BMI and WC	0.331	0.003
energy and FVS	0.271	0.015
Men 51+ years old		

BMI and WHtR	0.293	0.002
BMI and WC	0.256	0.006
Women 51+ years old		
BMI and WHtR	0.293	0.002
BMI and WC	0.256	0.006
BMI and FVS	-0.218	0.020
energy and FVS	0.252	0.007
energy and FGDS	0.281	0.002
energy NAR and FGDS	0.281	0.002
calcium NAR and FGDS	0.192	0.041
vitamin A NAR and FGDS	-0.220	0.019

4.4. DISCUSSION OF RESULTS

The emerging middle income community of Umlazi has an unemployment rate of 48.4%. The most common reason for unemployment was retirement followed by not being able to find a job. The employed population (52.6%) indicated that, among others, they were employed within the civil service (nurses, policemen/-women and teachers). In comparison, the current unemployment rate in South Africa is 25.2% and KZN province has an unemployment rate of 20.4%. From the 2012 municipal ward profile there were 30.8% of people unemployed in Ward 84, almost 20% less than what was found in the current study of the emerging middle income residents in Ward 84 (StatsSA 2015b; eThekwini Municipality 2012).

One of the selection criteria of the study was that a household with a minimum of R8000 total household monthly income would qualify to be included in the study. This was based on the need to study an emerging middle income community within Umlazi Township and not just the whole ward inclusively as this could also include lower income households. The selected income bracket was used to determine which stage of the nutrition transition the black emerging middle income population is currently experiencing. The emerging middle income bracket stands at between R8 333.33 and R25 000 per month or between R100 000 and R300 000 per annum. Of the Ward 84 community studied, almost two thirds (60.4%) of the households in the current study had a minimum total HH income greater than R10 000.00 per month which translates into a minimum of R120 000.00 on average per annum. The average annual income of households in Umlazi Ward 84 is representative of the country's statistics on annual income as indicated by the Income and Expenditure Report (2010/2011) having estimated that the average household annual income in SA was R119 542.00 (StatsSA 2012b). The other ranges of minimum total HH income amounted to 8%, 22.8% and 8.8% for the range

of R9 000.00– R10 000.00; R8 000.00– R9 000.00 and R7 000.00– R8 000.00 per month respectively for the study population (n=250).

The household income of the emerging middle income community may also be supplemented by a pension from the government that is set at R1500 ($135) per month for persons above the age of 60 years (Government of South Africa 2016). This community also has a high educational achievement rate with 75.2% of the participants having achieved either matric, college/ FET and/ or other post school in the form of tertiary education. StatsSA (2013) stated that through a better education one is more likely to be involved in formal employment consequently having access to a pension scheme. Education also plays a significant role in the food security of a household. Farell (2013); Hasan-Ghomi, Mirmiran, Asgari, Amiri, Saadhi, Sadeghian and Azizi (2015); Mutisya, Ngware, Kabiru and Kandala (2016) and Nyako (2013) found in various studies a plausible link between educational attainment and food security in Massachusetts, Iran, Kenya and Nigeria respectively. Populations were made up of urban-informal, nationally representative, urban and formally and informally educated adults. Variations that were reviewed were that education alone may not necessarily sustain food security; the household head's level of education was a contributing factor to food security. A positive relationship was found between individual dietary diversity, better fruit and vegetable intake and food security; however, for the Umlazi emerging middle income community food security may be covered by other factors such as income and employment as the fruit and vegetable intake was not adequate with only a medium food variety score.

Crush and Caesar (2014) stated the Msunduzi municipality includes another one of KZN's largest townships (Edendale) that is dominated by modern supermarket chains, which brings into consideration that wage employment and income are major factors of urban food security. Slightly more than two thirds (68.0%) of the Umlazi population spends between R1800.00–R2 000.00 or more on food per month of which approximately nine out of ten households indicated purchasing food from supermarkets. The WHO (2016c) states that households in urban areas with lower socioeconomic status are predisposed to spending more than 70% of their income on food which has implications for the availability of funds for education, child care and other activities. However, the Ward 84 community cannot be placed in the category of a low socioeconomic status. It was reported that approximately 13.9% of household expenditure in SA is allocated to food, beverages and tobacco, but in black households specifically food, beverages and tobacco make up 19.9% of the HH expenditure (StatsSA 2012b). This reflects the current study population where R10 000.00 is used as the minimum HH income with

R2000.00 being the amount spent on food, translating to 20% of HH expenditure being used on food.

Most (92.8%) of the households in Ward 84 had more than five rooms inside the house. More than half (57.6%) of the respondents had between one to five other people living in the household and the rest of the households housed more than six people permanently in the home. There was a statistically significant outcome of a positive relationship (p=0.003) using Peasron's test between the number of people in the household and the amount of money spent on food per month. Sekhampu (2012: 452) stated that household income, HH size, age, employment status and educational attainment of the HH head have an influence on food expenditure. In South Africa the poverty line currently sits at R26.00 ($2.34) per person per day and the international poverty line is $1.90 per person per day (World Bank 2015). In KwaZulu-Natal the poverty line is R757 per month which enables the ability to afford food and non-food items such as airtime and transportation. The poverty line for being able to at least buy food and survive is R335.00 per month, which translates to R11.00 per person per day (StatsSA 2015a). In this Umlazi community the average amount of money spent on food per household amounts to R2 023.44 per month and this would mean that for an average of 5.36 people in a household each person would have R12.58 to spend on food per day each month (30 days). From the country's statistics it comes across that this emerging middle income community is not living in poverty as households are living on more than R11.00 per person per day for food.

When measuring this group against the Multi-dimensional Poverty Index, health contributed 56.66%, less than five percent was contributed from education (4.40%) and assets contributed 38.94% to the poverty index; this was similar to the findings from the 2015 Human Development Report (UNDP 2015: 229) indicating that in SA, health, education and standard of living contributed 61.4%, 8.4% and 30.2% respectively to the deprivation cut-off point. In the current study, the final MPI for the Umlazi community was calculated at 9.09%. This is well below the deprivation cut-off point of 30% showing that this community does not live in poverty. Van der Berg (2014: 10) stated that the black middle class suffer from an asset-deficit as compared to their white counterparts as the black middle class have not inherited assets and sufficient incomes have not been earned significantly over a substantial amount of time required to reach the status of their affluent, or white, counterparts. Van der Berg (2014: 10) further emphasized this point by recounting that in white households earning between R7 500 and R22 000 per month, 83% of the households owned a car compared to 43% in black

households. Contrary to the above statistics, in the Umlazi emerging middle income community 83.6% of the respondents owned a car and this reiterates that the community of Ward 84 is not poverty stricken. According to Alkire and Santoz (2010: 61) deprivation can be described in terms of a lack of namely: access to safe water, improved sanitation, clean cooking fuel, electricity, non-dirt floor and essential assets. However, in Ward 84 these indicators do not appear as a shortfall.

