FOOD INSECURITY AND NUTRITIONAL STATUS RELATING TO CHRONIC DISEASE OF ELDERLY CAREGIVERS WITHIN THE RURAL HOUSEHOLDS OF MPHARANE IN LESOTHO

Submitted in fulfillment of the requirements of the degree of Master of Applied Science in Food and Nutrition in the Department of Food and Nutrition Consumer Science Faculty of Applied Sciences at the Durban University of Technology

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With God everything is possible and every time I face God in prayer and in silence, God speak to me. Then I know that I am nothing. It is only when I realize my emptiness, that God fills me with Himself and everything I do I put God first. I am thankful that he has given me the abilities to complete my dissertation.

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Dedication

In loving memory of my grandmother. I still love Nkhono with all my heart. Her life lives through my blood and my son's blood and the entire family of Mothepu. She has made me the person I am, the mother I am and the God fearing child. Through her strength and teachings I face life with courage and my deepest strength. I am hopeful in life because every day I get stronger, since she has given me a legacy of prayer and trust in God. She was a strong and most loving human being with no judgmental effort through her entire life. She has played a significant role throughout my life from six months till the age of twenty seven and her teachings will carry me throughout life. She will continue to grow within me and I only hope I can become the mother that she was, the grandmother that she was and the God fearing person that she was. If roses grow in heaven, Lord then pick a bunch for me, place them in my grandmother's arms and tell her they are from me. Tell her that I love and miss her, and when she turns to smile place a kiss upon her cheek and hold her for a while. Because remembering her is easy, I do it every day. But there is an ache within my heart that will never go away.

The greatest love and appreciation I have for elderly people and the growing interest in studying the elderly people further comes from the love I have for Nkhono. I will be the woman I will be come because of Nkhono.

ABSTRACT

Rational and Objectives

The objective of this study was to determine socio-demographic, socio-economic, health status, dietary diversity, nutrition adequacy, food consumption patterns, coping strategies, and agricultural practices in relation to food insecurity and nutritional status of elderly population in Mpharane.

Methodology

The sample size was n=260 participants with 75 men and 185 women. A variety of variables were used to measure the objectives and different types of questionnaires were used as measuring instruments for all the variables of the study. Socio-demographic questionnaires determined household indicators like age, employment status, and number of dependents, living conditions and assets. Anthropometrics measurements that were conducted included height, weight and blood pressure. Health status questionnaires included indictors such as consumption of alcohol, smoking, food allergies and affected parts of the body. Food frequency score, dietary intake and nutrition adequacy were established. Coping strategies in the household were determined for the period of food insecurity. Agricultural practices questionnaires were to determined household indictors like land, types of crops and livestock.

The completed Socio-demographic Questionnaires, Health Questionnaires, Food Frequency Questionnaires, Anthropometric Measurements Forms, Coping Strategies Questionnaires and the Agricultural Practices Questionnaire were captured on a Microsoft Excel® Spreadsheet by the researcher and analyzed using the Statistical Package for the Social Sciences (SPSS), version 21.0, with the assistance of a statistician.

Results

Results indicated that all participants resided with grandchildren. Majority of grandmothers headed the households. All participants were unemployed and 61.20% often had shortage of money to buy food. Nutrient analysis from 24-Hour Food Recall indicated deficient intake in energy, calcium and vitamin A. There were high levels of food insecurity among the participants since all the participants used all 15 coping strategies. The Body Mass Index (BMI) results indicated 65.50% of participants were overweight, 60.70% obese and 13.60% were underweight. Majority of participants had access to land for plantation. All Participants suffered from various health aliments.

The history of health associated with diseases indicating that 24.60% (n=64) of the participants had reported skin diseases, 71.20% (n=185) of the participants suffered from diseases of skeleton or joints and 81.90% (n=213) of the participants indicated affected eyes, ears, nose and teeth. Diseases of the chest or respiratory system were experienced by 50.80% (n=132) of the participants.

The total fat intake of all the groups was slightly below the recommended goal by the World Health Organization WHO (15-30%), with men obtaining 13.33% and women 12.55% of energy from fat. Carbohydrates contributed 75.12% for men and 75.41% for women of the daily energy needs in the groups, slightly above the levels recommended by the WHO (55-75%). The contribution of protein to total daily energy intake for all the groups was within the recommendation of 10-15%, men (11.56%) and women (12.07%). As a result this proves that the average participant consumed a balanced diet in terms of the macronutrient intake. Carbohydrates were the main source of food consumption.

The highest number of individual foods consumed by the majority of the participants was between 6-10 individual foods (53.46%, n=139) followed by 11-15 individual foods (39.23%, n=102). The mean Food Variety Score (FVS) (±SD) for all the foods consumed from the food groups during seven days was 10.06 (±6.726), which indicated a low food variety score.

The food group with the most variety was the cereal group. Seven different cereals were consumed by (1.53%, n=4) participants, a large number of the participants (31.15%, n=81) only consumed 3 different cereals within seven day period and (23.46%, n=61) of the participants consumed 4 different cereals.

Conclusion

The grandparents were the principle providers for the grandchildren and the demographic pressures, unemployment and old age increased the financial strains which contributed to high levels of poverty resulting in food and nutrition insecurity and poor nutritional status of the elderly people.

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ABBREVIATION

ADA – American Dietetic Association

ADA – American Dietetic Association

ADL – Activities of Daily Living

AIDS – Acquired Immunodeficiency Syndrome

AL – Adequate Intake

ALM – Appendicular Lean Mass

ARHI – Age-Related Hearing Deficiency

BMI – Body Mass Index

BP – Blood Pressure

CVD – Cardiovascular Disease

DDS – Dietary Diversity Score

DIRIs – Dietary Reference Intakes

DUT – Durban University of Technology

EAR – Estimated Average Requirement

EFRs – Estimated Food Records

EU – European Union

FAO – Food and Agricultural Organization

FBDGs – Food-Based Dietary Guidelines

FFQ – Food Frequency Questionnaire

FHIS – Food and Health Innovation Services

FM – Fat Mass

FNS – Food and Nutrition Security

FSP – Food Stamps Program

FVS – Food Variety Score

GDP – Gross Domestic Product

GEC – Global Environmental Changes

GI – Gastrointestinal

GM – Genetically modified

HCC – Hepato Cellular Carcinoma

HIV – Human Immunodeficiency Virus

INP – Integrated Nutrition Programme

IoM – Institute of Medicine

IREC – Institutional Research Ethics Committee

IS – Immune System

LDMA – Lesotho Disaster Management Authority

LES – Low Esophageal Sphincter

LM – Lean Mass

LVAC – Lesotho Vulnerability Assessment Committee

MDG – Millennium Development goals

MM – Millimetres

MRC - Medical Research Council

NAR – Nutrient Adequacy Ratio

NCDs – Non-communicable Diseases

NGOs – Non-government Organizations

NICUS – Nutrition Information Centre of the University of Stellenbosch

NSSA – Nutrition Society of South African

PEM – Protein Energy Malnutrition

PRS – Poverty Reduction Strategy

RDA – Recommended Dietary Allowance

SA – South Africa

SNAP – Supplemental Nutritional Assistance Programm

SPSS – Statistical Package for the Social Science

SPSS – Statistical Package for the Social Sciences

SSA – Sub-Saharan Africa

U.S. – United State

UK – United Kingdom

UL – Upper Intake Level

UN – United Nations

UNGPP – United Nations' Global Population Pyramid

UNICEF - United Nations International Children's Emergency Fund

UNPD – United Nations Population Division

UNPF – United Nations Populations Fund

USDA - United States Department of Agriculture

WC – Waist Circumference

WFRs – Weighed Food Records

WHO – World Health Organization

WHtR – Waist-to-Height-Ratio score

LIST OF SYMBOLS

% - Percent

n – Number

g – Grams

Kg – Kilograms

kJ – Kilojoule

> - Grater than

< - Less than

≥ - Greater than or Equal to

≤ - Less than or Equal to

mg – Milligram

Z – Z value

P – Percentage

C – Confidence Interval

mmHg – Millimeters of Mercury

R – Rand

M – Maluti

® - Registered Sign

SD – Standard Deviation

cm – Centimetre

m^{2-} Metre squared

µg – Microgram

± - Plus-minus sign

$ - US Dollar

~ - Frequency Scoring

º - Severity Weight

LIST OF ANNEXURES

CHAPTER ONE- THE PROBLEM AND ITS SETTING

1.1 INTRODUCTION

The United Nations Population Fund (UNPF) (2012: 11-12) believes that one of humanity's greatest achievements is the increasing number of the ageing population, for it brings continuous opportunities that can contribute to social activities, economical activities and the future of humankind. The United Nations (UN) (2011: 2) points out that in 2011 the elderly population of the world was estimated to be 760 million with different countries representing various ranging numbers in both developed and underdeveloped countries.

The World Health Organization (WHO) (2009) defines elderly people as all individuals over the age of 60 years. Bloom, Boersch-Supan, McGee and Seike (2011: 1) explains that the incidence of longevity is occurring in the world as a whole because the lifespan of individuals has improved over the two decades as a result the age gap has increased from 48 years to 68 years but in the course of the last fifty years the United Nations Population Division (UNPD) (2012) has predicted that the worldwide lifespan will increase again to 76 years in the coming years. Furthermore, in 1950 one woman could bear five children but in today's world the total fertility rate is roughly 2.5 percent and this figure is predicted to drop to 2.2 percent by 2050, hence the increasing number of elderly people.

Favela, Castro, Franco-Marina, Sánchez-García, Juárez-Cedillo, Bermudez, Mora-Altamirano, Rodriguez and García-Peña (2013: 85) explains further that from 1950 to 1955 the annual growth was 1.7 percent for people aged 60 years and above and it was relatively similar to the growth frequency of the complete population which was 1.8 percent. All this changed from 2005 to 2010 when the annual population growth rate was 2.6 percent for people aged 60 years and above and this was double the total population for annual growth rate which was 1.2 percent. The WHO (2011: 1) strengthens the above statement by elaborating that the world is at the periphery of a demographic milestone because the number of people aged 65 years and above is predicted to increase five times more than the number of children aged 5 years and below.

The elderly population in itself is ageing, meaning the oldest elderly population aged 80 years and above accounts for 14 percent of the populace aged 60 years and above. The elderly population (80 years and above) is the fastest increasing age sector of the elderly population. By 2050, 20 percent of the elderly population will be aged 80 years and above globally states the UN (2012: 1). Hintz (2012: 2) further indicates that the number of elderly people aged 100 years and above is increasing even faster than those above 80 and it was predicted to rise tenfold from nearly 343 000 in 2012 to 3.2 million in 2050.

According to Watson and Preedy (2013: 1) the ageing population is creating both positive and negative challenges. Some of these negative challenging factors are directly associated with ageing, namely the physiological, economical and physical aspect. These factors can increase chronic diseases, tissue oxidants, decreased dietary antioxidants, decreased physical activity, and reduced food consumption especially fruits and vegetables which increases nutritional stress on ageing people by reducing the ability to maintain health and the lower supply of anti-oxidants results in diseases. The main cause of the above challenges is usually income. The UNPF (2012: 11-12) further explains some of the heightened negative factors relating to the wellbeing of any elderly individual in any settlement as nourishment, hygiene, health, and advanced learning which creates financial security by emphasizing that 20 percent of the global populace survived under the global poverty line of US$ 1.25 a day in 2005. Poverty is a major threat for the elderly population due to lower income, insufficient pension allowance, reduced health and malnourishment.

Landi, Liperoti, Russo, Capoluongo, Barillaro, Pahor, Brnabei and Onder (2010: 752-753) state that progressive ageing increases the vulnerability of an elderly person to chronic health problems and that in most cases the elderly population are faced with multi-morbidity (the presences of multiple diseases in an individual simultaneously); the co-morbidity affects the development of concurrent diseases and reduces quality of life and increases the risk and severity of disability and death. He, Muenchrat and Kowal (2012: 1) explains that some of the measures used to rectify the challenges faced by the elderly population are associated with understanding the differences in the health of the older population across and within countries for it is significant in scheduling health care services, social support systems and health policies for every elderly individuals.

1.2 BACKGROUND TO THE PROBLEM: A GLOBAL PERSPECTIVE

Dale, SÖderhamn and SÖderharmn (2013: 113) elaborates on the challenges of elderly caregivers under the umbrella of self-care ability because self-care ability of the elderly is closely associated with perceived health related problems such as sense of coherence and nutritional status, mental health, former profession and type of housing. Apart from health and nutrition being a concern in the increasing ageing population, the ageing population is also faced with the challenge of caring for grandchildren.

The United States Beruea Division (2011) agrees with the above statement and explains that the Census Bureau in 2008 indicated that 2617580 children were under the care of grandparents. The grandparents are defined as people who are mainly accountable for the grandchildren who are below the age of 18. The trend of grandparents providing care for grandchildren seems to increase with the age of the children (Higgins and Murray 2010: 1189). The UNPF (2012: 11-12) indicates that the ageing population faces challenging demands when providing care to grandchildren such as excellent physical state, economic stability, household attributes, social attributes, emotional attributes, psychological factors and legal issues. What seems to be more pronounced are the financial problems which encourages low food security; 30 percent of households with elderly caregivers are marginally food insecure and at the risk of hunger. The most common coping mechanism is to reduce the grandchildren's portion sizes of food and this leads to inadequate nutritional intake (Bhattacharya, Currie and Haider 2004).

According to Roy, Stemple, Merrill and Thomas (2007: 2) the decline of the nutritional status has great impact and promotes the occurrence of diseases in elderly populations. The nutritional decline occurs because of many adjustments to the body of an elderly both physiological and pathological, which may be taken as inherent to the ageing or disease process. The healthy eating and nutritional status of the elderly person can be indirectly affected by other aspects such as socio-economic, social (isolation and depression) and quality of life because of concerns about money, especially for retired old people who have to survive on small pensions or low income. The other factor is socio-demographic, for example, limited skills when it comes to preparing food, and the apprehensive approach to new foods due to culture and religious status (Oliveira, Fogaça and

Leandro-Merhi 2009: 8). The Population Reference Bureau (2007: 1) supports the above statement regarding nutritional status of elderly population by pointing out that there are substantial portions of the elderly population all over the world who are underweight and undernourished and do not obtain sufficient kilojoules or the right nutrients from what is consumed. Adequate nutritional intake is essential throughout life because it provides good health, personal productivity and enhances the physiological changes in the elderly person's life. Ageing weakens the immunological system of an elderly person since there are alterations in the digestion, absorption and utilization of certain nutrients in the body which can increase the chances of infections. In most cases nutrients in short supply are energy, protein, and micronutrients so nutritional adequacy is important in elderly populations.

Christensen, Doblhammer, Rau and Vaupel (2009: 1197-1205) explains that the rate of diseases in the elderly population increases with age and some of the prevalent diseases are diabetes mellitus, cardiovascular disease and lower back pain. Gulley, Rasch and Chan (2011) states that the burden of diseases does not only affect the elderly population but it also affects the whole family, especially if the elderly person was the sources of income; this happens mostly in poorer countries. Non-communicable diseases (NCDs) such as ischaemic heart disease, stroke, and chronic lung diseases affects elderly populations in unindustrialized countries more than in the industrialized countries and statistics showed that elderly population from unindustrialized countries over the years have had either chronic lung disease or stroke more than two times that of such persons in industrialized countries.

Ficher, Cruickshanks, Klein, Klein, Schubert and Wiley (2009: 2-4) explains that hearing and vision impairments are linked to a deterioration in physical and social function among elderly people. Hardin (2012: 43) explains that the hearing loss increases among adults aged 45 to 69 years and in the category of the 60 year olds 1 in 3 suffers from a hearing loss that is caused by living and working in a noisy environments. Bloom *et al* (2011: 6) outline the major contributing risk factors that causes the decreased quality of life as the use of tobacco, physical inactivity, unhealthy food intake, and harmful usage of alcohol. The one non-modifiable risk factor is age.

The WHO (2008: 3) points out that the elderly population gets affected by natural disasters. Since 1994 to 2003 more than 225 million people were affected yearly by natural disasters which claimed an average of 58 000 lives annually. About 12 million people worldwide from 1998 to 2006 were refugees. The Food and Agricultural Organization (FAO) (2010) explains the impact of the food price increase on the people as a result of natural disasters due to the impact of climate change, increasing weather shocks, the connectivity between the energy and agricultural sector because of the emergent requirements for biofuel and the pricing of the food. Agricultural commodities emphasizes that food insecurity will be affecting individuals and nations for years to come. Food insecurity is not only caused by agricultural, but also by income inequality in middle income countries such as South Africa (SA). There has been a tremendously high levels of poverty and the SA government hoped to reduce the high levels of poverty by half from 2004 to 2014 (Altman, Hart and Jacobs 2009: 7).

The Journal of the American Dietetic Association (2006: 1369) describes the households with elderly people, especially those who stay alone less food insecure and the increasing number of the elderly population seem to imply food insecurity in the near future. Food insecurity is associated with poor physical and mental status as well as depression in women. Beaumier, Tagalik and Ford (2015: 197-198) study shows that food insecurity is intensively growing and people are experiencing food insecurity on a daily basis; as a result people skip meals, cut down on the size of the meals or let other family members eat first, especially children, and women are usually the last to eat and elderly women allow the husband to eat first.

According to Boersch-Supan and Ludwig (2009: 1) economic success is influenced by the magnitude and value of the employment. When people turn 50 years and above there is a possibility of a decrease in contributing in the work force. The availability of resources might also decline as the elderly population turn to depend on reserved funds to finance the expenses and lifestyle. The combination of potential labour market narrowing and dissaving has increased uncertainties in the severely ageing nations because these countries might experience sluggish economic progress and some nations could even face the contraction of the economy. The UN (2011: 31-34) recognizes that the elderly population spends money on housing, social services and energy. The elderly population aged 80 and above spend more because of health, long-term

care and social service than the younger age groups. In the emerging nations, the levels of buying food within the elderly population are slightly equivalent or lower than the levels of the younger grownups. In the more advanced nations, the buying power of food usually drops due to the fact that the elderly population stops working.