In a number of Sub-Saharan African studies obesity has been shown to have a positive and plateauing link with socioeconomic status. The socio-economic status is determined by access to water and electricity, smaller numbers of members residing in one household and increased amounts of money spent on food and mode of transport among other factors, converging to a Westernised lifestyle and diet (Micklesfield *et al* 2013); and this trend was observed in Ward 84 as a negative relationship was found (p=0.029)using Pearson's test, between BMI and how often the households experience 'food insecurity' through not having enough money to buy food. In this Umlazi study the majority (70%) of households in the emerging middle income community reported never experiencing a shortage of money to buy food.

A HH study conducted in rural and urban areas in the Free State province reported that the highest risk factors for chronic diseases in rural households was firstly self-reported hypertension and then BMI. Within the urban population the main risk factor for chronic diseases was physical inactivity and BMI (Van Zyl, Van der Merwe, Walsh, Groenewald and Van Rooyen 2011). In this Umlazi study women had a mean BMI of 36.31 and for men it was 29.91. A positive relationship at p=0.01 was found between the BMI of the women and the men for Pearson's test. Approximately three quarters (75.42%) of the women were obese and the men presented with a prevalence of 37.59% for obesity and similar results were found in the SANHANES-1 2012. Women in SA also had a higher occurrence of overweight and obesity than men (Shisana *et al* 2013: 9-10). In a Malawian study of 4 845 adults (65.7% women, 34.3% men, 25-64 years old) of which most (86.7%) participants lived in rural areas, it was found that women also presented with higher rates of BMI, waist-to-hip ratio and heart rate than men (Msyamboza, Kathyola and Dzowela 2013). It appears that the BMI levels of women and men who are urban residents are no different from those in rural households.

Among the study population in Umlazi Pearson' test correlations shows positive relationships were observed between BMI and WHtR for women 19-50 (p=0.001), and men and women 51+ years old (p=0.002). The mean WHtR for the group was calculated at 0.56 which is the same

as in the nationally representative Irish study conducted among 740 men and 760 women (18-90 years old). The prevalence of overweight was 37% and obesity was 24% for Irish adults aged 18-64 years old (Irish Universities Nutrition Alliance (IUNA) 2011).

In an Indian study of nutritional status by Barbhuiya and Das (2013: 38) amongst 264 Meitei adults (20 to 79 years old) in a region considered as economically backward it was found that men had a better nutritional status than women. The researchers also found that improved socioeconomic circumstances presented higher BMIs and a statistically significant positive relationship (p=0.056) was found between age and BMI much like the present study among Umlazi adults (p=0.007). Among the Meiteis in India a direct positive relationship was recorded between education and nutritional status measured by BMI. A decomposition study in SA also revealed that socioeconomic status, which included education, was a determinant of obesity (Alaba and Chola 2014). As much as there was no statistical significance found in this emerging middle income community between education and BMI, a Pearson's test positive relationship was found between FVS and education (p=0.008).

The present study of Umlazi residents found that there were deficiencies in nutrient intake of fibre, calcium, magnesium, iodine, selenium and vitamins D, E and K. It is suggested that the ideal way to prevent micronutrient deficiencies is through dietary diversity. The lacking nutrients are found in green leafy vegetables, seafood, fruits, vegetables, nuts and legumes which were not consumed sufficiently by the current study population. These nutrients have important roles in bone synthesis, preventing osteoporosis and having a protective antioxidant effect for the prevention of cancer and cardiovascular diseases (Thurnam 2014a and NICUS 2016). This is a cause for concern for this community as participants are ageing and nutrient adequacy becomes imperative. Kruger, Kruger, Wentzel-Viljoen and Kruger (2011) found that in the North West province (SA) urbanization of women led to low vitamin D and calcium intakes translating to low bone mass. The women also presented with high levels of obesity which may not be protective against low bone mass. Thurnam (2014b: 40) states that a tendency to consume and focus on staple foods of macronutrient density leads to the inadequate consumption of micronutrients which is evident in this emerging middle income community in Umlazi.

The micronutrients for which DRIs were either almost met or exceeded included B-Vitamins (biotin, niacin, B6, B12, pantothenate) and iron. This may be indicative of the meat food group intake of the population as indicated in the Top 20 foods consumed list in the form of beef and

chicken curry and eggs which also provides evidence for the present study population having exceeding slightly (18.79%) on average the 10-15% of the WHO goal of the contribution of protein to total energy and exceeding on average (190.20%) the mean iron intake requirements. Jackson, Williams, McEvoy, MacDonald-Wicks and Patterson (2016) noted that in a systematic review of experimental and observational studies of adults 18 years and older, a similar trend in developing countries whereby iron intake levels were positively associated with the consumption of flesh foods. The mandatory food fortification measures in place in South Africa may contribute to the micronutrient intakes observed in the Ward 84 community as there was a large consumption of fortified foods such as bread and maize.

The WHO (2015h) states that the ingestion of sugars should be limited to less than a tenth of total kilojoule intake from foods or drinks by the producer, food preparer or consumer, as well as sugars found naturally in honey, syrup, fruit juices and fruit juice concentrates. In a study conducted in the North West province in SA it was reported that diets with a sugar intake above a 10% contribution to energy also yielded a dearth of micronutrients and the BMI of women who consumed the most added sugar was significantly higher than that of women who consumed less (MacIntyre, Venter, Kruger and Serfontein 2012). In Ward 84 sugar was ranked either first or second in the top 20 foods consumed lists. Although the men had a higher mean intake per frequency (14.37g) of sugar than the women (12.31g) it was the women that presented with a higher prevalence of overweight and obesity; however, statistical relationships were not tested for individual foods and prevalence of overweight and obese. . Excessive sugar intake has a relationship with inferior dietary quality and prevalence of NCDs. It is also stated that sugar has the nature to cause a minimised consumption of more nutritionally adequate energy and cause weight gain (WHO 2015h).

Stern, Puoane and Tsolekile (2010) found that in a township community of young adult residents (18-35 years old) in Cape Town food consumed was high in fat and sugar, palatable and easily accessible. Among this urban township community weight gain was seen as a sign of progress and sense of achievement. Among the residents living within the informal settlements it was presented that among adult men (n=107) and women (n=530) >18 years old, 60% had abdominal obesity measured by WC. Women in the Cape Town study also presented with a higher (71.5%) prevalence of abdominal obesity than men (Malhotra *et al* 2008: 317). These results were similar to the Ward 84 community in that there were positive relationships observed between BMI and WC for the sample population (n=250) (p=0.000) and also for the different age groups at p=0.003 for women 19-50 years, men and women 51+ years old

(p=0.006) and the significance for men 19-50 years old (p=0.020). These statistical significances were based on Pearson's test for associations.

The WHO (2015g) stated that energy consumption should always be matched with energy outflow and physical activity is essential to prevent risk to health. In affluent regions of North America and Europe, saturated fat intake remains above the WHO recommended 10% of total energy intake (WHO 2016c). In this study of an emerging middle income community of Umlazi, women 51+ years old had the lowest fat contribution to energy (15.29%), men 19-50 (27.92%), women 19-50 (28.10%) and men 51+ years (26.20%); however, among adults in a national study in Ireland, fat provided 37% of total energy, with 63% of the population exceeding the generally recommended upper limit of 35% energy from fat and carbohydrates provided 45% of the energy (IUNA 2011).

A trend was found in the emerging middle income community in Ward 84 where fat contribution to energy was within the recommendation, protein only exceeded energy contribution slightly and carbohydrates were also within the recommended contribution to energy range even though the amounts of carbohydrate and protein were consumed in excess. The mean NAR for energy intake of Ward 84 residents for all the study groups was deficient. Discrepancies could be based on possible over estimation of portion sizes. Similarly, the Indian study by Barbhuiya and Das (2013:38) also revealed that a proportion (30.7%) of the adult Meiteis appeared to be suffering from chronic energy deficiency and especially the older age group of 60+ years for both men and women. Contrary to the current study in Umlazi a small proportion (6.4%) of the Meitei Indians were obese whereas Ward 84% members had a 67.2% prevalence of obesity. According to the IUNA (2011) study, men in Ireland had higher intakes of energy and of all macronutrients than women and for both men and women, energy intake decreased with increasing age. This was also seen in the present study where the men 19-50 years old had an average percentage energy intake of 51.31% and for men 51+ years it was 47.84%; women 19-50 years old took in a mean percentage of 59.20% whereas for women 51+ years it was 54.54% of energy. According to the FAO (1998) studies suggested that a diet that is high in fat is most likely to promote the consumption of more total energy than a diet high in carbohydrates. This is due to the low energy density of a high carbohydrate diet. Similar statements were made by Stookey (2001) in a national study among Chinese adults and Bechthold (2014) in a German study analysis having also found a positive relationship between energy density and body weight. Bowman (2002: 269) supports the possibility of high carbohydrate and high protein diets not necessarily yielding high energy intake in a study

among American adults. The study presented with these results: 'the high-carbohydrate diet was more energy restrictive than the other three diets. Adults in the high-carbohydrate group consumed 200 to 300 kilocalories less energy than others. All four groups consumed the same total food amount. However, adults in the high-carbohydrate group ate about 200 grams more of total food amount per 1,000 kilocalories of energy intake than the other adults'.

In Ward 84 all of the age groups of men and women exceeded the carbohydrate intake with the main contributors presumed to be rice, maize and bread as these foods appear highly ranked in the top 20 foods consumed lists. Similar results were found in Sierra Leone as rice, which is the staple food, was consumed at an annual per capita consumption of 104kg per person per year (Wagah 2013:16). Fanzo, Pokharel and Andrews (2013) also revealed that the Nepalese diet is made up mostly (72%) of rice, wheat and maize as indicated in the United Nations Standing Committee on Nutrition country analyses. The over-consumption of macro-nutrients may lead to increased BMI, risk of lifestyle disease and compromised micronutrient status. Physical activity levels were not determined in the Ward 84 study and therefore its contribution to energy consumption and expenditure may not be deduced.

In the Umlazi community the protein contribution to energy for men 19-50 years, men 51+ years, women 19-50 years and women 51+ years old was 16.27%, 15.52%, 16.46% and 26.90% respectively and the mean consumption of meat products was 140.64g, made up of chicken and beef curry, beef, cooked, dry, roasted chicken and sausages from the top 20 consumed foods lists. The mean amount of meat consumption is double that of Irish adults who consumed an average of 69g of meat products with bacon and ham as the most consumed foods which, however, are food items that did not appear on the top 20 foods consumed lists of the Umlazi community study (IUNA 2011). According to Heuer, Krems, Moon, Bromach and Hoffman (2015) a study conducted on German adults (14 to 80 years old) representing the population demographics and different socioeconomic statuses presented that men consumed twice as much meat, meat products and sausages than women. In the present study a similar trend could be seen where men consumed on average more (61.45g) protein than women (52.04g). Similar to the German study, men also consumed almost twice as many eggs than women and this is also observed in Ward 84 where men consumed on average 13g per frequency more eggs than the women. Puoane, Matwa, Bradley and Hughes (2006) stated that one of the reasons cited for the high consumption of meat products in a township in Cape Town was that it is linked to high socioeconomic standing. This could be a motivation for township communities to

consume more meat as it was also mentioned that protein intake tended to increase with increasing incomes in the township in Cape Town.

Among the 250 adults of the Umlazi community the non-micronutrient dense foods, sugar, margarine and carbonated cold drink appeared in all top 20 foods consumed lists within the top 10 foods most consumed except for women 51+ years old in respect of carbonated cold drinks (ranked number 14). In Canada **'**non- traditional' eaters had a diet with a higher density in CHO, sugar and saturated fat. For the traditional eaters, foods classified as non-nutrient dense were the single largest source of total energy intake (33%). These foods included butter, jam, ice cream, cakes, pies, chocolate bars, potato chips, french-fries, cookies, candies, sugar and salad dressing which were not considered as traditional foods (Sheehy, Koladhooz, Schaefer, Douglas, Corriveau and Sharma 2014). In Brazil Da Costa Louzada, Baraldi, Steele, Martins, Canella, Moubarac, Levy, Cannon, Afshin, Imamura, Mozaffarian and Monteiro (2015) studied over 30 000 individuals (75% being 20 years and older) across the country (with respondents mainly residing in urban areas) where 51% were women and reported a mean energy intake of 7983.072kJ. Ultra-processed foods (consisting of high fat and energy) made up 29.6% of the energy intake. The diet in the Ward 84 community did not reflect a traditional diet; the nutrient analysis indicated that the average energy intake for the whole group (n=250) was 6 062.99kJ with fat contributing a mean of 24.38% to the energy intake. This is also reflected in the high levels of overnutrition. Brazilian foods in the category of ultra-processed nature are similar to those considered as non-nutrient dense in Canada, namely: industrialised breads, pizzas, hamburgers, sandwiches, cakes and cookies. Although these foods do not appear in the top 20 foods consumed list of the Ward 84 community, several may be found in the 24-hour diet recall.

Ward 84 residents had milk appearing in the top twenty foods consumed list in all groups possibly due to the high frequency of consumption of tea and coffee and consumed a much lower mean intake of 77.49ml of milk per day compared to a mean of 250ml of low fat milk consumed daily by adults (n=281) in Italy who had moderate to severe obesity with no socioeconomic variables accounted for and aged between 18 and 74 years (Barrea, Di Somma, Macchia, Falco, Savanelli, Orio, Colao and Savastano 2015: 4). Barrea *et al* (2015: 4) stated that milk consumption among Italian adults showed no difference between the genders. In the Umlazi study, however, all groups and both genders consumed similar amounts of milk except for men 51+ years who had a much lower intake amounting to a mean intake of 51.76ml of milk per day. In a comparison study of black, mixed ancestry and white adults in Cape Town

it was reported that calcium intake was deficient and mostly among the hypertensive and black population (Charlton, Steyn, Levitt, Zulu, Jonathan, Veldman and Nel 2005). Calcium in the dietary intake of the Umlazi respondents was also deficient (26.91%) and this can be attributed to the low quantity of milk and dairy products intake even though consumed at a high frequency.