1.3 BACKGROUND TO THE PROBLEM: THE AFRICAN PERSPECTIVE

According to the WHO (2006: 4-5) the increasing ageing population is triggered by the number of factors which include: life expectancy at birth which has declined because of the continuous decline in fertility and high mortality rate in infants, children, adults because of the burden of Human Immunodeficiency Virus (HIV), Acquired Immunodeficiency Syndrome (AIDS), tuberculosis and malaria. Oldewage-Theron, Salami, Zotor and Venter (2008: 4) indicated that throughout the 1980s the life expectancy at birth for SA increased gradually but due to the prevalence of HIV and AIDS the life expectance decreased from 61.6 to 49.7 percent in 2006 and it further decreased to 6.2 percent but there was an estimate of 2.9 million elderly people aged 60 years and above of the total population. The HIV and AIDS epidemic has changed family structures where more and more elderly people finding it necessary to care for the grandchildren because the children are left behind by victims of HIV and AIDS. In Addition more than 50 percent of the orphans in Africa presently live with the grandparents who have inadequate resources and unstable incomes to provide for the households (United Nations International Children's Emergency Fund (UNICEF) 2003 and UNICEF 2013).

UNFP (2012: 1-6) agrees that elderly people contribute a great deal to African society especially by caring for children orphaned by HIV and AIDS but HIV and AIDS puts a burden on elderly people as caregivers. Elderly people are often presumed to be no longer sexually active so elderly people are not provided with information or training on HIV and AIDS but HIV and AIDS effects the elderly people because the elderly provide home-based care for people living with HIV and AIDS.

Nabalamba and Chikoko (2011: 2-3) explains further that the elderly population in Africa is faced with major challenges of physical disability, mental disability and chronic disorders and financial

responsibility. According to Charlton and Rose (2001: 2424) the majority of Africans come into old age after a prolonged life period of poverty, insufficient and deprived admission to healthcare resources. There is also a persistent poor food intake which results in an insufficient amount and quality of food. It has been discovered through partial evidence that undernutrition is widespread in elderly African men (9.5 to 36.1 percent) and elderly African women (13.1 to 27 percent). In support of these findings; the poor nutritional status of the elderly population in the African countries is affected by multiple dynamics which include insufficient household food, security, war, famine, and the indirect impact of HIV infection and acquired AIDS (Vorster, Kruger and Margetts 2011).

Golaz, Nowik and Sajoux (2012: 2-3) points out that a large number of Africans still do not receive old age pensions unlike countries in the Northern hemisphere where members of the elderly population receive old age pensions. Nonetheless, pensions or minimum old age related Welfare payments are not adequate to sustain a decent standard of living. When pensions are insufficient the elderly population who can no longer work have to rely on the family network. But it is predicted that, in centuries to come, families may not have the resources (financial) to care for elderly people or dependent relatives if not supported by appropriate public policy measures.

Faya (2007) agrees with the above statement by elaborating that old-age pensions paid in developing countries plays a significant part in safeguarding and improving the livelihoods of elderly people and decreasing poverty. Evidence specifies that poverty among the elderly people in countries like Brazil, Chile or South Africa is generally low because of the generous pension or safety net coverage put in place for the elderly in that country. Stewart and Yermo (2012) point out that pensions contributes a vital part in poverty by alleviating demographic pressures, poverty amongst the elderly and provide support for households headed by grandparents following the HIV and AIDS epidemic. African countries such as S.A. that have put in place pension systems have managed to reduce the poverty gap ratio of 13 percent and increased the income of the poorest by 5 percent of the population of 50 percent and in Zambia, a pilot cash-transfer scheme to older people caring for orphans has enhanced school attendance (Seedat and Rayner 2012).

1.4 BACKGROUND TO THE PROBLEM: THE LESOTHO PERSPECTIVE

Lesotho is a small mountainous country which is landlocked by SA. The total population of Lesotho is estimated at 1,942,008 (CIA world Factbook 2016). Lesotho's ageing population will increase in both the total quantity and proportion of elderly people towards the total population number with the majority of the people residing in extended family households (WHO 2008). In 2012 Lesotho had 6.3 percent of the population aged 60 and above and it is estimated that in 2050 9.1 percent of the total population will be 60 and above. There will be a standstill growth in the total population aged 80 and above in Lesotho by 2050 which will amount to 0.7 percent and this will not have changed from 2012 (UNFP 2012: 168).

Chaka (2011: 28-29) mentions the different percentages regarding the population of Lesotho because it is categorized as a young nation. CIA world Factbook (2016) states that the dependency ration of elderly was 7 percent in 2014. Secondly the elderly population from the age of 55-64 years was 4.9 percent men accounting for 51,274 and women 44,847. The elderly population aged 65 years and above were 5.4 percent with men accounting to 52,955 and women 51,973. The structure below defines the country's explicitly take into the effects of the increasing death rate because of AIDS. This condition has resulted in the decline in lower life expectancy, increased infant mortality, increased death rated, lower population growth rates.

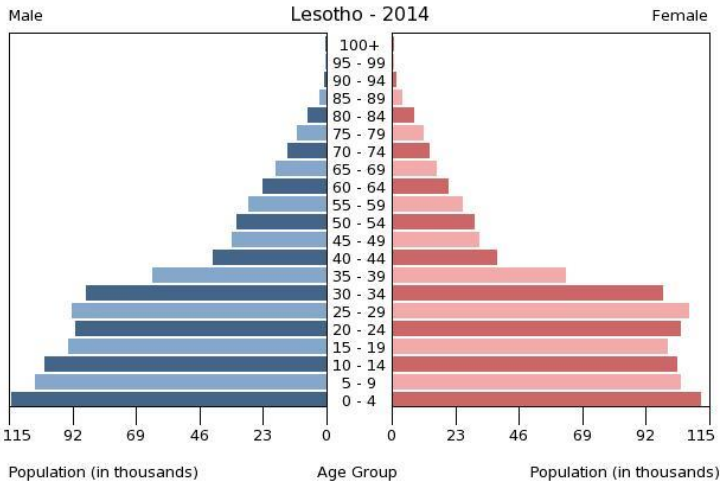

Figure 1.1: Population pyramid of Lesotho (2014) (CIA World Factbook 2015).

From 1986 to 1996 the annual growth rate of the Basotho population was 1.5 percent but this statistic has decreased to 0.08 percent due to declining population growth caused by the increasing AIDS deaths from 1996 to 2006 (WHO 2009: 3-4). Studies have indicated that the prevalence of HIV is estimated at 23 percent across the ages of 15-49 being infected; 60 percent of those with HIV are women and children. This means many elderly women are left to head the households, and in most cases the same women have to care for several orphaned grandchildren. The Lesotho Disaster Management Authority (LDMA), Lesotho Vulnerability Assessment Committee (LVAC) and the UN World Food Programme (2008) have indicated that HIV and AIDS has contributed to the overcrowded households which are mainly headed by elderly persons. The elderly population in Lesotho is unemployed and the highest income per monthly is two hundred and twenty eight Maluti (M228.00) (which is equivalent to $16.91 in 2015) and most of the money was spend on food and the majority of the households are food insecure because sometimes the households do not have enough money to buy food. The most common coping strategies the households use in time of money scarcity or food shortage is to depend on a lesser amount of costly or favoured food, borrow food or depend on the help from relations or reduce the number of meals in a day. This conditions were highlighted since 2003 by Mphale (2003) by elaborating that HIV and AIDS, low household income, unemployment, livestock theft and retrenchment contributes to food insecurity but there are other factors such as insistent drought, storms, extreme rains and other negative natural forces which results in food shortages but also the low exchange rate of Loti (M1.00) to Dollar ($13.48) has also resulted in the increase cost of important food supplies and this aggravates the condition.

The Lesotho Government has created the Lesotho Vision 2020 and the Lesotho Poverty Reduction Strategy (PRS) that channels the government's initiatives toward improving the existing socioeconomic challenges (WHO 2009: 3-4). It is projected that 352 000 people (approximately 17 percent) of the population is food insecure and 43 percent of the population lives below the poverty line. The UN indicates that 40 percent of these people are labeled as "ultra-poor". Lesotho in general has a very high prevalence of HIV and AIDS and as a result Lesotho is the third highest country with 24 percent of the population infected with HIV and AIDs in the world. This high rate has created a negative influence on human development in the country (World Bank 2006).

According to Nyanguru (2007: 11), in 2004 Lesotho presented economic assistance to the old age population. The economic assistance was the old age pension and it's was intended to eradicate poverty in elderly people. For example, in Lesotho 61 percent of rural households are affected by HIV and AIDS and in order to cope with the health challenges affecting most of the households, the majority of the people had to sell parts or the whole farming land in order to increase available cash. The require the funds to pay for extra medical expenses and other expenses associated with caring for HIV and AIDs person because the previous wage earner has lost the job due to the illness. HIV and AIDs has the impact of increasing the significance of old age pension income in a household with infected household members; the elderly people have to take on the additional duty of caring for children who have lost parents. Chaka (2007: 28-29) states that even though the Lesotho Government has no particular financial strategy for the support of ageing people currently, public maintenance programs are present. The Old Age Pension Scheme is part of this programme. The Lesotho Government introduced the non-contributory pension structure in November 2004 in which all individuals aged 70 years and above were receiving M150.00 (US$25.00) per month. This payment was accessible to all individuals meeting the requirement irrespective of the financial circumstances. M150.00 was giving to the ageing people in order to help the ageing people by the Lesotho's poverty line (Bureau of Statistics Household Budget Survey 2002/3). The same Pension Scheme is still in practice but the amount of allowance has been increased to M450.00 per month per elderly person.

No research studies were found to address the nutritional needs of the elderly population in Lesotho. Listed in Table 1.1 are four studies conducted in Lesotho on the elderly population. Therefore, the current study is essential to alert the government of Lesotho of the nutritional status, food insecurity and chronic diseases affecting the elderly population of Lesotho.

Table 1.1: Studies conducted in Lesotho on Elderly population

Author and reference	Study population	Measuring Instrument	Summarized results
Nyanguru (2007) **The Economic and Social Impacts of the Old Age Pension on the Protection of the Basotho Elderly and their Households.**	250 men and women elderly pension recipients (70+)	Soci-demographic questionnaire	-The pension money is usually paid out and the day announced. -The Post Office staff is usually praised for the way they deal with the recipients. -Most pensioners, especially those in the foothills, can walk to the pay point. In the mountain zone more use local taxis. The average time taken to get to the pay point is around 45 minutes and the cost to the average pensioner is around 5% of the pension paid. -Most pensioners (average age 78 years) went to get the cash by themselves or with pensioner neighbors. -Other household members were usually only involved in the 20-30% of cases where someone else had to be sent to get the pension. - Two percent of the participants were located in mountains and 5% in the lowland. - The survey would have preferred the pension to have been paid through a bank account.
Obioha and T'soeunyane (2012) **The Roles of the Elderly in Sotho Family System and Society of Lesotho, Southern Africa**	20 men and women (60+)	The study relied mainly on qualitative sources, where key informant interviews and in-depth interviews were used as the main sources of data collection, which are techniques where the lives of the people are fully observed, explained and discussed. -socio-demographic questionnaire	-This study found that the elderly play major roles within the socialization aspect. -The recognition and appreciation of this noble role by the elderly compels many young families to keep a strong link with their aging parents for the purpose of culture transmission.
Lesotho Disaster Management Authority (DMA), Lesotho, Vulnerability Assessment Committee (LVAC) and the	The study was conducted in all the ten district. The study group were households receiving care under support groups and a	Analyzing/understanding current food security situation of different groups in urban Areas. ssessing the impact of rising prices on the	-General, 30% of the surveyed family units had an elderly head (60+ years), with supported family units more possible to have an elderly head (40%) than the other family units (21%). - About 45% of the family units were accommodating orphans.

UN World Food Programme (2008)	comparable sample of non-support households A total of 1,278 households were sampled in ten districts of which 56.5% were supported households and 43.5% were non-supported households. The urban population is estimated at 447,597 people accounting for 23.8% of the total population.	vulnerable populations living in the ten major cities. Analyzing immediate, mid-term and long-term response options. - socio-demographic questionnaire	- The large number of the participating family units reside in their own households (72%), with the main quantity being in Mohale's Hoek. - These family units are, on average, composed of 4 members and almost all (88%) are controlled by an elderly individual and 77% are headed by females.
M.M. Mphale HIV/AIDS and food insecurity in Lesotho (2003)	This paper draws heavily on the Lesotho Emergency Food Security Assessment Report December 2002 and the study on HIV/AIDS and its Impacts On Land Tenur and Livelihoods in Lesotho by Mphale M., Makoae M,G. and Rwambali EG (2002).	Both studies utilized both Quantitative, Qualitative and Participatory methodologies - socio-demographic questionnaires - coping strategies questionnaires	-The previous studies evidently indicates that the food insecurity difficulty appears to have deteriorated ever since July/August vulnerability assessment. -This is shown by the stated extensive prevalence of food unavailability as well as rising values of food supplies which, in most circumstances do not relate with the people's buying powers. -Unmaintainable coping strategies depicting desperation also depicts an intense image of the disasters. - Moreover, summer harvests are projected to be lower than expected due to climatic difficulties and delays in delivery of inputs. -Other essential prevalence of diseases, particularly HIV and AIDS has also compounded the difficulties. HIV and AIDS disease and affected family units cannot access some of the coping strategies because of their health circumstances while some of the interventions do not seem to address their needs.

1.5 RATIONALE AND MOTIVATION

Studies have shown that ageing population is increasing year after year and thousands of people celebrate the 65th birthday everyday (Cohen 2003). Hamer, Sempértegui, Estrella, Tucker, Meydani Rodríguez, Egas, Dallal, Selhub and Griffiths (2009: 113-114) indicates that the increase in the proportion of the population over the age of 60 years in developing countries is estimated to be 1.5 times faster than that in developed countries. According to Hintz (2011: 2) the elderly population is one of the vulnerable age groups due to living conditions that are plagued by limited access to income, food security, shelter, health, family and community support. Nowson (2010: 28) indicates that other factors such as protein-energy malnutrition or other specific nutrient deficiencies make the elderly population a vulnerable group.

According to Ahmed and Haboubi (2010: 207) nutrition contributes significantly to the health state of the elderly population and nutrition affects the ageing process. If nutrients intake is inadequate the elderly population will suffer from malnutrition. Studies in United Kingdom (UK) have shown that 16 percent of those 65 years and 2 percent of those 85 years are classified as malnourished. Malnutrition is linked to a deterioration in functional status, reduced muscle activity, reduced bone mass, immune dysfunction, anemia, condensed cognitive abilities, poor wound healing and mortality. The reason the elderly population encounter malnutrition is due to the fact that older people often have condensed appetite and energy expenditure, which combines with a degeneration in biological and physiological functions and in addition pathological changes of ageing such as chronic diseases and psychological illness in general.

The Nestlé (2008: 2-3) indicated that psychological, physiological and economic factors can all play a major part towards the poor nutrition among the elderly population. Moreover metabolic, oral and dental, physical, clinical, social and economic factors such as depression, and worry about money can contribute to under-nutrition in an elderly person. Food and Health Innovation Services (FHIS) (2012) explains that malnutrition includes both under-nutrition and over-nutrition and the concern among the elderly population in the UK is that the elderly population does not consume enough to maintain good nutrition and in old age. Being underweight poses far greater risk to health than being overweight. The WHO (2011: 6007) also want to address the health problems

and eliminate death or disability by developing and implementing innovative ideas such as additional vaccination or boosters that can be administered to an individual through the different stages of life in order to stimulate the immune system during old age. A balanced nutritional intake turns to sustain a healthy life style but food insecurity creates an unbalanced nutritional intake. Food insecurity can be affected by the global economic decline.

1.6 RESEARCH AIM AND OBJECTIVE

The main aim of this study was to determine the food security, health and nutritional status of elderly caregivers within the rural households of Mpharane in Lesotho in order to inform the Lesotho government on food insecurity and nutritional status of elderly caregivers so as to create possible interventions. The findings from the study could be used to develop nutritional interventions that will benefit the communities and the results should therefore have an impact on public health policy regarding the prevention, and treatment of malnutrition and nutrition related chronic diseases in relationship with agricultural and traditional foods in adults in Lesotho.

1.6.1 Research objectives

The objective of the study was to:

- Determine the Socio-demographic profile of the families by means of a socio-demographic questionnaire.
- Determine the Anthropometric status of the caregivers by weighing and measuring each person in order to calculate Body Mass Index (BMI) measure waist circumference and blood pressure status.
- Determine the health and behavioural patterns and any self-reported chronic diseases of the participants by completing a Health and Behavioural questionnaire.
- Determine the participant's dietary intake by completing 3 x 24-Hour Recall questionnaires.
- Determine the food variety intake of the participants by completing a Food Frequency questionnaire.
- Determine the Household agricultural practices to inform traditional food intake habits in the household.
- Determine the coping strategies in time of hunger by using a Coping Strategy questionnaire

1.6.2 Framework of the study

Figure 1.2: Framework of the study

1.7 STRUCTURE OF THE DISSERTATION

The outline of the dissertation is presented in Figure 1.2 which provides a summary of each chapter.