The recommended intake of fruit and vegetables is at least 400g or five portions per day to limit the risk of NCDs and aid in ensuring a sufficient daily intake of dietary fibre (WHO 2015g). The fruit and vegetable intake of the Umlazi study was not met by all the age groups and both genders, achieving a combined mean intake of only 111.63g per day. This trend is also common globally. In the PURE study other upper middle income countries achieved an average consumption of 4.31 servings of fruit and vegetable out of a recommended five servings per day. Miller, Yusuf, Chow, Dehghan, Corsi, Lock, Popkin, Rangarajan, Khatib, Lear, Mony, Kaur, Mohan, Vijayakumar, Gupta, Kruger, Tsolekile, Mohammadifard, Rahman, Rosengren, Avezum, Orlandini, Ismail, Lopez-Jaramillo, Yusufali, Karsidag, Iqbal, Chifamba, Oakley, Ariffi, Zatonska, Poirier, Wei, Jian, Hui, Xu, Xiulin, Teo and Mente (2016) suggest that the cost of fruit and vegetables does not enable populations to purchase and consume sufficient amounts of fruit and vegetables as intake tends to decrease with rising costs. In addition to a lack of sufficient fruit and vegetable intake, the fibre intake of the emerging middle income community was deficient. Men 19-50, men 51+ years, women 190-50 years and women 51+ years achieved 41.84%; 51.48%; 56.54% and 69.64% of the recommended intake respectively. Dietary fibre is known to help lower blood pressure and may be important in controlling cholesterol and other organic processes that could minimise thickening of the arteries. It may also help to control insulin which may impact the risk of type 2 diabetes, and together with the high water content of fruits of vegetables, may help to reduce the risk of overweight and obesity by upholding fullness of the stomach and reducing hunger which leads to limited total energy intake (WHO 2014e). Although the fruit and vegetable intake was not met by the Ward 84 emerging middle income community, the amounts that were consumed may contribute to the overall micronutrient intake observed over and above that supplied by fortified bread and maize.

Legwegoh and Riley (2014) compared studies between Gaborone (Botswana) a transitioned city and Blantyre (Malawi), a traditional city, and reported that the Gaborone population of a transitioned city had more participants falling into the highly diverse food category than Blantyre. However, a similar trend pertaining to cereals intake was found between Gaborone,

Blantyre and Umlazi Ward 84, a population considered to be in transition. Cereals, roots and tubers were the most consumed food groups in all three of the study populations with maize being the most consumed grain of choice among all three. The FVS of Ward 84 also reflects this pattern of cereals, roots and tubers in that some respondents indicated having consumed up to seven items in the last seven days from the cereals food group. With regard to meat foods, there was a high consumption of the meat, poultry or offal category in Gaborone but low consumption of seafood. A high consumption of seafood was reported in Blantyre and Ward 84 achieved a medium variety score for the meat foods group. Much like the Gaborone population, consumption of fish did not appear in the top 20 foods lists of the emerging middle income community in Umlazi.

According to Labadarios, Steyn and Nel (2011) the meals of populations living in tribal areas and informal settlements lack diversity particularly in eggs, legumes and vitamin A rich fruit and vegetables. In the Umlazi Township's emerging middle income community similar results were also found in that the lowest FV scores achieved for all groups were those for legumes and nuts and vitamin A rich foods in comparison to the number of items that could have been consumed. It was found in Mexico in a study including varied locations that urban participants had a significantly higher dietary diversity index (DDI) than participants in rural areas (Ponce Rodríguez-Ramírez, Mundo-Rosas, Shamah, Barquera, and González de Cossio 2013). The scores were determined with the use of a FFQ. A Sri Lankan study was conducted on 481 adults (>18 years) with data extracted from the national Diabetes and CVD Study to evaluate three dietary scores, namely: the dietary diversity score (DDS) (with 12 food groups and not considering the amount consumed), dietary diversity score with portions (DDSP) and FVS (over a 24 hour period) and it was found that the Sri Lankan adults had generally low dietary diversity levels (Jayawardena, Byrne, Soares, Katalunda, Yadav and Hills 2013: 3). In the present study it is seen that the respondents achieved a medium food variety score (30-60 individual different foods consumed). The Sri Lankan study did, however, reveal that a relatively higher FVS was achieved and the researchers indicated that even though people consumed different foods, it was the quantity that was insufficient for many of the groups. It was found that people having better education or greater buying power could have led to the higher consumption of a better variety of foods. Even more so, this was reflected in the adults of the current study where a direct relationship was found between total income and FVS (p=0.01). The mean BMI, WC and energy intakes were gradually increased with DDS, DDSP and FVS for the Sri Lankans and among the women 19-50 years old in Umlazi a direct

relationship was also seen between energy and FVS (p=0.05). Participants with obesity had higher DDS, DDSP and FVS than non-obese participants in Sri Lanka. Once again this, too, can be seen in this study as the greatest proportion of obesity occurred in the group of women 51+ years who also achieved the highest FVS and FGDS.

There were positive associations found using Pearson's test among the women 51+ years were between energy NAR and FGDS (p=0.01), calcium NAR and FGDS (p=0.05) as well as vitamin A NAR and FGDS (p=0.05). For most of the population the increased food group diversity score did not seem to improve the nutrient adequacy ratio.

4.5 CONCLUSION

The objective of this study was to determine the nutritional status and dietary intake of adults among a transitioning, emerging middle-income environment. Overnutrition, nutrition insecurity and imbalanced food choices were determined from the results.

The socio-demographic data reveals that more than half (56.8%) of the population was above 51 years old. The mean age of the group was 52 years old. Slightly more than half (51.6%; n=129) of the population was unemployed. Retired participants made up 27.2% (n=68) of the population. Majority (92.8%) of the households had 5 or more rooms. The majority (80%) of the households indicated that between one to three members contributed to the total household income. Respondents that indicated a household income of above R10 000 amounted to 60.4%. Most (70%) of the respondents indicated that the household never has a shortage of money to purchase food. Half of the population spent more than R200 on food monthly. Respondents that have education from matric and more were 75.2%. Seventy percent of the respondents reported household ownership of at least one car. The MPI of the Ward 84 community amounted to 9.09 out of a possible 30 indicating minimal deprivation.

Anthropometric results indicate the prevalence of obesity was 37.59% (n=21) among men and 76.80% (n=147) for women. Majority (63.6%) of the population had exceeded the cut off points for risk factors related to increased waist circumference.

From the food intake recalled by the respondents mineral and fat soluble vitamin intake was deficient; however protein and carbohydrates were consumed in excess with mean percentages of 187.70% and 111.43% respectively. Top 20 foods consumed lists indicated that little fruit or vegetables were consumed. Common foods that appeared first on the Top 20 foods consumed lists were maize, bread, sugar, rice and tea.

The average food variety score was medium (47.15) indicating the consumption of between >30 but <60 different foods across the total population and had a positive relationship of statistical significance was found between food variety score and with income (p=0.007) when Pearson's test was conducted. There were 58% of respondents that consumed from all 9 food groups over a seven day period. In Chapter 5 key findings will be summarised and recommendations will be made to possibly address the current situation and foster a healthier lifestyle for the community.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter reiterates the aims of the study and the limitations encountered and summarises the main findings, and in conclusion provides recommendations emanating from the situational analysis study.

The nutrition transition is a phenomenon affecting developing countries the world over, accelerating the occurrence of obesity and other lifestyle diseases. Sedentary activities linked with urban employment and more access to television and computers, and assets such as motor vehicles impacts NCDs (Abrahams, Mchiza and Steyn 2011). The increase in lifestyle diseases may be seen mostly in communities where the diet has transitioned from a traditional to a 'westernised' diet. Due to prolonged exposure to unhealthy dietary practices, tobacco use, physical inactivity and possible stress, hypertension, high blood cholesterol, diabetes and obesity are factors that may lead to disability, heart failure, emphysema and chronic bronchitis – and ultimately, death. Other countries on the African continent are also experiencing the shift from a low-income and extremely poverty-stricken status to middle income status. Rising food prices and the demand for a varied diet still puts pressure on the supply of goods and reliance on imports to allow food to be accessible.

The aim of the study was to investigate the possible relationship between improved socioeconomic status and the effect on nutritional status and dietary consumption. The results from the study may be profitably used to develop tools to equip the population to make informed food buying decisions in order to inhibit the exacerbation of preventable lifestyle diseases and progress through the nutrition transition with a positive health outcome. The study findings may contribute to considerations for plans to deal with the increasing pressure on the demand for health care in South Africa. Focus should be placed on the regulation of modification of lifestyle behaviour, specifically modifying unhealthy adopted eating patterns and increasing energy expenditure of adults in the Umlazi township.

5.2 LIMITATIONS

i. The anthropometric data for disabled participants (n=2) was self-reported from most recent clinic visits as it was not possible to take measurements.
ii. Secondly, the 24-hour recall questionnaires were also completed during summer holidays, Easter holidays and school holidays. Eating patterns tend to change during

holidays. People may consume food differently to when schools are open, when they have to work during the week and may also be dependent on whether there are visitors within the home. This could yield major variance in quantities and types of food consumed resulting in over- and under-reporting.

5.3 MAIN FINDINGS

The literature researched indicates that many developing countries are experiencing a shift in the economic landscape. This has resulted in improved lifestyles and enhanced living conditions as a result of increased employment. Typically, urbanisation and improved lifestyle has led to a transition in diet whereby traditional foods may no longer be a common feature as a more Westernised diet is embraced which can lead to NCDs, and which has implications for healthcare systems. Many countries have yet to reach the nutrition transition stage five where behavioural changes are adopted in the household and there is a decline in the risk of NCDs, increased consumption of micronutrient dense foods and improved physical activity.

In as much as individuals are becoming more socioeconomically empowered, whole households are also affected. The eating, buying and general behaviour patterns and the power and position of the caregiver also influence the food consumption environment of the household. The literature reviewed has also indicated that obesity levels in South Africa vary across both genders and all ethnic groups. Women tend to have higher levels of overweight and obesity and increased waist circumference than men. Across the ethnic groups overweight and obesity are found to be most prevalent in the black population and lower proportions are found among their white, coloured and Indian counterparts.

A persistent issue in the black population also remains in terms of black society's view of an acceptable image indicating affluence or a perception of what is 'healthy'. Although this was not studied in the current study other literature has found that the overweight image tends to be more desirable and even encouraged, which may pose a problem in the face of plans to address obesity and the prevention of lifestyle diseases.

Ward 84: An emerging middle income community in Umlazi

The literature reviewed cites several cases that are similar to the current situation in Ward 84 of Umlazi Township. This community is in the 4th stage/ pattern of the nutrition transition. The findings indicate that the emerging middle income community of adults in the present study

displays the potential to reach the status of the affluent even though the population is ageing. In comparison to low income communities it is evident that this emerging middle income group has made major progress in averting poverty. Basic services, infrastructure, formal housing, employment, education and ownership of assets are of a high standard in this community. The majority of households have been occupied by the respondents living in Ward 84 for more than five years. Although slightly more than half of the participants indicated being unemployed, a large number reported that they identified as not actively looking for employment, which is an indication of the ageing nature of this community in that many participants are retired. As much as this may be the case most households did have another person contributing to the household income of at least R8000 per month. This income is generally shared among an average of five residents to cater for basic needs. Most of the Ward 84 respondents have at least a matric qualification and many also have post-school qualifications. When using Pearson's test the level of education showed to be directly associated with the FVS (p=0.01) and similarly the FVS presented significance positive relationship with income (p=0.01) too. It appears that a westernised diet and lifestyle is more accessible and is embraced by this urban community but there is a tendency to overlook the nutrient quality of a varied diet and achieve energy balance with macronutrient intake linked to informed nutritional choices. Most (70%) of the community of Ward 84 that was studied reported never having shortage of money to buy food and this had a negative association with the high prevalence of overweight and obesity (p=-0.029).

This community is faced with a significant problem of overnutrition and this is mostly seen in the women, which is a common trend throughout South Africa as previous literature has highlighted. It was found that in some individuals it is most likely that more than one risk factor for non-communicable disease exists. This is seen in the direct associations by Pearson's test found between WC and BMI (p=0.01), BMI and WHtR (p=0.01) among the different age groups and both genders. The biggest contributing factor to the high prevalence of obesity could be linked to the significant need to increase energy expenditure to counteract the over consumption of macronutrient-dense food.

The Ward 84 nutrient and food consumption profile presents that many individuals consume excessive amounts of macronutrients (protein and carbohydrates) with insufficient micronutrients. Micronutrients consumed in insufficient amounts and that contributed to a poor nutrient status were magnesium, calcium, selenium and iodine as well as the fat soluble vitamins D, E and K. The common foods eaten are clearly reflected in the nutrient intake as

there are several energy dense foods but a limited selection of fruit and vegetables that appear in the top 20 foods consumed rankings. Rich sources of the deficient nutrients such as green leafy vegetables did not appear on the top 20 foods consumed lists. Additionally, results showed that the more income increased the higher the FVS of the respondents in the Umlazi community as a positive relationship was found at p=0.01 of the Pearson's test. The FVS averaged at 47.15 different foods for this community which indicates a medium food variety. Women 19-50 years and 51+ years also displayed a statistical significance of a positive relationship between energy intake and FVS (p=0.05 and p=0.05 respectively) when using Pearson's test.

5.4 CONCLUSION

During interviews it was indicated that the community had a fairly large ageing population and many household owners were not necessarily the bread winners but were maintained by children with some possibly even living outside of the home. The adults appeared to have sufficient education to have secured promotions in the employment arena and were able to afford a lifestyle similar to those who had always been more privileged. High carbohydrate intake contributed to the high prevalence of overweight and obesity. As much as the dietary diversity score was medium, this did not translate into better nutrient adequacy ratios except for those linked to a high protein intake.