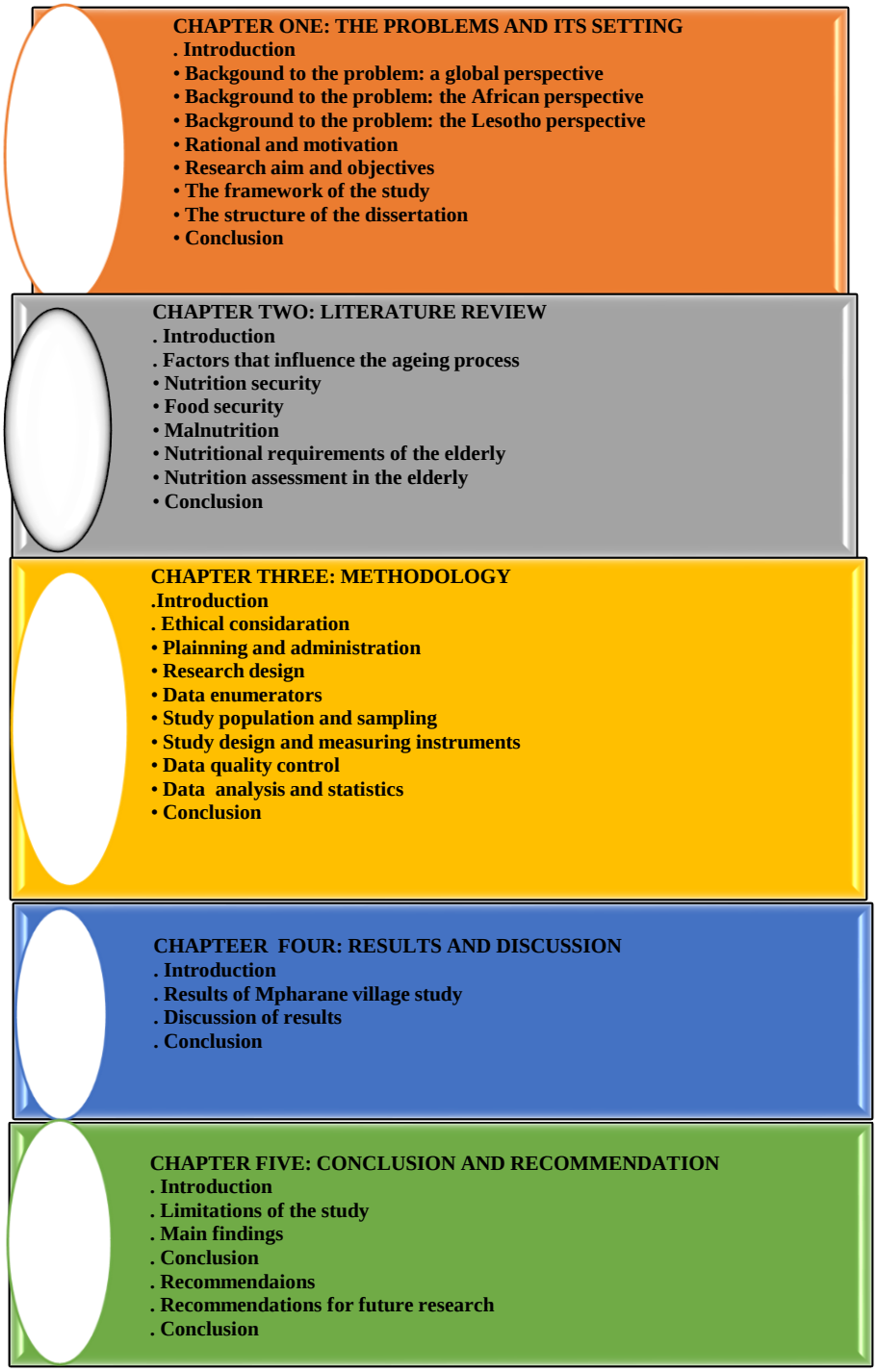

Figure 1.3: The outline of the dissertation

1.8 CONCLUSION

The ageing population is increasing globally and the change in the demographic structure brings great challenges as the elderly people are one of the most vulnerable groups. It is important that goals on healthy ageing and active ageing are put in place in order to reduce the strain in the health and economic sectors. Elderly people suffer from various diseases; some have been present since infancy and are mostly diet-related such as malnutrition. To some degree malnutrition is associated with food insecurity due to poverty. Eradication of poverty and reduction in inequality could create a healthy ageing population. The literature in this chapter highlights the various challenges the elderly population faces.

CHAPTER TWO- LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews the available literature that applies to the study in order to provide a background to the issue. Figure 2.1 presents the risk factors for poor nutritional status in older persons and each of these factors will be discussed in more detail in this chapter.

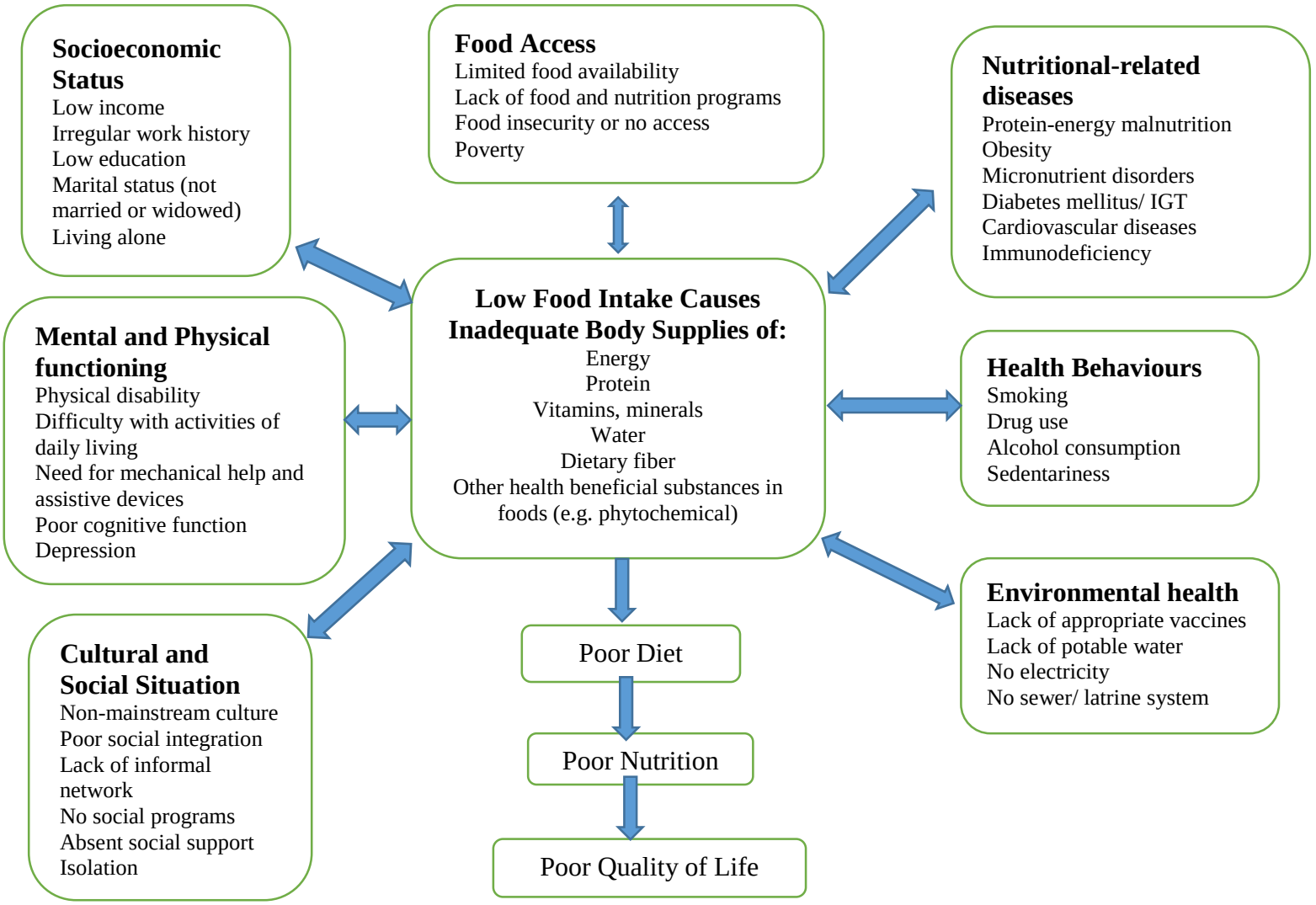

Figure 2.1: The adapted risk factors for poor nutritional status in older persons. (Wahlqvist and Lukito 1992 and Bermudez and Dwyer 1999)

The Food and Health Innovation Services (FHIS) (2012) stated that in 2002 the elderly population was predicted to be 605 million globally and 400 million of that population lived in developing countries. In 2025 the number of elderly population is predicted to be more than 1.2 billion with 840 million of the population from the developing countries. Joubert and Bradshawb (2005: 2014) explained that ageing population or demographic ageing means that people from the age of 60 years and above turn out to be a larger number of the population towards the total population because of lower levels of fertility and lower levels of mortality. The United Nations' Global Population Pyramid (UNGPP) believes that the cause of the increasing ageing population is associated with the decrease in fertility and mortality rates (Tyrovolas, Tountas, Polychronopoulos and Panagiotakos 2011:13 and He *et al* 2012: 1) agrees with the above statements by affirming that the major cause in the rising elderly population is triggered by the decline in fertility which is attached to a marginal life expectancy.

Thomas-Crusells, McElhaney and Aguado (2012: 6007) also reported that the high life expectancy is equivalent to the drop in the percentage of fertility rate which guarantees that the population of 60 years and above will increase from 10 percent to 21 percent in 2050. These statements are supported by the following statistic: every second, two people are celebrating a sixtieth birthday around the world amounting to 58 million sixtieth birthdays annually. In 2050 the ratio of one in nine people in the world being at the age of 60 years or above is estimated to increase to one in five. FHIS (2012) explained that mortality rates have dropped globally because of the progress in the fight against infectious diseases, improving hygiene, sanitation and overall social development and higher living standards.

Katta, Gopalakrishnan, Ganeshkumar, Ajitha (2015) believes that old age is not a disease itself but that it hosts and promotes non-communicable diseases such as cardiovascular diseases, musculoskeletal diseases, diabetes mellitus, malignancy disease and mental illness. Thomas-Crusells *et al* (2012: 6007) point out that infectious diseases are a major concern for the ageing population which promote morbidity, disability, and mortality. The infectious diseases manifest themselves more as acute respiratory illnesses that lead to influenza and pneumonia, digestive tract infections, herpes zoster, malaria, leishmaniasis, tuberculosis, helminthiasis and HIV and AIDS;

these are more dominant in the developing countries. In addition Higgins and Murray (2010: 1189) lists some of the relevant health problems such as depression and poor self-rated health.

Apart from factors that influence the health of the ageing population, the shift in the ageing structure has a major influence on an extensive range of economic, political and social conditions. An increasing older population affects other aspects such as retirement, pensions, other social benefits, and medical costs with increased demands for health services because older people are more vulnerable to chronic diseases which tend to exist over a longer period of time (United Nations 2010: 3).

2.2 FACTORS THAT INFLUENCE THE AGEING PROCESS

The ageing population is placed under the category of multi-morbidity, which is explained as the occurrence of two or more connected diseases, disabilities and geriatric conditions for example, polypharmacy, sensory deficits, incontinence, decreased energy dense, cognitive impairment, reduced social contribution and functional weakening, which is often referred to as a decline in the activities of daily living (ADL) and this results in dwindled physiological reserves. The outcome of functional weakening is reduced independence, inferior quality of life, advanced danger of institutionalization and death (Parlevliet, Buurman, Pannekeet, Boeschoten, Brinke, Hamaker, Munster and Rooij 2012: 3-4).

Nutrition is a significant component of health in the older population and nutrition has an impact on the ageing process. There is increasing frequency of malnutrition in the older population and it is linked with several health problems such as: reduced health status, reduced muscle function, reduced bone mass, immune dysfunction, anemia, decreased cognitive function, poor wound healing, and slow recovery from surgery, greater hospital readmission rates, and death. Elderly people repeatedly have a decreased appetite and energy expenditure, which is also associated with a decline in biological and physiological functions such as decreased lean body mass, variations in cytokine and hormonal level, variations in fluid electrolyte regulation, delayed gastric emptying and reduced senses of smell and taste. Furthermore, pathological alterations of ageing such as chronic diseases and psychological illness all contribute to the complex etiology

of malnutrition in older people. Nutritional assessment is important to identify and treat patients at risk (Ahmed and Haboubi 2010).

2.2.1 The ageing process

According to Chuckrow (2010) the ageing process is a constant and irretrievable process and ageing is not only chronological but it is also initiated by cell damage. The degree of deterioration is different among individuals and can be controlled by three theoretically different impacts, that have different comparative weight in each individual; these are physiology (alterations due to the action of time), pathology (adaptive sequels of previous diseases or surgeries suffered throughout one's life), and, lastly, alterations brought by the individual lifestyle, the environment or by different risk factors, including polypharmacy. Insufficient nutrient intake contributes to decreased function, repair, and production of the cells because each cell in the body needs oxygen, vitamins, minerals, amino acids and sugar. Simkó, Gyurkó, Veres, Nánási and Csermely (2009: 1) explain that ageing is associated with some diseases, which include cancer, atherosclerosis, diabetes and neurodegenerative disorders such as Alzheimer's disease and Parkinson's disease because of the decline in cell function(Whitney and Rolfes 2016)

2.2.1.1 Physiological factors

According to Whitney and Rolfes (2016) physiological functions certainly deteriorates with age and may impact on the absorption and metabolism of nutrients. One disorders that occurs in persons of advanced age is Gastric atrophy. Gastric atrophy is accountable for reduced absorption of calcium, iron and vitamin B12 and this can result in failure to release cobalamin from food or its binding properties on proteins which contributes to some deficiencies especially vitamin B12. Deterioration in physiological function affect functional physical, cognitive ability in older populations and depression (Doets, Groot, Dibari, Visser, Bartali, Volpato, Topinkova, Gambassi and Salva 2011).

2.2.1.1.1 Sensory

Deficiencies in the apprehension of information are frequently prevalent in the older population. Evaluation and rehabilitation of sensory deficits may contribute to an improvement in functioning and well-being in the later years of life. A substantial proportion of the information that is used to function is captured through multiple senses and must be centrally combined and integrated to provide a coherent observation. These multiple senses include vision, hearing and olfactory. Impairments in vision and hearing demonstrates independent effects on the quality of life. Previous work has revealed that hearing and vision impairments are associated with a decline in physical and social functioning among elderly people (Fischer, Cruickshanks, Klein, Klein, Schubert, and Wiley 2009: 1-3 and Cruickshanks, Nondahl, Dalton, Fischer, Klein, Klein, Nieto, Schubert, and Tweed, 2015).

In unindustrialized countries visual impairments is the main cause of the burden of diseases and this is three times more the case in industrialized countries. These impairments are initiated by refractive errors, cataracts, glaucoma and macular degeneration. Hearing loss is another cause of disability because untreated hearing loss affects communication but it also contributes to social isolation, loss of autonomy and is associated with anxiety, depression and cognitive decline (Sopinath, Schneider, Mcmahon, Burlusky, Leeder and Mitchell (2013). In old age, there is a decreased threshold for taste and smell which can make a person consume less food because the food is no longer enjoyable, the decrease intake of food can result in nutrient deficiencies. Loss of vision and hearing can result to social isolation and eating alone may lead to poor intake of food (Whitney and Rolfes 2016).

Ahmed and Haboubi (2010) agrees with the above statement by explaining that taste and smell decline with age. The reduced taste can be triggered by the decreased number of taste buds and the alteration in the olfactory epithelium, receptors and neural pathways might affect the sense of smell. Medication such as those for Parkinson’s Diseases and antidepressants might affect the sense of taste. The decreased taste and smell reduces food consumption, interest in food, food choices and variety in the diet which can lead to micronutrient deficiencies in elderly people.

2.2.1.1.2 Oral Health Status

Masticatory dysfunction triggered by loss of teeth and muscle bulk can cause the consumption of a limited, nutritionally imbalanced diet. Edentulous people rate the health as fair or poor because there is lower consumption of fruits and vegetables, less diverse diet and poorer quality diet than people with heath set of teeth. Tooth loss is prevalent among elderly people all over the world especially elderly people with low income and elderly people that consume a lot of sugar and smokes tobacco on a regular basis. Dental diseases cause problems with eating because it reduces chewing performance and affects food choices and as a result older people tend to avoid dietary fibre but prefer foods rich in saturated fats and cholesterols. In addition to the chewing, old-age people may have social handicaps related to communication and social interaction because of missing, discolored or damaged teeth. Tooth loss is also shown to be an independent risk factor for weight loss among older population because it affects the nutritional intake of food in general. Tooth loss has also been connected with amplified risk of ischemic stroke and poor mental health. The treatments of oral and dental disease leads to dry mouth and changed sense of taste and smell (Petersen and Yamamoto 2005: 83-89; Bronkhorst, Creugers, Gerritsen, Allen and Witter 2010; Pau 2012 and Petersen 2010).

2.2.1.1.3 Hearing

According to Friedman, Laer, Huentelman, Sheth, Eyken, Corneveaux, Tembe, Halperin, Thorburn, Thys, Bonneux, Fransen, Huyghe, Pyykko, Cremers, Kremer, Dhooge, Stephens, Orzan, Pfister, Bille, Parving, Sorri, Heyning, Makmura, Ohmen, Linthicum, Fayad, Pearson, Craig, Stephan and Camp (2009: 786) age-related hearing deficiency (ARHI) or presbycusis is the greatest mutual sensory irregularity in the older population. It is predicted that in 2020 over one billion people over the age of 60 years will be affected by ARHI. It has been publicized that ARHI can lead to social isolation, depression and cognitive deficiency in old age.

Benova, Grundy, and Ploubidis (2015: 1-2) support the above statement by outlining that hearing deficiency happens among the old population as an outcome of the ageing process but can be aggravated by factors such as noise experience, and genetic conditions. The frequency of hearing

deficiency is more advanced amongst older men than older women and is linked with other health comorbidities, such as poor nutrition and smoking. Among the older population, untreated hearing deficiency is related to a decline in physical, mental, and psychosocial functioning as well as with mortality.

Hardin (2012: 43) explains that hearing loss differs by age, sex, race, and ethnicity. The mechanism for less hearing loss in women is believed to be associated to levels of estrogen, vitamin B12, and red cell folates. Men have constantly reported more hearing difficulties than women have irrespective of race. Gopinath, Schneider, Mcmahon, Teber, Leeder, and Mitchell (2012: 195-196) state that hearing loss is associated with both old age and numerous signs of undesirable well-being including decreased quality of life, social isolation and depressive symptoms(Lin, Thorpe Gordon-Salant and Ferrucci 2011).