5.5 RECOMMENDATIONS

The current landscape of the township residents reflects that there is a high prevalence of overnutrition and room to improve the intake of some micronutrients in the diet. In addition to this the significant proportion of income spent on food, acquiring assets and possibly debt repayments calls for interventions in order to assist the progression to stage/pattern five of the nutrition transition towards behavioural modification. Strategies should be put in place to equip the community with preventive measures to prevent regression into poverty, and to increase knowledge regarding nutrition and achieve an optimal energy balance.

5.5.1 RECOMMENDATIONS FOR POLICY MAKERS

Government

i. The Food Based Dietary Guidelines developed and disseminated by the Department of Health need to be more far-reaching and localised to reach all populations. A holistic family-centred approach to disseminate and implement nutrition information would be beneficial so as to avoid individual and isolated efforts and enable a collaborated decision and foster behavioural change.

ii. The use of mobile technology (social media and its various applications) is a good platform to promote and engage in discussion regarding health issues and could be used to communicate with populations. The government's investment in this technology should be considered to build trust in the public service and ensure the same reliable, consistent information and references as are made available through national Department of Health endorsed messages.

iii. Implementation of an urban agricultural policy to enable the availability of food at a lower cost and to empower communities with skills to sustain a healthy lifestyle.

Non-Government Organisations (NGOs)

i. NGOs should consider getting involved in communities who are in phase four of the nutrition transition as it is the ideal stage to impact on nutrition knowledge, skills and food choices. By empowering the community with the knowledge and skills to apply various healthful behaviours in daily life such as group sport and exercise as well as interactive knowledge empowerment to enable better decision making, keeping in mind that this type of community may not look poor but may suffer from hidden hunger.

ii. In order for the community to participate and take advantage of opportunities, organisations promoting and assisting in the improvement of lifestyle should become more visible in such a community and not only focus on obviously poor populations. Increased visibility of such organisations would allow for members of this society to know where to go for assistance and to be aware of which institutions are available to help with preventing NCDs and promoting and managing a healthy lifestyle. Good avenues to promote health and wellness resources in the Umlazi community may be

found at the local swimming pool including the community aerobics club formed by active members of the community.

iii. The promotion of good financial planning and practices should be a priority to facilitate the application of knowledge regarding saving and budgeting and the skill to source and exploit cost saving methods of purchasing food. Education on how to use money to make valuable decisions and use money for investment in future security is also significant.

5.5.2 RECOMMENDATIONS FOR THE COMMUNITY

i. Most of the residents have incomes and possibly access to a medical aid therefore there is ease of access to the local medical centre offering a weight loss programme and residents should use this to its full potential as the doctor and dietician are also in relatively close proximity to their homes.

ii. Prominent community leaders and local business owners could lobby for the building of designated and safe walking paths for residents to utilise for exercising.

5.5.3 RECOMMENDATIONS FOR FUTURE RESEARCH

i. Assessment and early screening of lifestyle diseases and the risk factors linked to this emerging middle income community could be undertaken. Insights into health and healthy behaviour, hypertension, blood glucose levels and physical activity – which were not included in this study – could be evaluated to provide better insight into the nutritional severity of the situation in this transitioning community. Nutrition knowledge assessment has the potential to advise any nutrition education strategies available to further empower the population.

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ANNNEXURES Annexure A

DURBAN UNIVERSITY of TECHNOLOGY

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC)

22 November 2012

IREC Reference Number: **REC 63/12**

Ms S N Memela
BB 828
Umlazi
4031

Dear Ms Memela

Anthropometric profile and food consumption patterns of an emerging middle income community in Umlazi

I am pleased to inform you that Full Approval has been granted to your proposal REC 63/12.

The Proposal has been allocated the following Ethical Clearance number IREC 49/12. 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]

Dr D F Naude
Chairperson: IREC

Annexure B

LETTER OF INFORMATION

Dear Ward 84 resident

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

Title of the Research Study:

Anthropometric profile and food consumption patterns of an emerging middle income community in Umlazi

Principal Investigator/s/researcher:

Sinenhlanhla Memela, B. Tech: Consumer Sciences Food and Nutrition

Co-Investigator/s/supervisor/s:

Professor Carin Napier

Why is it important to do this study?

Obesity among men in South Africa in 2008 was estimated at 23.2% and at 42.8% among females (DOH 2011). The aim of this study is to analyse the nutritional status and actual food intake of middle income adults living in Ward 84 of Umlazi Township, 257 households in ward 84 in Umlazi will be included in the study. This will help in the development of guidelines to educate this community in bettering food habits.

What will it involve?

- The counsellor of the community has been approached to get permission from the local Government for the study to be undertaken.
- I will need you to sign a consent form to 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 3 questionnaires in an interview situation it could take up to 1 hour.
- The questionnaires will include:
- 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, measure your height and waist circumference, 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**.**

Risks or Discomforts to the Participant: All measurements and weighing will be done in a private. You will be requested to remove shoes and jackets and jerseys only and will not be requested to undress.

Benefits to the community: please remember that the information will be presented of the community as a whole and no individuals will be highlighted. The anonymous results of the study will be shared with the councillor after the study has been concluded 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

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

Supervisor: Prof. Carin Napier

Researcher: Sine Memela 083 880 9614

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.

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 C

Sawubona, mhlali wase ward 84

Ngiyabonga ukungipha ithuba lokuchaza kabanzi ngocwaningo

Ucwaningo lwami lubizwa ngokuthi: “Anthropometric profile and food consumption patterns of an emerging middle income community in Umlazi”.

Okungukuthi: “Isimo sempilo kanye nendlela yokudla kwabahlali asebethola okuphakathi nendawo ngokwemali emphakathini waseMlazi.”

Ref: REC 63/12

Umcwaningi omkhulu:

Mina, Sinenhlanhla Memela (B. Tech: Consumer Sciences Food and Nutrition) ngizoba umcwaningi omkhulu ngiphathwe ngu Solwazi Carin Napier (D. Tech Food Service Management).

Isingeniso Nenhloso Yocwaningo:

Kubalulekile ukwenziwa kwalolucwaningo ngoba kutholakale ukuthi isimo sokukhuluphala okungekuhle kubantu singango 23.3% kubantu besilisa no42.8% kubantu besifazane. Siyazi futhi ukuthi luncane ulwazi lokuthi abantu baseNingizimu Afrika badlani ngempela. Lokhu kubalulekile kuhulumeni ukuze akwazi ukulisebenzisa lolulwazi ukusiza abantu abantu abanesisindo esincane kakhulu, nalabo abakhuluphele kakhulu.

Inhloso yalolucwaningo ukuthola isimo sempilo nokudla kwabantu abahlala emphakathini wabantu abathola ngaphezulu kuka- R100 000 ngonyaka umuzi nomuzi.

Sidinga imizi engu- 257 evela ewardini lakho (uWard 84) ukuthi babe yingxenye yalolucwaningo. Lokhu kuzosiza ekwakheni imihlahlandlela yokufundisa lomphakathi ngokudla kangcono.