2.2.1.1.4 Immunodeficiency

The rate of infections is higher in the old population, and in numerous cases fatal. Specified nutrition can aid in improve an individual's immune function to some degree. As people grow older the immune functions reduce in different ways. For example, there is a declined in antibody reaction to vaccines such as the flu vaccine, also there is a reduction in cell mediated immune reactions (reduced T-cell reactions) and there are long-lasting activation of macrophages, cells that kills foreign material and a significant escalation in the production of free radicals imitative from oxygen, leading to chronic oxidative stress. Several nutritional deficiencies in older people have been connected with declined immunity. Dietary antioxidants such as vitamins A, C, and E are assumed to be of actual significance because of the alleviating influence on cell membranes and the deterrence of impairment by free radicals. Vitamin E specifically improves the immune response in older people. Minerals such as iron, zinc, selenium and copper are required for enzymes to neutralize free radicals. The mixture of zinc and selenium reduces the occurrence of respiratory and urinary infections and improves the antibody reaction to the flu vaccine. With age increasing, protein metabolism also decelerates and the degree of replacement of particular amino acids consequently also deteriorates thereby leading to less

effective immune function or reaction to infection or trauma (Nestlé 2008; Wahlqvist and Lukito 1992 and Pae, Meydani and Wu 2012).

2.2.1.1.5 Physical function

Physical function is a multifaceted and broad ranging term that can refer to the function of a specific organ or organ system, mobility, strength, or the capability to perform daily activities. Disability is defined by the WHO (2009) as a multifaceted singularity, reflecting a relation between a person's health conditions, the social and the environmental context in which he or she lives. Even though disability serves as an umbrella term for impairments on limitations in activities, some impairments may lead to disability. Functional limitations through the procedure of ageing is a consequence of impairments triggered by a number of pathological situations and chronic diseases. An individual with impaired function might have problems in carrying out activities of everyday life. Such complications can distress the family life, social relationships, psychological well-being, and level of independence. ADL measures are extensively used to evaluate older population for disability in carrying out daily functions (functional disability), including basic ADL such as washing and buying, preparing and eating food (Ferdous, Cederholm, Razzaque, Wahlin and Kabir 2009: 518-520 and Parlevliet, Buurman, Pannekeet, Boeschoten, Brinke, Hamaker, Munster; Rooij 2012 and Mithal, Bonjour, Boonen, Burckhardt, Degens, Hajj Fuleihan, Josse, Lips, Torres, Rizzoli, Yoshimura, Wahl, Cooper, Dawson-Hughes 2013).

According to Rabaglitti, Ciairano, Candela, Magistro and Liubicich (2012) elderly people should be encouraged to engage in physical activity as it can improve the biological and physiological state of an elderly person. Regular exercise can prevent and decrease the risk of chronic and degenerative diseases such as geriatric syndromes, depression, gastrointestinal diseases, anorexia morbidity and mortality. Energy and nutrient intake also improve.

2.2.1.2 Biological factors

2.2.1.2.1 Gastrointestinal (GI) decline in elderly people

The physiological changes of the GI tract are prompted by the ageing process as well as other age-related events for example alteration in diet, lifestyle and decrease of functionality of the immune system (IS). These variations in the configuration and construction of the intestinal microbiota could be linked to distinct conditions of the elderly population such as frailty, immunosenescence, metabolic syndrome, diabetes and sarcopenia (Biagi, Candela, Fairweather-Tait, Franceschi and Brigidi 2012). Epidemiological studies have established that both gastric atrophy and H. pylori infection escalate with ageing (Pilotto *et al.* 2004 and Fagundes, Gillie, Derry, Bennett and Kiecolt-Glaser 2012). In persons over the age of 75 years the assortment of gastric atrophy and H. pylori has also been linked with lesser expression of gut appetite in proteins, in leptin and in ghrelin which increases the prospect that H. pylori may be contributing towards undernutrition in the older population. Gastric atrophy can also cause constipation and anal sphincter because of the reduced production of the mucoprotein intrinsic factors and malabsorption of vitamin B_{12} (Di-Mauro, Neu, Riezz, Raimondi, Martinelli, Francavilla and Indrio 2013).

Ahmed and Haboubi (2010) agrees with the above statement by elaborating that the age-related alterations in the gastrointestinal tract can result in malnourishment. The struggle is that with age it can be problematic to eliminate pathological factors such as diabetes, pancreatitis, liver disease and malignancy because these factors will have possible adverse effects on the intestine. Selective neurodegeneration of the ageing enteric nervous system can lead to gastrointestinal symptoms such as dysphagia, gastrointestinal reflux and constipation. Decreased gastric acid secretions, for example, increase with ageing. Hypochlorhydia take place due to chronic gastritis. The overall decrease in acid excretions predisposes the gut to small bowel bacterial overgrowth. Bacterial overgrowth has been established to be related with decreased body weight and decreased intake of micronutrients. The liver deteriorates in size and blood flow also deteriorates with age; however, the microscopic changes are subtle. Kilojoule decrease in rodents can avert neuronal loss, proposing that diet may influence the ageing gut. Esophageal motility may decrease the decrease of neurons in the mesenteric plexus in the elderly population. Gastric motility is decreased with

ageing but the small intestine is unaffected. With age colonic motility can be influenced by signal transduction pathways and cellular mechanisms that control smooth muscle contraction which could lead to constipation.

2.2.1.2.2 Biological changes of the digestive system in the elderly

In the ageing population's digestive functions alternates in simple procedures such as motility, secretion, intraluminal digestion and absorption. The older individuals often have oropharyngeal muscle dysmotility and changed swallowing of food. Decrease in esophageal peristalsis and lower esophageal sphincter (LES) pressures are common in old age and can cause gastroesophageal reflux. The modification in the digestive system signifies the underlying mechanisms of symptomatic gastrointestinal dysfunctions in the older population, such as dysphagia, gastroesophageal reflux disease, primary dyspepsia, irritable bowel syndrome, major constipation, maldigestion, and decreased absorption of nutrients. The gastrointestinal diseases that are common in the older population are atrophic gastritis, gastric ulcer, colon diverticulosis, malignant tumors, gallstones, chronic hepatitis, liver cirrhosis, Hepato Cellular Carcinoma (HCC) and chronic pancreatitis (Grassi, Petraccia, Mennuni, Fontana, Scarno, Sabetta and Fraioli 2011).

2.2.1.2.3 Gastric emptying

Gastric motility, emptying and small bowel motility problems are common in elderly population. The propulsive motility of the colon is reduced, and this change is related to neurological and endocrine-paracrine modifications in the colonic wall. Reduced gastric secretions (acid, pepsin) and deficiency of the mucous-bicarbonate barrier are regularly defined in the older members of the population and may lead to gastric ulcers. Exocrine pancreatic secretion is often reduced, as is the bile salt content of bile (Pilotto, Rotondo, Mario and Parma 2007).

2.2.1.2.4 Metabolic System

According to Roy *et al* (2007: 2), after the age of 50 years, numerous metabolic and physiological alterations occur in an individual. The metabolic rate decreases and in some cases it can drop to

30 percent over a life period. The body alignment alters with age because the lean tissues mass decreases and the amount of fat increases. The decreased metabolic rate in elderly people also causes the body to use and absorb protein less efficiently (Jan 2006).

2.2.1.3 Pathological factors

Pathological factors are related to old-age and contribute to malnutrition.

Table 2.1: Types of pathological factors (Ahmed and Haboubi 2010 and Hickson 2006).

Types of the pathological factors	Types of diseases
Medical factors	▪ Cardiac (chronic heart failure) ▪ Respiratory disease (chronic obstructive pulmonary Disease) • Gastrointestinal (malabsorption syndromes, dysphagia, Helicobacter pylori, atrophic gastritis) • Endocrine disorders (diabetes thyrotoxicosis) • Neurological (stroke, Parkinson's disease, motor neurone disease) • Infection (pneumonia, urinary tract infection) • Malignancy • Physical disability (arthritis) • Alcoholism • Poor dentition • Drugs
Psychological factors	• Delirium • Dementia/Alzheimer's disease • Depression • Anxiety • Alcoholism • Bereavement
Sociological factors	• Poverty • Isolation • Inability to shop, prepare and cook meals.

2.2.1.3.1 Disease affecting the elderly

Communicable diseases and non-communicable diseases such as cardiovascular disease, stroke, diabetes mellitus and cancer are amongst the primary cause of death and disability around the world. The cause of these illnesses is associated with lifestyles habits such as smoking, inadequate food intake and absence of physical activity. The other contributing factors are non-modifiable risk factors which include age and genetics (Alexander, Landsman, Teutch and Haffner 2003 and

Whitney and Rolfes 2016). Nutrition evolution in diets that are rich in saturated fats, and poor in carbohydrates and dietary fibre, fruit and vegetables is also a contributing factor to diseases that affect the elderly (Magnusson 2008 and Lucca, Garri, Recchia, Logroscino, Tiraboschi, Franceschi, Bertinotti, Biotti, Gargantini, Maragna, Nobili, Pasina, Franchi, Riva and Tettamanti 2011).

2.2.1.3.2 Obesity

According to Nowson (2009) the epidemic of obesity and overweight has spread in the elderly population groups over the years. Elderly people tend to suffer from the combination sarcopenia obesity which results from excessive weight and reduced muscle mass. The consequences of obesity and sarcopenia are physical disability, morbidity and mortality. Obese and overweight results from fail to meet the nutritional requirement because of prolonged higher energy/low nutrient density foods in elderly population (Pearson and Biddle 2011).

Ahmed and Haboubi (2010) explains that obesity is also associated with diseases such as diabetes, hypertension and cardiovascular disease. In some cases the older population with high BMI suffer from symptomatic osteoarthritis, amplified degree of cataracts, mechanical urinary and bladder problems, and sleep apnea and other respiratory problems. Even though premeditated weight loss by overweight older population maybe harmless and favorable, attention should be applied in endorsing weight loss to overweight older population on the basis of body weight alone. Weight loss diets should be combined with an exercise program to reserve muscle mass, as dieting results in loss of muscle as well as fat, and older population already have decreased skeletal muscle mass. Weight loss drugs have not been extensively studied in older populations, and there is the possibility of drug side effects and interactions. Weight loss surgery seems to be harmless and actual, albeit slightly less so than in younger adults, but little is known about the outcomes of such surgery in those aged 65 years and above. Body-Mass-Index (BMI) is the WHO (1995) indicator used to assess underweight, overweight and obesity in adults (refer table 2.2).

Table 2.2: BMI classifications was adapted from WHO, 1995, WHO, 2000 and WHO 2004 WHO (2016).

Classification	BMI (Kg/m)	
	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 rang	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 I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese II	35.00 - 39.99	35.00 – 37.49
		37.50 -39.99
Obese III	≥40.00	≥40.00

2.2.1.3.3 Cardiovascular disease

Tourlouki, Matala and Panagiotakos (2009: 319) explain that cardiovascular disease (CVD) is projected to be the main source of mortality and loss of disability in old age. The WHO predicts that 30 percent of universal deaths are a result of CVD. In the European Union (EU), CVD affects approximately half of all the 42 percent deaths and cost the EU economy 169 billion a year. CVD has progressively affected low income and middle income countries like India and China. The elderly population, particularly those from the age of 85 years and above are most likely to suffer from chronic diseases. Not only does biological capacity deteriorate with ordinary ageing, but a variety of experiences and behaviors during the course of life dictate CVD risk. For instance, absence of physical activity in earlier years might negatively affect health status, while loneliness and depression in advanced lifespan might decrease appetite and escalate the chances of nutrient deficiency. In addition, current health situations and malnutrition could aggravate these diseases.

2.3 NUTRITION SECURITY

Ruel 2013; Misselhorn, Aggarwal, Ericksen, Gregory, Horn-Phathanothai, Ingram and Wiebe (2012: 8-9) indicated the importance of food consumption in human beings by outlining the fact that it aids in achieving and retaining the wellbeing of the development in human beings. Alkire and Santos (2014) explained that it is not enough just to consume food but every individual should have continuous access to a variety of nutritious foods for example food which contain proteins, carbohydrates, fats, vitamins and minerals. Apart from nutrients, potable drinking water should be accessible as it is associated with a sanitary environment, acceptable health services that provides knowledge, resources, skills and healthy active living for all the household members. In relation to the above report every individual should be provided with facilities for the prevention, treatment, and care of diseases affecting nutritional status and a safety-net system during crisis situations namely, natural disasters or political unrest. If all these can be achieved in both developing and developed nations, then nutritional security would be achieved. Gross, Schoeneberger, Pfeifer, Preuss (2000: 6) explained that the nutritional status is a result of food intake and health status of an individual. Figure 2.1 illustrates the factors contributing to food and nutrition security. It also emphasizes the coexistence between food security and nutrition security.

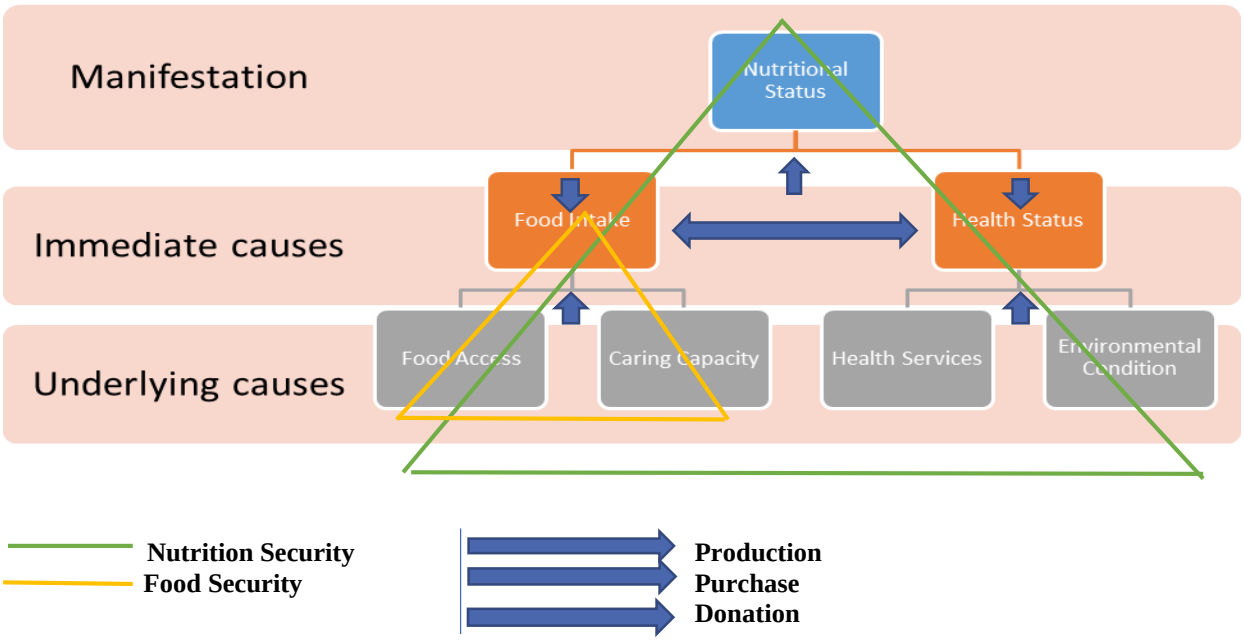

Figure 2.2: The conceptual framework of food and nutrition security at household level

2.3.1 Food and Nutritional Security (FNS)

Ruel (2013) explains that nutritional security coincides with food security. Food security occurs when all people, at all times, have physical, social, and economic admission to adequate, harmless, and nutritious food to meet the dietary needs and food partialities for an active and healthy life. The four pillars of food security are availability, accessibility, utilization, and stability. Nutrition security entails food security and the two terms are sometimes combined together to form the term "Food and Nutrition Security (FNS)*"* which emphasizes both food and health requirements (Gross, Schoeneberger, Pfeifer and Preuss 2000). UNICEF agrees with the above statements by discussing the coexistence between nutrition security and food security of every individual in the household. Nutritional security is adequate nutritional intake of energy, vitamins, proteins and minerals in a household at all times. The nutritional security framework concentrated more on the biological needs of the human body, the physiological requirements and the causes of the bioavailability (the level in which the nutrients are absorbed and become available so to assist in physiological activities). Food security concentrates more on the economic approach, meaning how food is produced. This comes to show that food security is not enough just on its own to maintain the healthy nutritional status. Poor households, poor communities and poor nations are one of the major targets when it comes to food security and nutritional security (Shetty 2009: 431-433).

(Misselhorn, Aggarwal, Ericksen, Gregory, Horn-Phathanothai, Ingram and Wiebe 2012) points out that the world has not achieved both nutrition security and food security because billions of people globally receives inadequate nutrition and also one billion of people in this century still do not have enough food to eat regardless of the world trying to maximise food production over the past half century in order to keep up with the world's demand. It is predicted that in the next 50 years the world will still be under an enormous pressure for food demands due to global environmental changes (GEC) which are associated with climate, biodiversity, water availability, land usage, tropospheric ozone, other pollutants and sea level rise. These changes are brought about partly by the food system itself.

Godfray, Beddington, Crute, Haddad, Lawrence, Muir, Pretty, Robinson, Thomas, and Toulmin (2010: 812-813) stated that the world is facing a dilemma because on one hand there has been

growth in the food production which has permitted dramatic reduction in the number of the world's people who are hungry, irrespective of the replication of the total population in the past century. On the other hand more than one in seven people today still do not have admission to adequate protein and energy from the diet that is being consumed and even more people suffer from some form of micronutrient malnourishment. With the estimated global population increasing to nine billion by the middle of the century, there will be an upsurge in wealth and high buying power. There are expectations on ingesting and larger demand for processed food, meat, dairy, fish and all these increase the pressure on the food supply system. At the same time, food manufacturers are experiencing greater competition for land, water, and energy, and the need to curb the many negative effects of food production on the environment. The challenge with this increase in demand for food places additional pressure on food production methods that are ecologically and socially maintainable. Also, suppliers have to ensure that the world's poorest people are no longer hungry. This challenge involves changes in the way food is manufactured, stored, processed, dispersed, and accessed as radical as those that occurred during the 18th and 19th century in the Industrial and Agricultural Revolutions and the 20th century Green Revolution (Biesalski 2013).

2.4 FOOD SECURITY

Strickhouser, Wright and Donley (2014) points out that public policy and public health have replaced the term "hunger" with "food insecurity" over the past years because hunger is explained as a physiological condition which describes the physical pain and discomfort a person encounters. Food insecurity, on the other hand, is a social, cultural or economic state which makes it simpler to conceptualize and measure; also food insecurity requires a much wider and often more systemic problem than "hunger" describes. Unlike hunger, food insecurity is not a temporary state or sensation. When people are in a state of hunger this condition implies a much greater degree of need, or a much more serious condition, than saying people have problems with accessing food. Wolfe, Frongillo and Valois (2003) explains that food insecurity and hunger coexist and the two are not only objectionable distinctively but food insecurity and hunger contributes to multiple nutritional and non-nutritional concerns which can intensify poor health and nutritional status especially in vulnerable groups such as elderly people (McGuire and Beerman 2013).

The term food security surfaced in the 1970s and it was defined as the availability of and access to food. With continuous research over the years on food security more expansion on the definition was created in order to emphasise the effect on vulnerable people who are food insecure. Food security exists when all people, at all times, have physical, social and economic access to adequate, harmless, and nutritious food to meet the dietary needs and food preferences for an active and healthy life. But people who do not satisfy the circumstances in this description are thought to be food insecure. Moreover, food insecurity takes place when food systems are stressed to a point where food is not available, accessible and/or of sufficient quality (Maxwell and Smith 1992; World Food Summit 1996; Beaumier and Ford 2010; Ivers and Cullen 2011 and McGuire and Beerman 2013).

Carletto, Zezza, and Banerjee (2013) explains that food security is a multidimensional concept; meaning the assessment of several measuring indicators need to be used in order to capture the various dimensions of food security. The four key points of food security are the availability and accessibility of food at an individual level as well as the quality of food and cultural preferences. The hierarchy of food security is evident across the dimensions: availability is necessary for food security, but is not sufficient to ensure access. Whereas, food access is similarly necessary but insufficient to ensure proper utilization of food and the concept of stability cuts across the first dimensions and uncertainty in both availability and access (Matla 2008).

Lambrou and Nelson (2010) explains that the leading causes of the rise in universal and national food insecurity consist of trade boundaries imposed by the main food exporters, biofuels policies, and increased food commodity assumption combined with poor national and local governance to cope with such tremors. In addition, longer-term changing aspects such as climate alteration and increasing food demand over the constant adjustment in dietary patterns and increasing populations have stressed global food markets. There are further expectations that are indicating advanced rising food prices and cumulative price volatility because of the 2008 universal food price crisis which ignited riots in more than two dozen countries and this regenerated political and scientific interest in food security. The usage of land for industrial application causes the soil to be degraded because of pollutants and once the soil is polluted agricultural practices cannot be carried out and that creates food insecurity. When the land is converted to urban use rather than

agricultural that means majority of the population in the developing countries depend on commercial trades which is the main source of food and this makes the population vulnerable to food price increase (Stage, Stage and McGranahan 2009: 1-3).

Seligman, Laraia and Kushel (2010) mention that households that are food insecure are incapable of affording a balanced meal, worry about inadequate food supply, run out of food, cut the size of the meals, and skip meals. At the most severe levels of food insecurity people go hungry and do not eat for the whole day because there is not enough money to buy food. Household food insecurity is caused by income insecurity due to the lack of employment (Altman, Hart and Jacobs 2009: 7-11).

Although poverty and low income are associated with food insecurity, adequate household income is not sufficient to ensure food security. When the household suffers from household food insecurity it usually adopt mechanisms to cope with the shortage of food and this can either be changing the diet by relying more on cheaper food rather than preferred foods, or households turn to use short-term strategies rather than long-term strategies in order to increase the food supplies and the tactics followed are borrowing, buying on credit, begging or eating wild foods or seed stock but this is done in extreme cases. The household can use the reduction form, process by which the household reduces the number of people it needs to feed by sending some away; for example, the mother might send a child eat at the neighbour's house when the neighbours' are eating or even make use of medium-term migration as a coping strategy. The household tries and manages with the little that is there by rationing the food available in the house; for example, by minimizing portion sizes, reducing the number of meals per day, going the whole day without food or feeding children before adults. This coping mechanism shows different levels of severity of food insecurity but the severity will only be determined by the frequency which will indicate the magnitude of the food insecurity per household (Maxwell, Watkins, Wheeler and Collins 2003: 1-3 and Ivers and Cullen 2011 and Bremmer 2012).

Barrett (2010: 825) provides information relating to the above statistics by elaborating that food insecurity is developing at an alarming rate globally. The FAO (2010) states that regardless of significant attempts by national governments and the international community to decrease hunger

and malnutrition based on the Millennium Development Goals (MDGs) and other initiatives, the percentage of undernourished people in developing countries has been increasing constantly since the mid-1990s. There was visible progress regarding hunger reduction but this all changed in 2008 because of the global food price crisis and subsequent food price spikes in local markets, as a result millions of people are at risk of food insecurity (Brinkman and Hendrix 2010).

According to the FAO (2010) 925 million people are undernourished because of food insecurity. Undernourishment occurs when kilojoule intake is below the minimum dietary energy requirements. Even though food insecurity and undernourishment are different problems the two topics overlap geographically and are, indeed, connected. Seligman *et al* (2009) explains that households that are food insecure reduces the budget for food, reduces food intake and reduces the type of foods. The negative impact of the reduction in dietary variety is the increased consumption of the energy-dense food. The energy-dense foods, consist of refined grains, additional sugars, and added saturated/ trans fats, which tend to be of poor nutritional quality and less expensive kilojoule-for-kilojoule than alternatives. People staying in households that are food insecure eat less fruits, vegetables, dairy products and lower levels of micronutrient, including the B complex vitamins, magnesium, iron, zinc, and calcium. These dietary patterns are linked to the development of chronic diseases, including hypertension, hyperlipidemia and diabetes (Dewbre 2010).

Food insecurity is a clinically related problem which contributes to the development and poor management of diet-related chronic diseases and poor health care access. These detrimental consequences are potentially more severe for elderly people because of the distinctive characteristics related to ageing, diseases, and health status. With reference to the 2004 report by the FAO on the circumstances of food insecurity more than 81 million people in developing countries were undernourished. In 2012 the number had increased to 240 million people, meaning one person in every four people in Sub-Saharan Africa had inadequate food intake which negatively affected a healthy active life. The prevalence of food insecurity within the households of elderly people have been associated with poor food availability, decreased nutrient consumption, poor self-reported health status, overweight and obesity, physical and psychological health problems, advanced cardiovascular and poor diabetes self-management. Food insecurity in elderly people may worsen diseases, decline resistance to infection, and prolong hospitalization

and as a result there would be an increase in individual care-giving and healthcare costs and national healthcare expenditures (Labadarios, Mchiza, Steyn, Gericke, Maunder, Davids and Parker 2011: 891; Jason Bremner 2012 and Bhargava, Lee, Jain, Johnson and Brown 2012).

In recent years there has been the assumption about food insecurity causing chronic disease. Food insecurity in relation to households with low income are linked to chronic diseases because of the reduction in food quality and food quantity. Type 2 diabetes and poor diabetes control are associated with food insecurity because there may be increased chances of patients having difficulties following a diabetes-appropriate diet because of shift in the dietary intake towards the high prevalence of low-cost, extremely palatable foods that are energy dense, which generally include a high proportion of added fats, sugar, and other refined carbohydrates to maintain the energy need. These foods generally make glycemic control more difficult to achieve. As a result patients receiving insulin to treat diabetes have been reported to have a hypoglycemic reaction, a serious event indicating poor diabetes management with short-term implications of blurred vision, agitation, and anxiety which can cause coma or seizure. The consumption of these foods follows a cyclical pattern, a period of abundance at the beginning of the month followed by food scarcity at the end of the month; this irregular availability of food could lead to weight gain over a short period of time. The cyclical food shortages are also associated with weight gain and obesity because of the high-fat foods or physiological response to the diet. Depression and stress, and metabolic syndrome, are also associated with food insecurity (Laraia 2013; Seligman, Jacobs, López, Tschann and Fernandez 2012; Kim and Frongillo 2007).

2.5 MALNUTRITION

Globally, developing countries are going through extreme socio-economic changes and unfortunately the changes affect the health of the people negatively because socio-economic changes bring about diseases of poverty. The poverty diseases are usually lead by undernutrition in low income households. The problem is even worse because now in the low and middle income countries there is obesity as well as undernutrition which creates a double burden of malnutrition because of poor nutrient intake (Aitsi-Selmi, Benova, Sholkamy and Marmot 2009). According to McGuire and Beerman (2013) malnutrition which is one of the devastating results of food

insecurity and in the case of shortage of food malnutrition takes a form of undernutrition which as both short and long term on the effects of an individual, families, society and the world in general (Nnyepi 2009).

2.5.1 Malnutrition in elderly populations

Malnutrition is defined as a deficiency caused by an excess or imbalance of micronutrients, macronutrients, protein and energy consumption; this can cause either undernutrition or over nutrition (McGuire and Beerman 2013). Holmes (2006) elaborates on the accumulating concerns of malnutrition on the elderly population by stating that 16 percent of the elderly population aged 65 years and above are malnourished and 2 percent out of the 16 percent are 85 years old. These figures are projected to increase intensely in the next 30 years and majority of the adjustment will be from malnutrition. Malnutrition is also aligned with the reduced muscle function, reduced bone mass, immune dysfunction, anemia, weakened cognitive function, poor wound recovery and deferred from surgery, and mortality.

Double burden malnutrition causes health problems such as chronic diseases which can be hypertension, diabetes, blood lipids, cancer or osteoporosis. In summary, countries in Africa such as SA and the United Republic of Tanzania have been dealing with recurring challenges when it comes to infectious diseases and there is an increasing accumulation of these diseases such as parasitic diseases, for example, tuberculosis (TB), malaria and HIV and AIDS. In SA there has been an increasing percentage of coronary heart disease and stroke and this occurs mostly in over weight individuals (FAO 2006: 2). Malnutrition is affected by three aspects of life which are: direct losses in production from poor physical grade meaning more than 10 percent of individuals' life time earnings, indirect losses from poor cognitive participation and deficits in schooling, and also losses due to increased health care costs (The World Bank 2006: 1-9).

Additionally, undernutrition branches from malnutrition and it is a chronic condition which is caused by prolonged insufficient intake of food that is needed by the body to meet the dietary energy requirements. The condition creates insignificant absorption and biological use of nutrients which have been ingested and these results in the loss of weight which promotes underweight

Furthermore, over-nutrition also stems from malnutrition, which is a chronic condition where there is substantial consumption of food beyond the dietary energy needs. The consequences of over-nutrition are overweight which promotes obesity (McGuire and Beerman 2013). The term obesity stands for a great accumulation of fat in the adipose tissue due to excessive consumption of energy foods which are not utilized by the body. There are also other factors that contribute to body weight regulations such as genetic factors and leptin which is secreted by the adipocytes (Popkin 2001).

Protein Energy Malnutrition (PEM) is caused by insufficient intake of energy foods and protein. The deficiency of these macronutrients causes disease such as kwashiorkor and marasmus (Holmes 2006). Moreover, insufficient dietary protein can create problems in old age because when an individual ages the body composition changes and this change results in an increase in fat mass (FM), decrease lean mass (LM) and appendicular lean mass (ALM). In 2008 a study was conducted on men and women aged 70 to 79 years on protein consumption over a period of three years in Pittsburgh, PA, and Memphis, TN, metropolitan areas. It was revealed that the men and women do not consume adequate protein intake; as a results the mean daily protein intake was 70.0g in men and 60.9g in women. The mean ±SD change in total and LM was a decrease of 0.68 - 1.94 and 0.48 - 1.08 kg, correspondingly (Houston, Nicklas, Ding, Harris, Tylavsky, Newman, Lee, Sahyoun, Visser, Marjolein and Kritcheveky 2008: 150).

Developing countries and industrialised countries suffer from nutritional disorders such as micronutrient deficiencies. Micronutrients are needed in small quantities in the human body for metabolic processes to take place and for some specific role in the body. When micronutrients are not consumed in the diet, nutritional health problems occur (Ruel 2013).

Anemia deficiency is an iron deficiency which causes the body to be vulnerable to infectious diseases such as malaria and tuberculosis. Zinc is one of the most important micronutrients in the body because zinc functions with many enzymes in the body, for example, in protein synthesis and cell division. The nutritional disorder of zinc deficiency is poor operation of the immune system. Vitamin A plays an important role in the development of the eye sight especially retinal, maturity in bone and improvement in the immune response. Vitamin A deficiency can be the prime cause

of many severe infectious diseases in the human body due to insufficient micronutrients intake (Tulchinsky 2010).

2.5.2 Methods of addressing malnutrition

According to Shetty (2009: 431-433) food security should be addressed globally because it can help improve the nutritional priorities that contributed to the health of the population. The major problem in the developing world is poor quality of food and minimum diversity in the diet and this brings complications such as ill health, lives lost, decreased economic productivity and poor quality of life. Having inadequate dietary intake usually results in micronutrient deficiencies which can be rectified by sustainable food-based infrastructure such as diversification and bio-fortification which will increase the consumption of micronutrients (Houston *et al* 2008: 150 and McGuire and Beerman 2013).

The World Bank (2006) explains that the international community and governments in the developing countries are responsible for the eradication of malnutrition in every developing country. Malnutrition has long existed but the two bodies persistently fail to eradicate this deficiency. The international community and the developing countries' governments know the core factors of malnutrition which are economic expansion and poverty but the two bodies cannot use this knowledge to the advantage. Reluctance in manipulating these factors has affected the progress in MDGs particularly in reducing poverty and hunger by half in 2015 and this has made the world's progress inadequate towards the MDGs. Unfortunately the more malnutrition is ignored the more damage it causes because malnutrition does not only affect hunger and poverty but other concerns are also involved such as maternal and child health, HIV and AIDS, education and gender equity. If the developed countries and developing countries can learn from the past mistakes both the developing and the developed countries would know that it is wise to utilise nutritional fundamental in developing different economic and social improvements that rely on nutrition so to avoid the same disaster of HIV and AIDS which the global community failed to address for more than a decade. Furthermore, if gross domestic product (GDP) was injected into malnutrition, it would run as high as 2 to 3 percent in improving nutrition because it is as costly as an economic issue such as social protection or human rights (FAO 2006 and Ruel 2013).

2.5.2.1 Food based Dietary Guidelines (FBDG)

The Food-Based Dietary Guidelines (FBDGs) are used by the Government as a nutritional educational tool with the intention of improving the individual's, communities' and the country's healthy eating habits and lifestyles. To improve these conditions attention should be paid to the 1992 FAO/WHO international conference which was held in Rome regarding the World Declaration and Plan of Action for Nutrition. One of the goals decided on by the conference was to globally reduce or extensive decrease malnutrition, micronutrient malnutrition and diet-related communicable and non-communicable diseases. The problems that were nutritionally related were going to be solved by encouraging correct nutritional intake and healthy lifestyle. With the less favorable results from the nutrition-based guidelines to significant pressure of dietary patterns for diverse population (Tyrovolas and Polychronopoulos 2011; Seedat and Rayner 2012 and Vorster, Badham and Venter 2013).

Nutrients are now associated with locally availability and production of foods. The Nutrition Society of South African (NSSA) has worked to improve the FBDGs to suits the South African population at large. The recommendations that were made by the NSSA were as follows: each guideline should be simple, understandable and easily interpreted by other cultures with minimum education. The guidelines should be encouraging and not discouraging. The requirements should be affordable and widely available so it can be sustainable. The food selection should be paired with dietary practices. The guidelines should address both the under-and-over-nutrition related problems. The guidelines are as follows: individuals are advised to: enjoy a variety of foods, be active, make starchy foods part of most meals, eat plenty of vegetables and fruit 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 that are high in sugar sparingly, and use salt and food high in salt sparingly (Vorster, Love and Browne 2001: 1-6 and Vorster, Badham and Venter 2013).

2.5.2.2 Food fortification

Food fortification is a well trusted method of incorporating complete micronutrients such as vitamin A, iron or iodine in foods in order to reduce micronutrient deficiencies. In countries such as South Africa food fortification has been in practice since 1996 because the Department of Health has utilised its power to implement the national fortification program with different bodies such as: government, academia, and public organizations. The staple-food fortification programme was introduced in South Africa in 2003. In 2003 the legislation was enforced on all large and small millers and manufactures to fortify the bread wheat flour and maize meal. If the manufactures were found guilty of not following the legislation, manufacturers had to pay a fine of R125 000 and this penalty was made official in the Foodstuffs, Cosmetics and Disinfectants Act (Act No. 54) of 1972. Bread flour and maize meal; (super, special, sifted and unsifted) was chosen because South Africans consume these food products more. The micronutrients that were to be incorporated were as follows; Vitamins: Pyridoxine (Vitamin B6) Vitamin A, Riboflavin (Vitamin B2), Thiamin (Vitamin B1), Niacin, Folic Acid, and Minerals: Iron, Zinc (South African Department of Health 2009: 1-9 and Nesamvumi, Vorster, Margetts and Kruger 2005).

Salt was fortified with iodine due to iodine deficiency occurring in South Africa. Iodine deficiency occurs when there is shortage of iodine in the body. The shortage can hampers the development of the brain in children and it develops to goiter in adults. Prolonged iodine deficiency can result in mental retardation, cretinism, abortion and hypothyroidism (Department of Health South Africa 2009: 1). The Department of Health has achieved impressive results both nationally and provincial on the fortification of the salt with iodine because at the national level ninety seven percent of the salt contains >2 ppm amount of iodine with eight out of ten having salt with a higher of >15 pmm iodine content. The food fortification program has to keep improving the fortification of the iron, folic acid and zinc because the implementation is not yet fully accomplished (Labadarios *et al* 2011).