Okuhlelwe ukuba kulandelwe:

- Ikhansela laWard 84 seliceliwe imvumo yokwenza lolucwaningo lavuma.
- Ngizodinga ukuba usayini incwadi yesivumelwano esho ukuthi uyavuma ukuba yingxenye yocwaningo, lokhu kuzokwenzeka uma sengikuchazele konke okuzolandelwa.
- Umangabe uvuma ukuba yingxenye yalolucwaningo ngizocela ukuthi siphendule imibuzo ngendlela yokuxoxisana. Lokhu kungathat ihora linye nje.
- Imibuzo izoqhamuka kulamaquestionnaire:
    - Socio- Demographic Questionnaire: Ukukala isimo sokuphila
    - 3 x 24 hour recall questionnaires: Ukuthola ukuthi udla kudla kuni
    - Food Frequency Questionnaire: Ukuthola ukuhluka kokudla okudlayo
- Uzokalwa isisindo kanye nobude kanye nobubanzi bokhalo lwakho. Lokhu kuzokwenziwa endlini ngesikhathi esivumelana ngaso. Ngizocela ukuthi ungagqoki ijersey nazicathulo. Ngeke sicele ukukhumula izingubo.
- Awuphoqiwe ukuba yingxenye yalolucwaningo, Uyazikhethela wena. Uvunyeliwe futhi ukuhoxa ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.

Ingozi kulowo oyingxenye yocwaningo:

Konke okuhleliwe kuzokwenziwa endlini wakho. Akulindelekile ukuba ulimale ngokuba yingxenye yalolucwaningo.

Okuzozuzwa/ Ukusizakala:

Ngalolucwaningo sizothola imininingwane ngesimo sempilo nokudla okudliwa kulomphakathi waseMlazi.

Imiphumela yalolucwaningo izidluliselwa nekhansela kodwa igama lakho alizukubalulwa. Imiphumela siyothemba ukuthi izosetshenziswa ekukhuliseni umphakathi nganoma iziphi izinkinga ezivelayo. Uma unemibuzo singabuya sizame ukukusiza uma sesiqedile ukuqoqa imininingwane.

Uyaziswa ukuthi:

- Awuphoqiwe ukuba yingxenye yalolucwaningo, Uyazikhethela wena. Uvunyeliwe futhi ukuhoxa ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.
- Awukho umuholo otholakala ngokuba ingxenye yalolucwaningo.
- Azikho izindleko othweswe zona mayelana nalolucwaningo.
- Konke okuzokwenziwa kuzokwenziwela ngasese, umnutu nomuntu ukuze umhlanganyeli akhululeke. Kuyagcizelelwa futhi njengoba bekushiwo encwadini yokwazisa ukuthi oyingxenye yocwaningo uzothola inombolo kunokuba abhalwe/ aziwe ngegama. Lokhu kozoqinisiseka ukuthi imiphumela ingaziwa ukuthi ngekabani.

Okungalimaza ngocwaningo:

Akulindelekile ukuba ulimale ngokuba yingxenye yalolucwaningo.

Ukuba yingxenye yalolucwaningo kungathokozelwa kakhulu, Ngiyabonga futhi ithuba lokuba ngichaze lolucwaningo kuwe.

Ungaxhumana nalaba uma unemibuzo:

USolwazi Carin Napier ungumphathi

Sicela uxhumane nomcwaningi: 083 8809614

Umphathi: 031 373 2326 noma

Institutional Research Ethics administrator ku 031 373 2900.

Izikhalazo kuDVC: TIP, Solwazi F. Otieno ku 031 373 2382

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC) CONSENT

Isivumelwano sokuba yingxenye yocwaningo:

- Ngiyavuma ukuthi ngichazeliwe ngu _____ ngalolucwaningi. Research Ethics Clearance Number: REC 63/12
- Ngiyifundile imininingwane yalolu cwaningo, noma ngilalelile ngezwa kuchazwa ngokomlomo. Ngakho-ke futhi ngiyasho ukuthi ngiyayiqonda.
- Ngiyazi ukuthi imiphumela yocwaningo, kanye neminingwane yami ayizukudalulwa.
- Ngiyavuma ukuthi imininingwane yocwaningo ihlaziywe ngekhomputha ngumcwaningi.
- Angiphoqiwe ukuba yingxenye yalolucwaningo, Ngingahoxa ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.
- Lapho ebenginemibuzo khona, ngichazeliwe kabanzi. Ngiyazikhethela mina ukuba yingxenye yalolucwaningo.
- Imiphumela yalolucwaningo ephathelene nami ekuqhubekeni kwaocwaningo ngizokwazi ukuyithola.

_____	_____	_____	_____
Igama lakho eliphelele	**Usuku**	**Iskhathi**	**Sayina**

Mina, _____ ngiyavuma ukuthi obhalwe ngaphezulu uchazelwe ngokuphelele ngalolucwaningo,

_____	_____	_____
Igama lomcwaningi	**Usuku**	**Sayina**

_____	_____	_____
Igama likafakazi	**Usuku**	**Sayina**

Annexure D

BB 828 Cetshwayo Circle

Umlazi

4031

January 2013

Councillor

Ward 84

Umlazi

4031

Re: Request for permission to conduct research

Mr. Phungula

I am Sinenhlanhla Memela currently doing my M. Tech: Consumer Sciences: Food and Nutrition and would like to request permission to conduct a nutritional research study in Ward 84. The Title of the study is: The Impact of a Westernised Diet among an Emerging Middle Income Black Community of Umlazi Township.

The researcher will approach households directly and data collection will be done at the household. An information letter and consent form will be given to participants.

The aim of this study is to assess current nutritional status, dietary patterns and socio economic status of the adults in Ward 84. The study will provide a needs analysis data which could be used in developing general community health promotion and education. Results of the findings will be shared with the councillor, any parties interested and also made available at the Durban University of Technology library.

The study will be conducted through the Durban University of Technology, under the supervision of Professor Carin Napier (031- 373 2326) of the Food and Nutrition Department.

Your approval and assistance would be sincerely appreciated.

Yours sincerely

Sine Memela (Researcher)

Tel: 031 373 2961 Cell: 083 880 9614

ETHEKWINI MUNICIPALITY

AA1292

Ngcede groove

uMlazi

4031

03/05/2013

076 535 7190

I councillor **BP Phungula** would like to confirm that **Sinenhlanhla Memela** is a resident in my ward and she is a DUT Student conducting house hold research on the anthropometric profile and food consumption patterns of an emerging middle Income community in **uMlazi(ward 84).**

I therefore request that you assist her with all the help she needs, your assistance in this matter would be highly appreciated.

Yours in community development

Ward 84 councillor

BP Phungula

[redacted].....