2.5.2.3 Food supplementation

Supplementation indicates the episodic management of pharmacological arrangements of nutrients in capsules or tablets or the form of an injection. It should be administered significant or instantaneously to benefit the people in danger of malnutrition. The nutritional supplementation should be constrained to people who cannot congregate the required nutrient from food. The vulnerable groups that may need supplementation in some period of the lives are as follows: women of childbearing age, babies, ageing people, low socio-economic groups, emigrant people, immigrants, and inhabitants that are undergoing other emergency situations (FAO/WHO 2006: 14 Leandro-Merhi, Fogaça, Gomes and Oliveira 2009).

2.5.2.4 Food diversification-genetically modified food

Genetic modification is different from the traditional way of growing crops because technological means are used and the process involves scientists taking genes from one organism and combining them with others; this changes the characteristics of the organism or the way the organism grows and develops (Friends of the earth 2003: 2 and Mozumdar, Islam and Saha 2012). The genetically modified crops (GM) were available from 1996 and 2010, 29 counties such as USA planted a large scale of GM crops using 148 million hectares of land which amounted to percent of land used for planting crops. The twenty nine countries included both developed and developing countries that cultivate GM crops. The only problem with GM crops is the limited variety. Some of the crops that have taken well to genetic modification are soybeans and maize which covers about 50 percent of the world' GM crops and the reason the soybeans have been so popular for genetic modification is that this crop can be planted as a second crop after wheat. Maize covers about 31 percent of the global GM area of plantation (Lusser, Raney, Tillie, Dillen and Cerezo 2012: 6-8). The organization, Mozumdar, Islam and Saha (2012) indicates the possible negative impact of genetic engineering by suggesting that GM products are imprecise and unpredictable because genes are inserted in organisms which have never been eaten as food, and new proteins are introduced into the human and animal food chains. There is a concern that these could cause allergic reactions or other health effects.

2.5.2.5 Nutrition education

The associations among diets, health, and disease inhibition have become clearer. Nutrition education and the advancement of healthy eating behaviour and healthy lifestyles is increasing. Nutrition education is any arrangement of educational policies planned to assist voluntary acceptance of food choices, other foods and nutrition associated behaviour to favourable health and well-being. Nutrition education can be delivered through numerous events that can be carried out as a collective or as individuals. This description distinguishes that several factors have to be manipulate behaviour. A nutrition education tool that uses a methodical style and policies consist of different activities to assist the targeted group and help in making behaviour modification enhances the outcome (Gibson 2005 and Margetts and Nelson 2006).

More in depth nutrition education is an important educational intervention that focuses on poor diets and lack of physical activities which contributes to four of the leading causes of deaths which are heart disease, cancer, stroke, and diabetes in the United States and in the world. The diet also contributes to life style diseases such as obesity, hypertension and osteoporosis. Nutrition education aims to improve the nutritional status of the individuals or groups by providing information that will assist the people to change eating behaviour and lifestyles. With the increase of poverty and diet related disease, nutrition education can be implemented in order to improve the lives of the people; firstly, by encouraging a well-balanced diet and increased physical activity. Secondly, by encourage pregnant women to eat well balanced diets during pregnancy so as to give birth to a healthy child. Thirdly, to teach people hygienic ways of handling food in order to limit food borne illness. Fourthly, to encourage and teach mothers that breast feeding babies benefits the child with a stronger immune system and protects against childhood diseases. Nutrition education can save lives of the people and reduce the cost of health care expenditures. Nutrition education can also improve the consumption of healthy foods in low income families by learning how to choose the healthy foods rather than spending money on health care (Homenko, Morin, Eimicke, Teresi and Weinstock 2010 and Nishida, Uauy, Kumanyika and Shetty 2004).

2.5.2.6 Government Initiatives

2.5.2.6.1 Food Stamps Program (FSP)

Due to the economic crisis the USA had to design infrastructures to cope with food prices that had a negative impact on the low income earners; the Food Stamp Program (FSP) was one of these initiatives. Food stamps were the first line of protection in the fight against hunger by increasing the buying power of low-income individuals and families. Food pricing and availability has presented a more explicit association between hunger and obesity which has trigged malnutrition in people because it has been allied with poor dietary intake in relation with overweight and obesity. The food stamp cycle has been described as a feast at the beginning of the month followed by a famine once resources run out and the action has the impact to alter metabolism and promote weight gain. The low-income people turn to eat high-energy-density foods such as sugary baked products rather than nutritious foods such as fresh fruits. That is why high-energy-density foods are more active in poorer and disadvantaged communities, thereby creating a limitation for low-income families to make healthful food choices. Food stamp recipients select purchases from a wide range of permissible foods, the current challenge was to change consumer preferences by understanding the reason towards for buying (Wiig and Smith 2008: 1726-1727).

2.6 NUTRITIONAL REQUIREMENTS OF THE ELDERLY

Ageing is complemented by a variety of physical, psychological, economic and social variations which can have an impact on the nutritional status of an individual. With increasing age there is also a decrease in appetite and food intake. Healthy older people are less hungry, get full before meals, ingest smaller meals, eat slowly, consume fewer snacks in between meals and become satisfied more easily after eating a standard meal than younger people. The average daily intake of food decrease by 30 percent between 20 and 80 years. The Dietary Reference Intake (DRI) cluster people older than 50 into two age categories, one group of 51 to 70 years and one of 71 and older (Whitney and Rolfes 2016).

A major problem concerning the ageing population is nutritional deficiencies. Nutrition is one of the factors in the development of age-related diseases with diseases such as diabetes, vascular diseases, cancer and osteoporosis which are found to correlate with diseases such as sarcopenia, frailty, cognitive decline and Alzheimer's disease. The elderly population has been described as one of the groups that are malnourished because of the in adequate intake of nutrients. Malnutrition in the elderly population is amplified by underlying illnesses that are caused by old age. The elderly population's dietary guidelines mainly focuses on the adjustment of nutrient intake such as energy and nutrient-dense foods in order to maximize the available nutrients per 1,000 KJ. The dietary guidelines also focuses on fluid intake because the elderly population struggles with dehydration due to the physiological changes such as:

- The kidney's reduced ability to concentrate urine
- There reduced thirst sensation
- The reduced renin activity and aldosterone secretion
- Relative renal resistance to vasopressin
- The change in the cognitive and functional status
- Medication side effects (Whitney and Rolfes 2016 and Turley and Thompson 2016)

The shift in the nutrition requirements in the elderly is cause by the shift in the physiological structure of the human body and these changes are as follows: the body weight peaks between the ages of 55 years and 65 years in women and between the ages of 34 years and 54 years in the men, only to decline thereafter. The loss of the weight occurs at the expense of the bodily water and the lean body mass. The decline in lean body mass basal metabolic rate, in addition to reduced physical activity, leads to reduced energy requirement and this process leads to the reduced food intake. Malnutrition can adversely affect the well-being of the elderly person, causing deterioration in the functional status and making existing medical problem worse. Despite favourable results in high-risk individuals, diets that are very low in fat can produce adverse consequences in elderly people (Turley and Thompson 2016).

Even though elderly persons require few total kilojoules, there is also an enhanced requirement of certain vitamins and minerals. It is especially important for the elderly population to eat foods rich

in nutrients such as vegetables and fruits, whole grains, lean meat, fish, poultry, low-fat milk and dairy products, nuts and seeds. Sweets and alcohol should be reduced, but not excluded, as a good healthy diet should also give as much pleasure as possible within reasonable limits. In summary the healthy eating message for elderly people is as follows (Nestlé 2008).

Healthy Eating Messages

• Eat more calcium-rich foods
• Eat protein-rich foods
• Eat more green leafy vegetables
• Eat more fibre, seeds and nuts
• Eat more fruits with antioxidants and vitamin C
• Eat more fruits and other coloured vegetables with phytonutrients (Nestlé 2008).

2.6.1 Dietary Reference Intakes (DRIs)

NICUS (2003) has reported on the DRIs established by the United States Food and Nutrition Board of the Institute of Medicine (IoM). The DRIs have been formulated on the basis of an expanded concept, which includes indicators for good nutrition, good health, the prevention of diseases and the possible adverse effects of overconsumption. DRIs provide measures and guidelines for groups and individuals regarding nutrient requirements which is defined as the low continuing intake level of nutrients. A specified indicators of adequacy will maintain a defined level of nutrition in an individual. NICUS (2003) indicated that the DRIs framework incorporates the following objectives:

- To formulate recommendations to meet a variety of uses
- The contribution by nutrients in the risk reduction of chronic diseases
- The inclusion and review of the food components
- The use and rationale for functional end points
- The assessment of estimates of upper safe levels of nutrient intake

The statistics used in support of formulating the DRIs have principally appeared from scientific, dose-response, balance, depletion-repletion, observational, and case-control studies and only publications in peer reviewed journal were used (Food and Nutrition Board 2005).

The DRIs are categorized into a set of four nutrient-based reference values, of which each type of DRI refers to the average daily nutrient intake and it is, therefore, the average mean intake over time that is of the nutritionally important reference value (Food and Nutrition Board 2005).

- Estimated Average Requirement (EAR) is the average daily dietary intake level estimated to the nutrient requirements of half of all healthy individuals in a particular life stage and gender group. The EAR is a dietary intake value and it includes an adjustment for an assumed bioavailability of the respective nutrient. The EAR is used as the basis in setting the RDA. If sufficient scientific evidence is not available to establish an EAR, no RDA is set.

- Recommended Dietary Allowance (RDA) is the average daily dietary intake level sufficient to meet the nutrient requirements of nearly all healthy individual in that gender group, at the given life-stage.

- Adequate intake (AI) is used in a case where the scientific evidence is inadequate to set an EAR. Therefore, in such cases, the AI reference is used instead of the RDA. The AI is based on experimentally resultant intake levels or approximations of observed mean nutrient intakes by a group of healthy people, who have normal circulating nutrient blood concentrations, growth, or other functional indicators of health. An AI is seen as an indication that substantially more research is required in order to have an EAR establish and to have an RDA calculated.

- Tolerable Upper Intake Level (UL) is maximum level of daily nutrient intake likely to pose no risk of adverse health effects for almost all individual in the general population (NICUS 2003).

2.6.2 Macronutrients

Macronutrients are nutrients that provide kilojoules or energy. Nutrients are substances needed for growth, metabolism, and for other body functions. Since "macro" means large, macronutrients are nutrients needed in large amounts. There are three macronutrients: Carbohydrate, Protein, and lipids. While each of these macronutrients provides kilojoules, the amount of kilojoules that each one provides varies**:**

- **Energy:** measured in kJ for men is 2300kcal and women is 1800kcal
- **Protein:** 0.8 to1.0g pro/kg body weight and about 10-15 percent of total kJ
- **Fats:** no more than 10 percent from saturated fat and the dietary cholesterol is no more than 300 mg per day
- **Carbohydrates**: minimum 50 to 100g per day at least 50 percent of total kilojoules should come from complex carbohydrate sources.
- **Fibre**: 20 to 35 g per day (Nestlé 2008 and McKinley Health Center 2014).

2.6.2.1 Energy

The total and resting energy requirements for elderly people declines increasingly because of increasing age and decreased physical activity. The reduced physical activity automatically reduces the energy expenditure resulting in reduced basal metabolic rate because of lost lean mass. Monitoring of energy distribution of the macronutrients (carbohydrates, protein, Fats and lesser degree, alcohol) of diet could be beneficial in order to improve the physiological status of elderly people. This physiological age-related reduction in appetite and energy intake has been termed the "anorexia of ageing" (Ahmed and Haboubi 2010; Whitney and Rolfes 2016 and Turley and Thompson 2016).
from approximately 16.7 kJ/g for carbohydrates or protein to 29.3 kJ/g for alcohol and 37.7 kJ/g for fats (FAO and WHO 2001).

The unit of energy is the kilojoule (kJ) or megajoule (1 MJ = 1,000 kJ) 4.18 kJ are equal to KJ Kilojoule needs depend on activity level as well as on body weight and composition. A person

who is confined to a bed needs less than a person who is mobile. The higher the lean body mass, the more a person can eat without gaining weight and the more likely person will get adequate supplies of nutrients from daily meals. The body needs about 1.5 times the basal energy expenditure per day. There is a 10 percent reduction in this kilojoule need between the ages of 50 and 75 years with an additional 10 to 15 percent reduction after 75, depending on individual activity (Nestlé 2008).

Table 2.3: The categories of physical activity level (NICUS 2003)

Physical Activity Level (PAL) 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

2.6.2.2 Carbohydrate

Carbohydrates are the macronutrients that are needed in largest amounts. According to the Dietary Reference Intakes published by the USDA, 55-75 percent of kJ should come from carbohydrate. This amount of carbohydrate is needed because

- Carbohydrates are the body's main source of fuel.
- Carbohydrates are easily used by the body for energy. All of the tissues and cells in the body can use glucose for energy.

- Carbohydrates are needed for the central nervous system, the kidneys, the brain, the muscles (including the heart) to function properly.
- Carbohydrates can be stored in the muscles and liver and later used for energy.
- Carbohydrates are important in intestinal health and waste elimination.

- Carbohydrates are mainly found in starchy foods (like grain and potatoes), fruits, milk, and yogurt. Other foods like vegetables, beans, nuts, seeds and cottage cheese contain carbohydrates, but in lesser amounts (McKinley Health Center 2014; Turley and Thompson 2016).

2.6.2.3 Protein

Protein is an essential macronutrient that must be consumed in the diet throughout life. The recommended dietary allowance (RDA) for protein is 0.8 g protein/kg body weight per day for adults regardless of age. However, it is suggested that the recommendation for protein intake for elderly people should be increased from 10 to 20 percent; i.e. be between 0.9 to 1.0 g proteins per kg body weight. In fact a 10 year longitudinal study in initially healthy elderly women showed that women who habitually consumed greater than 1.2g protein per kg body weight developed fewer health problems than those who consumed the recommended value of 0.8g. The reason for protein increase is muscle contains over 80 percent of protein-bound amino acid in the body, protein intake is often hypothesized to have the greatest impact on muscle mass and function. Adequate dietary protein is a prerequisite for muscle protein synthesis; decreased protein intake results in reduced muscle mass (muscle wasting), reduced efficiency of digestion, and an increase in the risk of infection in old age (The Academy of Nutrition and Dietics 2012; Nestlé 2008 and Nowson 2009).

Protein is required for many specific functions in the body, the overall purpose being to build and maintain the tissues of the body - both structurally (as in the case of muscle, connective tissue, blood vessels, skin and internal organs). Furthermore, this intake can improve immune status, wound healing and blood pressure. Concerns about the detrimental effects of increased protein intake on bone health, renal function, neurological function and cardiovascular function are generally unfounded. It has been recommended that the RDA intake of 1.5 g protein/kg body weight per day is a reasonable intake for older people to optimize protein intake in terms of health and function (The Academy of Nutrition and Dietetics 2012 Nestlé 2008 and Nowson 2009).

2.6.2.4 Fat

Although fats have received a bad reputation for causing weight gain, some fat is essential for survival. According to the Dietary Reference Intakes published by the USDA15-30 percent of kilojoules should come from fat. Skeletal muscle also accounts for substantial fatty acid oxidation in the body, and diminished fatty acid oxidation is associated with glucose intolerance.

We need this amount of fat for:

- Normal growth and development
- Energy (fat is the most concentrated source of energy)
- Absorbing certain vitamins (like vitamins A, D, E, K, and carotenoids)
- Providing cushioning for the organs
- Maintaining cell membranes
- Providing taste, consistency, and stability to foods (McKinley Health Center 2014).

2.6.2.5 Fibre

Fibre refers to certain types of carbohydrates that our body cannot digest. These carbohydrates pass through the intestinal tract intact and help to move waste out of the body. Diets that are low in fibre have been shown to cause problems such as constipation and hemorrhoids and to increase the risk of certain types of cancers such as colon cancer. Diets high in fibre, however, have been shown to decrease risks in heart disease, obesity, and help lower cholesterol. Foods high in fibre include fruits, vegetables, and whole grain products (Food and Nutrition Board 2005). Fibre intake in elderly people is very low due to sensory changes such as chewing problems, salivary glands shrinkage and the digestive tract degeneration but fibre is important and elderly people should be encourage to consume fibre as it improves gastric motility, glycemic control and reduced cholesterol (Sharkey, Johnson and Dean 2010).

2.6.2.6 Water

Dehydration is frequent among elderly people and the body also needs water (6-8 glasses a day). It is often the reason for urgent hospitalization, and if undiagnosed, can be fatal. The loss of fat free mass, (which contains over 70 percent water) that occurs with ageing, can induce total body fluid imbalance. The sensation of thirst diminishes with age and therefore the risk of dehydration increases as people "forget" to drink since old age is often accompanied by diminished cognitive and visual function. This double risk, lack of sensation of thirst, plus "forgetting" to drink puts major responsibility on caregivers to make sure elderly people drink small quantities regularly. Many older people are afraid of incontinence or prostate problems and voluntarily limit the water

intake. Dehydration is often linked to infection and can be very serious with mortality reaching up to 50 percent of cases involving both conditions. Water loss of as little as 2 percent body weight leads to decreased endurance and the risk of heat exhaustion. Maintaining sufficient water in the body is important because cells need adequate hydration to function correctly (Nestlé 2007 and Whitney and Rolffes 2016).

Water is renewed rapidly and constantly in the tissues, maintaining a balance between intake and losses. Water deprivation can result in dehydration in just a few days. In the elderly it may result not only from drinking less but also from eating less, as food contains significant amounts of water. This fluid deficit from eating less food must be made up for with increased intake of liquids. Sudden weight loss, muscle cramps and mental confusion and a feeling of intense tiredness and muscular weakness are typical signs of dehydration. Concentrated urine, also considered a sign, actually depends on the kidneys' ability to concentrate or dilute urine. Kidney function is reduced in elderly, which makes it more difficult for an old person to recover either from dehydration or from over-hydration. Water is also lost through skin as a result of skin becoming thinner as people age (Nestlé 2008 and Food and Health Innovation Service 2012).