Councillor Bhekithemba Paulus Phungul

BPP

COMMISSIONER OF OATHS
ETHEKWINI MUNICIPALITY
EX OFFICIO DISTRICT OF DURBAN IN
TERMS OF SECTION 6 OF ACT 16 OF 1963
(AS AMENDED) CITY HALL SECRETARIAT
Dr Pixley Ka Seme Street, Durban, 4001

Annexure F

FOOD AND NUTRITION CONSUMER SCIENCES

FFQ LIST OF FOODS AND FOOD GROUPS DIVERSITY

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

GROUP 1: Flesh Foods (Meat, Poultry, Fish) Diversity	**Y**	**N**
Meat (Chicken)		
Meat (Beef)		
Meat (Mutton, Lamb)		
Meat (Pork)		
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		
Maas/ Inkomasi		
All Cheese		
Custard		
Ice Cream		
Yoghurt		
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, Morvite, Muesli,FutureLife Instant porridge etc.)		
All Tubers/Roots (Amadumbe, Sweet Potato)	**Y**	**N**

Potatoes		
GROUP 5: Legumes and Nuts	**Y**	**N**
All Beans Dried		
Dried Peas		
Lentils		
Peanuts and Nuts		
GROUP 6: Vitamin A Rich Fruits and Vegetables Diversity	**Y**	**N**
Pumpkin		
Carrots		
Wild Leafy Vegetables (Imifino,- cadolo, mbuya, ntanga, ntufeshe, ntshungu) Fresh and Dried		
Spinach		
Butternut		
Apricots (Appelkoos)		
Peach (yellow cling)		
Mango		
GROUP 7: Other Fruits (and juices) Diversity	**Y**	**N**
Deciduous Fruits		
Apple		
Peaches		
Pear		
Grapes (black/green)		
Plum		
Sub – Tropical Fruit	**Y**	**N**
Lemon		
Orange		
Naartjie		
Banana		
Pineapple		
Avocado		
Watermelon		
Guava		
Paw- Paw		
All berries		
Juices	**Y**	**N**
Juice (100% pure juice e.g. Ceres/Liquifruit)		
GROUP 8: Other Vegetables Diversity	**Y**	**N**
Onions		
Cabbage		
Beetroot		
Tomatoes	**Y**	**N**
Green beans (fresh)		
Peas (fresh)		

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

Annexure G

FIELDWORKER AGREEMENT

I, _____ agree to be a field worker for the study: Anthropometric profile and food consumption patterns of an emerging middle income community in Umlazi.

The researcher, Sinenhlanhla Memela, has explained to me fully the details of the study and all that is expected of me during data collection.

Fieldworker signature_____ Date: _____

Researcher signature _____ Date: _____

DURBAN UNIVERSITY of TECHNOLOGY

FACULTY: APPLIED SCIENCES

DEPARTMENT OF FOOD AND NUTRITION
CONSUMER SCIENCES

NATIONAL DIPLOMA: CONSUMER SCIENCES FOOD AND NUTRITION

Fieldworker Guide

2013

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 : Professor C. Napier - S9 Level 3

Tel. No. : 031 373 2326
E-mail : carinn@dut.ac.za

Research Assistant : Miss S. Memela - S9 Level 3

Tel. No. : 031 373 2961
E-mail : researchFN@dut.ac.za

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
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

FOOD	Smaller than smallest	Between small and medium	Between medium and large	Between large and very large	Larger than large/very large
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
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 I

Food and Nutrition Consumer Sciences

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

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

1. GENERAL INFORMATION

Participant number:……..……. Date: ……

Fieldworker name: ……

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

Where do you live?

.....

2. PERSONAL INFORMATION

2.1 Your role in the family

Mother	Grandmother	Father	Grandfather	Other, specify……

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

2.3 How old are you? _____ years

2.4 Gender:

Male	Female

3. ACCOMMODATION AND FAMILY COMPOSITION

3.1 Do you live in?

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

3.2 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…….	

3.3 Do other people live in the house with you?

Yes	No

3.4 How many people are permanent residents living in the house with you? (Only if these people eat and sleep in this house at least 4 days a week?)

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

3.5 How long have you been staying permanent in this house?

< 1 year	1-5 years	>5 years

3.6 In what type of house are you staying?

Brick	Clay	Grass	Wood	Zinc/shack

3.7 How many rooms does your house have?

1 room	2 rooms	3 rooms	4 room	>5 rooms

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

Yes	No

3.9 Do you have the following facilities/ services at home?

3.9.1 Water

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

3.9.2 Toilet facilities

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

Waste removal	Yes	No	3.9.3
Tarred road in front of house	Yes	No	3.9.4
Gravel road in front of house	Yes	No	3.9.5
Access to electricity	Yes	No	3.9.6

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

……
……

3.11 Do you have problems with the following?

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

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

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

4. **WORK STATUS AND INCOME**

4.1. Are you currently employed?

Yes	No

If YES, go to Question 4.5.

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

Unemployed	Retired	Housewife	Student	Other, specify……

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

Yes	No

4.4. How long have you been unemployed?

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

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

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

4.6. Are you doing part time jobs as a second job on weekends and school vacations?

Yes	No

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

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

R0- R500	R501-R1000	R1001-R1500	R1501-R2000	R2001-R2500	R2501-R3000
R3001-R3500	R3501-R4000	R4001-R4500	R4501-R5000	R5001-R6000	R6001- R7000
R7001- R8000	R8001- R9000	R9001- R10 000	>R10 000		

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	

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 car	
Bicycle/ Motorbike	
Other Specify	

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

R 0 – R 200	R 201 – R 300	R 301 – R 400	R 401 – R 500	R 501 – R 600	R 601 – R 700	R 701- R800	R801- 1000
R1001- R1200	R1201- R1400	R1401- R1600	R1601- R1800	R1801- R2000	>R2001		

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 Has any children in your household died in the past?

Yes	No

Reason: ……..

5.6 Number of children attending school

None	1	2	3	4	5	6	7	8	All

5.7 How do the children get to school?

Walk	Bus	Taxi	Parents car	Other, specify…….

Food practices in the household

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

5.13 How many meals do you eat per day?

0	1	2	3	> 3

5.14 Where do you eat most of your meals?

Home	Friends	Work	School	Other, specify…….

5.15 Where do your children eat most of their meals?

Home	Friends	School	Other, specify…….

6. ASSETS

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

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

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

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

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

Cast iron	Aluminium	Stainless steel	Clay	Other, specify……

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

FOOD AND NUTRITION CONSUMER SCIENCES

Anthropometric Measurements

Section A:

1. Number/Name of the subject……

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 K

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					

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

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

Annexure L

04 March 2017

To whom it may concern

Re: Masters Dissertation by Ms Sinenhlanhla Memela

This letter serves to confirm that as requested I have edited and proofread the Dissertation entitled:

ANTHROPOMETRIC PROFILE AND FOOD CONSUMPTION PATTERNS OF AN EMERGING MIDDLE INCOME COMMUNITY IN UMLAZI

I have edited the work twice and to the best of my knowledge it is now free of spelling and grammatical errors and reads well. However, the author is responsible for implementing final corrections in chapter 2. Where necessary I also made comments to enable the author to clarify, improve and develop her work.

I am an experienced publisher, editor and proof reader.
Michael Vermeer (B.A., U.E.D., Dip. Translation)
082 093 4347
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