2.6.3 Micronutrients

Micronutrients are nutrients that our bodies need in smaller amounts, and include vitamins and minerals. Reduced intake and unbalanced diet predispose older people to vitamin and mineral deficiencies (Food and Nutrition Board 2005). The decreased consumption of micronutrients by elderly increases the decline in the immune function which can result in increased morbidity and mortality because elderly people consume less fruits and vegetables. Also elderly people consume less amounts of milk and milk products. (Whitney and Rolfes 2016 and Turley and Thompson 2016).

2.6.3.1 Minerals

Mineral requirements in old age do not change. Zinc, selenium, chromium, copper and manganese levels are unchanged with healthy ageing. (Food and Nutrition Board 2005 and Turley and Thompson 2016).

2.6.3.2 Vitamins

Drugs can affect the absorption of vitamins, and can also interfere with hepatic metabolism, causing delayed elimination of vitamins. Smoking interferes with absorption of vitamins, particularly vitamin C. Older people do not clear vitamin A well and are subsequently prone to hypervitaminosis. Reduced intake of vitamin D can result from reduced dietary consumption, and gastrointestinal and renal disease. Vitamin D deficiency leads to osteomalacia, rickets and myopathy. It is associated with reduced bone density, impaired mobility, increased risk of falls and probably an increased risk for developing type 1 diabetes, cardiovascular disease and rheumatoid arthritis. Dietary requirements in older people are higher due to reduced skin production, decreased exposure to sunlight and thinning of the skin. Vitamin B12 deficiency occurs in 12 to 14 percent of community- dwelling in people 60 years of age and up to 25 percent of institutionalized older people. It can cause macrocytic anemia, subacute combined degeneration of the spinal cord, neuropathies, ataxia, glossitis and dementia. It also causes an increased level of homocystine, which increases risk of cardiovascular disease, and is associated with reduced bone density and increased rate of hip fracture rate. In older people atrophic gastritis and pernicious anemia are the most common causes of vitamin B12 deficiency; less common causes are a strict vegetarian diet over a period of time (10 to 30 years) or inadequate absorption after gastrectomy or ileostomy (Nestlé 2008 and Turley and Thompson 2016).

Vitamin B12 deficiency is great amongst the older population because atrophic gastritis (or a previous history of gastric surgery) reduces the production of the acid and digestive enzymes required to separate protein-bound vitamin B12 from the natural chemical form of vitamin B12 found in meat, poultry, fish and dairy foods. Between 5 percent and 20 percent of the elderly population have some degree of B12 deficiency Clinical trials studies shows that an oral dose of

500microg/d of crystalline vitamin B12 is required to reverse biochemical signs of vitamin B12 deficiency in the older population(Nestlé 2008; Yang, Wongsiriro and Blaner 2014 and Vogel, Dali-Youcef, Kaltenbach and Andres 2009).

- **Vitamin A** needs decrease, so vitamin A in the form of supplements should be avoided. Requirements should be met by varied food choices.
- **Vitamin D** needs increase, so exposure to sunlight is recommended and vitamin D-rich foods such as fish and fortified skim milk should be a part of the diet.
- **Vitamin B12** needs increase. This vitamin, extremely important for brain function, is found in lean red meat, chicken and skim milk. In fact all vitamins of the B group are important with advancing years.
- **Folate** is not required in higher doses than for younger adults. It is commonly found in green vegetables, liver and yeast.
- **Chromium** needs increase. Whole grain cereals and brewers' yeast are good sources.
- **Zinc** needs increase. Foods rich in zinc are red meat, oysters, wheat germ and whole grains.
- **Calcium** In old age, calcium is less well absorbed, due to alterations in vitamin D metabolism. Many post-menopausal women do not get their 1000mg daily intake, or three servings of calcium-rich foods per day. Many studies even recommend 1500 mg per day. It is recommended that older people who are lactose intolerant or allergic to milk, look for special foods such as black molasses (treacle) or other non-milk sources or supplements to complete daily requirements. Mineral waters such as Contrex are a good source of assailable calcium (Nestlé 2008 and Whitney and Rolfes 2016).

Table 2.4: Dietary Reference Intakes: Macronutrients for elderly people adapted from NICUS Dietary Reference Intakes (Food and Nutrition Board 2005)

Nutrients	Selected food sources	Functions	Male	RDA/AI* g/day	Female	RDA/AI * g/day
Carbohydrates Total digestible	Starch such as grain and vegetables for example pasta and potatoes	It provides the body with energy and maintains the body weight	51-70 >70	100 100	51-70 >70	100 100

	Sugar such as natural sugars found in fruits and added sugars found in soft drinks and sweets (NICUS 2003and Food and Nutrition Board 2005)	Prevents constipation (NICUS 2003 and Food and Heath Innovation Services 2012)				
Total fibre (Total fibre is the sum of Dietary Fibre and Functional Fibre)	The grain foods such as bran, wild black rice and oats. Raw vegetables and fruits are a good source of fibre (NICUS 2003and Food and Nutrition Board 2005)	Prevents constipation, helps maintain healthy digestive system and normal glucose levels, prolonged feeling of fullness and reducing energy intake (NICUS 2003 and Food and Heath Innovation Services 2012).	51-70 >70	30 30	51-70 >70	21 21
n-6 polyunsaturated fatty acids (Linoleic acid)	Nuts, seeds, and vegetable oils such as soybean, safflower and corn oil (NICUS 2003and Food and Nutrition Board 2005)	Essential for normal skin function, signalling of cells and precursor of eicosanoids (NICUS 2003and Food and Nutrition Board 2005)	51-70 >70	14 14	51-70 >70	11 11
n-3 polyunsaturated fatty acids (α-Linolenic acid)	Vegetable oils such as soybean, canola, and flax seed oil. Fish oils, fatty fish. Animal fats but in smaller amounts in meats and eggs (NICUS 2003and Food and Nutrition Board 2005)	No required role for these nutrients other than as energy sources was identified; the body can synthesize its needs for saturated fatty acids and cholesterol from other sources (NICUS 2003and Food and Nutrition Board 2005)	51-70 >70	1.6 1.6	50-70 >70	1.1 1.1
Protein (amino acids)	Complete protein sources are animal protein such as meat, fish poultry and eggs because they have the nine essential amino acids and incomplete proteins which are plant protein such as legumes, grains, nuts, seed and vegetables(a combination of either two or three of the plant protein will give a complete protein) (NICUS	Helps with the function, development, and maintenance of structural components of all cells, enzymes, membranes and hormones. (NICUS 2003and Food and Nutrition Board 2005)	51-70 >70	0.66 0.66	51-70 >70	0.66 0.66

	2003 and Food and Nutrition Board 2005)					

Table 2.5: Dietary Reference Intake: Micronutrients (Macrominerals) for elderly people adapted from NICUS Dietary Reference Intakes (Food and Nutrition Board 2005).

Nutrients	Selected food sources	Functions	Males	AI Mg/day	Females	AI Mg/day
Calcium (mg/day)	Milk, yoghourt, cheese, greens (kale, collards) and calcium-fortified orange juice dietary calcium supplementation (NICUS 2003; Food and Nutrition Board 2005 and Nowson 2009)	Calcium is used for building bones and teeth and in maintaining bone strength. Adequate calcium is necessary in the diet to allow for optimal gains in bone mass and density, increases levels of physical activity, reduces the rate of fracture and reduces bone loss (NICUS2003 and Nowson 2009)	51-70 >70	1200 1200	51-70 >70	1200 1200
Phosphorus (mg/day)	Phosphorus depends on the intake of calcium (NICUS 2003 and Food and Nutrition Board 2005)	It helps with body's developmental structure and dental enamel. It is also involved in the structure of genetic material DNA and RNA (Hathcock 2004:1).	51-70 >70	580 580	51-70 >70	580 580
Magnesium (mg/day)	Water and milk are good source of magnesium and other sources are whelks, winkles, snails, walnuts, beetroot and lentils (NICUS 2003 and Food and Nutrition Board 2005)	It has two roles, structural and metabolic. It is a stabiliser of the different compartments of the cell such as organelles (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	350 350	51-70 >70	265 265

Table 2.6: Dietary Reference Intake: Micronutrients (Trace Elements) for elderly people adapted from NICUS Dietary Reference Intakes (Food and Nutrition Board 2005)

Nutrients	Selected food sources	Functions	Males	RDA/AI	Females	RDA/AI
Iron (mg/day)	Cooked blood sausage, cooked lentils and orange juice (Bourre 2006: 382).	It stores and transport oxygen, it also transports electrons and metabolism (Bourre 2006: 382).	51-70 >70	6.0 6.0	51-70 >70	5.0 5.0
Zinc (mg/day)	Oysters are very rich in zinc; they contain ten times more than cheeses, steak and poultry livers (Bourre 2006: 382).	it helps in cognitive development and participates in the mechanisms for perception of taste and smell (Bourre 2006: 382).	51-70 >70	9.4 9.4	51-70 >70	6.8 6.8
Fluoride (mg/day)	Fluoridate drinking water and fluoridate toothpaste (Hathcock 2004: 1-4).	It helps with maintaining strong teeth and bones; it helps to protect dental enamel from dental caries (Hathcock 2004: 1-4).	51-70 >70	3.8 3.8	51-70 >70	3.1 3.1
Iodine (µg/day)	The salt used by the food-processing industry is iodinated. It can be found in mussels, oysters, sea fish and eggs (Bourre 2006: 382).	it participates in the composition of hormones secreted by the thyroid gland (Bourre 2006: 382).	51-70 >70	95 95	51-70 >70	95 95
Selenium (mg/day)	it is found in few mushrooms, finfish and animal seafood (mussels, oysters, fish) and eggs (Bourre 2006: 382).	it is association with glutathione peroxidise, a Crucial enzyme for protection against peroxidation (Bourre 2006: 382).	51-70 >70	45 45	51-70 >70	45 45
Chromium (µg/day)	Vegetable oil, egg yolk, whole grain and meat (Lukaski 2000: 589-590).	It supports normal cholesterol levels, maintains normal glucose uptake into cells and helps insulin bind to cell (Kabla 2000: 1-5).	51-70 >70	30 30	51-70 >70	20 20

Table 2.7: Dietary Reference Intake: Micronutrients (Fat Soluble Vitamins) for elderly people adapted from NICUS Dietary Reference Intakes (Food and Nutrition Board 2005)

Nutrients	Selected food source	Functions	Male	RDA/AI	Female	RDA/AI
Vitamin A (µg/day)	Carrots, spinach, sweet potatoes, fortified breakfast cereal (NICUS 2003 and Food and Nutrition Board 2005)	It helps with cell growth and cell differentiation (a process by which a cell changes its structure and develops specific functions. It plays important roles in reproduction, bone growth and tooth development (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	625 625	51-70 >70	500 500
Vitamin D (Calciferol) (µg/day)	Our skin makes vitamin D when the skin is exposed to sunlight. Foods that contain vitamin D are fatty fish and fish oils, fortified milk and margarine, liver, butter, cream and egg yolks (NICUS 2003 and Food and Nutrition Board 2005)	Helps increase absorption of calcium from the intestine and it reduces excretion of calcium from the kidney. It promotes bone mineralisation (depositing calcium in the bone) and maintains bone density together with other nutrients (e.g. phosphorous and calcium), and hormones (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	10 15	51-70 >70	10 15
Vitamin E (α-tocopherol) (mg/day)	Plant oil, wheat germ, nuts, seeds, green leafy vegetables and shrimp (NICUS 2003 and Food and Nutrition Board 2005)	It forms part of all cell membrane structures and is therefore vital to the healthy functioning of the human body. It protects tissues and cells from oxidant damage, for the formation of red blood cells and the maintenance of a healthy immune system (NICUS	51-70 >70	12 12	51-70 >70	12 12

		2003 and Food and Nutrition Board 2005)				
Vitamin K (µg/day)	Liver, green leafy vegetables, broccoli, dairy products and eggs. Vitamin k is naturally produced by a bacterium in the intestine (NICUS 2003 and Food and Nutrition Board 2005)	It has an essential role in normal blood clotting (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	120 120	51-70 >70	90 90

Table 2.8 Dietary Reference Intake: Micronutrients (Water Soluble Vitamins) for elderly people adapted from NICUS Dietary Reference Intakes (Food and Nutrition Board 2005)

Nutrients	**Selected food sources**	**Factions**	**Male**	**RDA/AI**	**Females**	**RDA/AI**
Thiamin (Vitamin B1 or Aneurin) (mg/day)	Lean pork, wheat germ, sunflower seeds and organ meat (NICUS 2003 and Food and Nutrition Board 2005)	It helps to release energy from foods, particularly carbohydrates by breaking down and using glucose, the primary nutrient produced during carbohydrate digestion (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	1.0 1.0	51-70 >70	0.9 0.9
Riboflavin (Vitamin B2) (mg/day)	Milk and milk products such as cheddar cheese, cottage cheese and organ meat (NICUS 2003 and Food and Nutrition Board 2005)	Riboflavin is an integral component of the coenzymes that participate in many energy-yielding metabolic pathways. They promote the first steps in the metabolism of glucose and of fatty acids (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	1.1 1.1	51-70 >70	0.9 0.9
Nicotinic acid (Vitamin B3 or Nicotinic Acid) (mg/NE/day)	Lean meats, fish, Brewer's yeast and eggs (NICUS 2003 and Food and Nutrition Board 2005)	It forms part of coenzymes that are essential in the reactions involved in the release of energy from carbohydrates, fats and protein (NICUS	51-70 >70	12 12	51-70 >70	11 11

		2003 and Food and Nutrition Board 2005)				
Vitamin B6 (Pyridoxine) (mg/day)	Potatoes, cauliflower, avocados, bananas and dates (NICUS 2003 and Food and Nutrition Board 2005)	The coenzymes of vitamin B6 are needed for the activity of several enzymes involved in carbohydrate, protein, and fat metabolism (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	1.4 1.4	51-70 >70	1.3 1.3
Folic acid (Folate, Folacin) (µg dietary FE/day)	Orange, strawberries, cantaloupe, leafy green vegetables, liver, chickpeas, lentils (spinach) and beans (NICUS 2003; Food and Nutrition Board 2005 and Nowson 2009)	The formation of the essential building blocks of DNA and RNA. DNA and RNA are involved in cell division, when a cell divides and forms 2 new identical copies, and in the transmission of genes (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	320 320	51-70 >70	320 320
Vitamin B12 (Cobalamin) (µg/day)	Organ meat, seafood, beef, egg, ham, milk and milk product (NICUS 2003 and Food and Nutrition Board 2005)	The formation of proteins and red blood cells, and for the functioning of the nervous system. It participates in a variety of cellular reactions to release energy from carbohydrates, fats and protein (NICUS 2003 and Food and Nutrition Board 2005)	51-70 >70	2.0 2.0	51-70 >70	2.0 2.0
Vitamin C (Ascorbic Acid) (mg/day)	Citrus fruits, cantaloupes, guava, pineapple, tomatoes and potatoes (NICUS 2003 and Food and Nutrition Board 2005)	Required for the production of collagen, an important structural component of blood vessels, tendons, ligaments, and bone. Deficiency, therefore, leads to poor healing of wounds, fractures, pinpoint bleeding,	51-70 >70	75 75	51-70 >70	60 60

		and bleeding gums (NICUS 2003 and Food and Nutrition Board 2005)				

2.7 NUTRITIONAL ASSESSMENT IN THE ELDERLY

2.7.1 EVALUATION OF DIETARY INTAKE DATA

There can be physiological factors affecting food intake such as hunger which is a biological phenomenon, appetite which is emotionally connected with previous food intake, anorexia which is considered to be represented by the absence of desired food and satiety which is a lack of desire to eat that is ensured after eating. The other factors are emotional because it is associated with a sense of belonging towards other family members, or social implications of wellbeing. Cultural factors are eating patterns which are practiced by different cultural groups; some foods are seen as a taboo so they are not consumed. Certain age groups in other culture are restricted in consuming other foods. The other items that influence the intake of food are guidance in food selection, variation in food intake, individual variability, environmental temperature, education, imitation, society economy and religion (Whitney and Rolfes 2016).

The dietary intake can determine whether an individual or the community is nourished or undernourished or overnourished but this information is only conclusive if other methods are practiced for examinations such as weight, height, chemical concentration in the blood or urine is measured to help to determine the nutritional status of an individual. Dietary intake is not conclusive on its own because food consumed on one day or two days do not represent food taken overtime. The recommended dietary intake which means the nutrition reference intake may not be enough for everyone mostly in case of people who are ill. Health professionals cannot assess an individual using one method such as dietary history to determine the nutritional status (Truswell 2007: 429).

2.7.1.1 24-Hour Food Recall Questionnaire

The 24 hour food recall was developed by Wiehl in 1942. The 24 hour food recall is a more applicable to different ethnicities but it is a very simple, quick, non-invasive dietary tool. It can be applied both in developed and developing countries. In developing countries 24 hour food recall can be administered by a person who has knowledge of the food and beverages the population consume. 24 hour food recall is commonly used and is based on an interview during which the participant recalls all food consumed in the previous 24 hours. The main disadvantages are that it represents only food intake for one day and may not represent a participant's typical intake. Data can also be affected if the participant has cognitive impairment and the ability of a trained interviewer on the portion size that are estimated (Rankin, Ellis, Hanekom, Wright and Maclntyre 2011: 69).

2.7.1.2 Food Frequency Questionnaire (FFQ)

The FFQ is ideal to use in epidemiology studies because it can give the individual's intake of specific foods and the nutrients into qualities so to determine the relative risk of diseases for different qualities. The FFQ can give more information if the food items are two hundred or more. One of the disadvantages in the FFQ is that sometimes the individual cannot recall the frequency of intakes over the past weeks or months or years (Rankin *et al* 2011: 68).

2.7.1.3 Food Record

A Food record is regarded as the most efficient dietary assessment and it is used to validate other dietary assessments because it does not rely on the memory of the participants and estimated portion sizes. There are two types of food records; the first one being weighed food record (WFRs) and the second one is estimated food record (EFRs). There is no stipulated time given on the food record but it was discovered that under-reporting increases from one day; 7.9 percent to seven days 15.5 percent in adolescence. Three days is the most recommended time frame. Participants tend to lose weight when keeping a food record because they are conscious about the food intake. The

food record can be influenced by different factors such as gender, age, and BMI (Rankin *et al* 2010: 66).

2.7.1.4 Nutritional Knowledge

Nutritional knowledge surveys are instruments used to make valid and reliable measures on nutrition knowledge, attitudes and behavour because these are critical in a nutritional study or nutritional research. Every nutritional knowledge surveys instrument is created to suit the context it works under. Nutritional knowledge surveys are used to assess nutritional knowledge and behavior and to measure the impact of policies and nutrition education program initiatives that are designed to help in healthy nutritional status of individual and populations (Macías and Glasauer 2014 and Steyn, Labadarios, Nel and Heidi-Lee 2005).

2.7.1.5 Diet History

The dietary history is very important as a nutrition assessment because it provides information on the amount and quality of food eaten and also on the eating patterns and behaviour of the individual and the family. The dietary history also gives details on the amount and number of meals, snacks and beverages being eaten with the meals and between the meals. The dietary history gives important information such as vitamin, minerals supplements taken, food allergies, intolerances, religion, culture and unusual feeding behaviour. Other questions that are included in the dietary history are psychosocial factors that can impact on food selection and intake which is associated with a family history, and socio-economic status which helps to analyse the family's nutritional situation (Maqbool, Olsen and Stallings 2008: 6).

2.7.2 SOCIO-DEMOGRAPHIC SURVEY

The socio-demographic surveys are instruments used to collect social and demographic data on the population, housing censuses, administrative records and household samples. When the survey is handled with great care and understanding it can help a researcher or a country to complete and complement its integrated programs of data collections. Social and demographic statistics are

crucial for development and monitoring socio-economic expansion programmes in order to advance the lives of the citizens. The social and demographic statistics do coverage on the composition by age and sex including geographical distributions which are among the essential data necessary to explain a population or a sub-group of a population. These fundamental characteristics supply the context within which other significant information on social phenomena, such as: education, disability, labour, health, nutrition, crime, fertility, mortality and migration, can be studied (Banda 2003: 1-4).

2.7.3 HEALTH ASSESSMENT METHODS

Health surveys are instruments used to obtain systematic knowledge and technological health information that can be used to advance the health of the individuals or groups of populations. This health information can be used as a first step to promoting good health, to preventing disease from occurring and to promoting good health care management through health programs that can be made from the information obtained from the health surveys. The most effective health survey is population health survey because it gathers information from the majority of the targeted group and it includes questions that relate to health status, health determinants, personal characteristics and health consumption. Out of the instrument the health survey can create a branching tool such as a health interview survey to obtain information even more easily and efficiently (Wolfe, Michaud, and Pincus 2014 and Bruce 2013).

2.7.3.1 Biochemical Indices

Biochemical tests are used for human nutrition experiments and epidemiological studies. Test that are suitable are, protein intake inspection (and hence roughly energy intake), 24-hour urinary nitrogen or sodium inspection, support in change of type of fat, plasma fatty acid pattern, and urinary iodine intake inspection because it varies greatly among foods (Truswell 2007: 431). For example biochemical markers are used for assessment and monitoring such as serum proteins have been used as markers of nutrition albumin, transferrin, retinol-binding proteins and thyroxine-binding prealbumin. Serum albumin is the most frequently used marker since it can predict mortality in older people and it can be synthesized by the liver. Nevertheless albumin can be affected by not only nutritional state but by other factors, including inflammation and infection.

This limits the usefulness especially in acutely unwell patients. Albumin has a long half-life and therefore is not useful for short-term changes in protein and energy intake. Transferrin is a more sensitive marker of early protein-energy malnutrition but is affected by a number of conditions including pregnancy, iron deficiency, hypoxia, chronic infection and hepatic disease. Malnutrition impairs the immune system and decreases lymphocyte proliferation. Low total serum cholesterol has been associated with increased risk of malnutrition. Assessment of vitamins and trace elements is also important since deficiencies can lead to medical complications. To date there is no single biochemical marker of malnutrition as a screening test (Charlton and Rose 2001).

2.7.3.2 Skinfold Thickness

The skinfold is an indication of the subcutaneous fat (energy) accumulated and stored fat, and total body fat. This form of nutritional assessment provides information on fat spreading throughout the body (Maqbool *et al* 2008: 10). To administer this measuring method special precision calipers are used to pinch of subcutaneous fat gently so to take up and measure the width. What is caught between the jaws of the calipers is a double layer of fat and skin and this fold is measured in millimetres. The skinfold is first picked up between the finger and the thumb and away from the muscle. There are different parts of the body that can be used to do the skinfold test, namely, triceps skinfold which is placed above the triceps muscle midway behind the back of the upper arm, biceps skinfold is placed on an upright fold midway down the front of the upper arm, over the biceps muscle. Subscapular skinfold is placed on an upright fold engaged just under and lateral to the substandard angle of the scapular, with shoulder and arm relaxed. Suprailiac skinfold in the mid-axillary line directly above the iliac crest, grasped obliquely (Truswell 2007: 436-437).

Skinfold measurements using tricipital skinfold is particularly important together with arm circumference, and can be used to calculate muscular circumference of the arm, which indicates lean mass. Mid-upper arm circumference is a helpful indicator of malnutrition in ill patients. The skinfold for a healthy normal man is 23cm and for a healthy woman is 22cm. This measurement has been shown to be an independent predictor of mortality in older people in long-term institution. Haboubi- Kennedy has devised a formula using both BMI and mid-arm circumference to evaluate nutritional status (Maqbool *et al* 2008: 10).

2.7.3.3 Anthropometric Measurements

According to National Health and Nutrition Examination Survey (NHANES) (2009) anthropometry is the study of the measurement of the human body regarding the dimensions of bone, muscle, and adipose (fat) tissue. The anthropometry measurements includes a variety of human body measurements. Weight, stature (standing height), recumbent length, skinfold thicknesses, circumferences (head, waist, limb, etc.), limb lengths, and breadths (shoulder, wrist). Malnutrition is assessed by the reduction in the body size which can be caused by the dietary intake. The basic anthropometric measurements are very user friendly, effective, simple, not complicated, inexpensive and safe. BMI is used to indict the nutritional status which includes body mass (body weight) and measurement of height (stature) (Truswell 2007: 429). The WHO (2016) further explains that the BMI is a simple index of weight-for-height that is normally used to categorize underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2).

2.7.3.4 Height

In order to monitor the long progress of nutritional status of an individual stature measurement needs to be done. The measurement of height is done using a stadiometer, with a moveable headboard at a fixed 90° angle to the back of the stadiometer. The participant stands erect on a flat floor, feet together, heels, buttocks, and back of head touching the stadiometer, shoulders relaxed with arms hanging down, and looking out (Truswell 2007: 429).

2.7.3.5 Weight

Weight accounts for overall measures for nutritional status basing the findings on the age, gender, and it is considered in terms of height/length which is measured in meters and weight which is measures in kilograms (kg) is required for optimal interpretation and this is achieved by simple calculation of the BMI. In order to obtain weight certain instruments are used namely a digital, electronic or beam balance scale. Measurements for weight should be measured in 0.1 kg increments. Measurements should be taken with minimum clothing or no clothing so to obtain

accurate body weight and it should be done by a health professional (Maqbool *et al* 2008: 6). When weighing individuals that are in a health steady state on frequent basis the body fluctuation can be ±1.0kg.

According to Truswell (2007: 431-432) weight is made up of different body components which can change due to different factors resulting in an individual being overweight; this is generally an accumulation of fat or underweight which is the negative energy balance where fat is lost and some of the fat-free mass such as protein are lost too. The weight distribution in an average healthy adult can be interpreted as follows: twenty percent is fat (triacylglycerol), forty percent muscle (skeleton muscle), twenty percent protein (skeleton muscle) and the remaining amount is bone minerals (skeleton). There are other components that contribute to the weight of the body namely organs such as skin, blood, gut, liver, brain, lungs, heart and much more. Chemically, water (non-skeletal muscles soft lean tissue) is the largest components of body weight.

2.7.3.6 Body Mass Index (BMI)

BMI is a generally used measurement for diagnosing whether an individual is overweight or obese and this measurement is utilised by WHO and other government health departments in major countries including South Africa. BMI uses the same cut-off figures for men and women (WHO 2016). BMI is calculated as weight in kilograms divided by height in meters squared (kg/m^2). An unfavourable BMI is associated with high rate of morbidity, mortality and some of the non-communicable diseases. Some of these diseases are type 2 diabetes, cardiovascular disease, musculoskeletal morbidity disorder, and respiratory dysfunction, also decrease in physical activity and poor quality of life (Maqbool *et al* 2008: 8-9).

The disadvantage of BMI is that it only calculates the increase in the adiposity which does not make it fully accurate for people's body structure and weight differs because of the size of the body components such as the muscles bulk, broad frame and this can be presented as body fat. The classification of the BMI for adults according to the WHO's stands: underweight <18.50, normal range =18.5–24.99, overweight =25.00–29.99, obese =>30.00, and very severely obese =>40.00 (WHO 2016). This can be adjusted for different ethnic groups and the body compositions. To show

the impact of BMI on ethnic groups and body compositions, South Asians and Indonesians have relatively more body fat, while Polynesians tend to have more muscle. BMI does not only show indication of overweight but it can also indicate undernutrition meaning below the BMI of 18.5 which implies that the severity of the energy deficiency is moderate until 17.0. 16.0 signifies severe and below 16.0 is very severe (Truswell 2007: 434).

That is why there are three specific factors that are leading to convening another expert in consultation on the BMI classification; the first one is the increase in the type 2 diabetes and increase in cardiovascular diseases. In some part of Asia the average BMI is 25kg/m² and that is overweight cut-off in the current WHO classification. The second one is increased association between the BMI and the body fat percentage and body fat distribution that differs throughout different populations. The third one is the difference body formation in different ethnic groups (WHO 2016).

2.7.4 CIRCUMFERENCES

Waist circumference and limb circumference measurements are used to measure the growth and index of energy and protein stored in the body and provide fat patterns in the body. To proceed with the measurement the midpoint of the upper arm, located halfway between the lateral tip of the acromion and the olecronon when the arm is flexed at a ninety degrees celcious (Truswell 2007: 437). The head circumference indicates growth but mostly head growth because it indicts brain growth and development. This measurement is used on children and results are favourable between the ages of one to three because there is increasingly great growth in that period. It is a less sensitive indictor of short term nutritional status than weight and height since the brain is preserved in conditions of nutrition stress. The head is measured with a flexible but non-stretching tape measure (Maqbool *et al* 2008: 7-12).

2.7.4.1 Waist Circumference

Waist circumference (WC) is the simplest and most effective surrogate measure of abdominal obesity. Abdominal obesity is the excess accumulation of both central subcutaneous and visceral

fat. WC has emerged as an important predictor for metabolic complication and adverse health effect. Abdominal obesity has been linked with type 2 diabetes and cardiovascular diseases in both men and women (Chaoyang, Ford, Mokdad and Cooks 2006: 1390). The metabolic complication of overweight and obesity can be brought about by the adipose tissue that are more concentrated in the abdomen. Abdominal obesity or visceral obesity can be measured with a simple tape around the waist. WC works hand-in-hand with BMI. The classification of risk using waist circumference is population-specific and depends on the levels of obesity and other risk factors for cardiovascular diseases and diabetes in the ethnic group and it is also used on individual with a broad frame body but its results are not conclusive (Truswell 2007: 434-435).

2.8 CONCLUSION

The growing longevity in humans is one of the great biosocial and biomedical achievements of the recent era. Demographic ageing comes with great challenges in psychological, physiological, economical and social issues which can all contribute to poor nutritional status among elderly people. Nutritional deficiency is a common problem that affects the health and the ageing process of elderly people due to reduced food intake, absorption and utilization of nutrients which can be influenced by non-nutritional factors such as physical activity and diseases. Poor nutritional status in elderly people provides greater risk of multiple chronic diseases which results in high rates of morbidity and mortality.

Hunger and food insecurity also contribute to poor nutritional status such as malnutrition. Elderly people are prone to food insecurity due to income below the poverty line, less education, disability, living with grandchildren and depending on Supplemental Nutritional Assistance Program (SNAP). In order to promote healthy ageing the public health services should encourage nutritional education on food-based rather than nutrient-based dietary. Food-based dietary guidelines go beyond nutrients and food groups because it indicates the interaction between food components which include guidance on the way food is produced, prepared, processed, developed and finally eaten in a meal or as a snack.

CHAPTER THREE: METHODOLOGY

3.1 INTRODUCTION

This chapter provides a description of the research design and methodology used in this study. A description of the participants and sampling procedure is provided, together with a brief overview of the procedures used to gather the data. The processes of the research and the data analysis of the study are explained. Proper planning, research design, and measuring instruments are critical components in gathering good quality data. When selecting the research methods, the following factors were taken into account in order to meet the research objectives: population characteristics (gender, age, level of education, and income), estimated time and resources that are available.

Population ageing is one of the most significant demographic singularities observable globally. It can also be referred to as demographic ageing, meaning all individuals who are 60 years and above are considered as elderly members of the population and this group is the largest component of the total world population (WHO 2009). The age categorises of the groups of the elderly are as follows: young elderly age (≥60≤69), old elderly age (≥70≤79) and the very old (≥80) (WHO 2008).

The rationale of the study was to determine the food insecurity and nutritional status relating to chronic diseases of elderly caregivers within the rural households of Mpharane village in Lesotho. The study will provide information on the relationship between the food intake, socio-economic, nutritional status and the chronic diseases that elderly caregivers are at the risk of having. The main objective of the study was to determine the socio-demographic profile, nutritional status, dietary intake patterns in relation to the agricultural practices, and the depth of food insecurity and health status of 260 elderly caregivers in Mpharane village. The measurements chosen for the study included socio-demographic questionnaires, 24-Hour Food Recall questionnaires, food frequency questionnaires (FFQ), anthropometric measurements, Coping Strategy questionnaires, health and behavioural questionnaires and agricultural practices questionnaires. This chapter focuses on the study design, and planning, which includes the administration of the study, data analysis and statistics.

3.2 ETHICAL CONSIDERATIONS

The research proposal was submitted, and approved in 2013 by the Institutional Research Ethics Committee (IREC 058/13) at the Durban University of Technology (DUT) prior to the commencement of the study (Annexure A). The researcher approached the government of Lesotho through the Ministry of Health in Lesotho to request permission to conduct research in Lesotho in an elderly population group because there is a great scarcity of researched information regarding the elderly population in Lesotho (Annexure B). The Ministry of Health granted permission for the study to be conducted in Lesotho, but the researcher also had to obtain a written permission from the Ministry of Health Research Ethics Committee (Annexure C). When the Ministry of Health Research Ethics Committee in Lesotho approved the study, the researcher randomly selected a village called Mpharane in the districts of Mohale's Hoek from the ten districts in Lesotho.

The researcher also had to ask for permission from the chief in Mpharane village to conduct the research in the village (Annexure D) and a verbal permission was granted to the researcher. A meeting was held with the members of the village to explain the research study; it was also explained that the participation was voluntary and it was explained to the participants that cooperation was vital to the study but the participants had the right to withdraw from the research should there be a need at any time during the study. All the village members were informed about signing an informed consent agreement (Annexure E) and it was emphasized that all information including data collected would be kept confidential and locked away in the DUT Department of Food and Nutrition archives for a period of five years and thereafter, it will be disposed of by shredding. Only the researcher and the supervisor would have access to this information. From the village meeting ten members of the village were selected to form a formal forum focus group which would assist in reformulating the already existing questionnaires; the ten village participants were requested to sign an informed consents agreement. All 260 participants were requested to sign the consent form before commencing with the data collection.

3.3 PLANNING AND ADMINISTRATION

A meeting was conducted between the researcher, the chief, and the village people and in the meeting the village people were informed about the research project and its purpose. From the meeting ten randomly selected elderly participants were chosen to form a formal forum which would assist in modifying already existing questionnaires in order for the questionnaires to relate and be relevant to the elderly population in Mpharane village. A pilot study was conducted by the researcher in order to verify the validity of the modified questionnaires and it was made-up of 20 village members. Figure 3.1 presents the empirical study design.

Figure 3.1: Empirical study design

3.4 RESEARCH DESIGN

Setting

Basutholand was renamed the Kingdom of Lesotho after it gained its independence from the United Kingdom (UK) in 1966. Lesotho is a small mountainous country with total land boundaries of 909 km, completely surrounded by South Africa (S.A). Lesotho's total land area is 30 355 sq/km and it is slightly smaller than Maryland, U.S.A. Lesotho has 10 districts and the research was conducted in one of the districts called Mohale's Hoek, in the village called Mpharane. In July 2013 the estimated population in Lesotho was 1 936 181 with the adult prevalence rate of 23.1 percent with the population growth rate of 0.34 percent. In 2011, the urban population was 27.6 percent of the total population (The World Fact Book Africa Lesotho 2014). In the rural areas 76.2 percent of the population is living in high levels of poverty which are mostly customary, with the Gross Domestic Product (GDP) estimated at US$ 5.124 billion in 2005 and the GDP per capital of US$ 296. It is estimated that 50.2 percent of the population is living below $1 a day. This high poverty rate is due to the unemployment rate of 45 percent and a high adult illiteracy rate of 82 percent (WHO 2009).

Methodology

This study was conducted over a period of four weeks. The data was collected by going house to house and administering questionnaires. Each interview was between one hour to one hour and thirty minutes. During the four weeks, data was also collected during a pension collection day when more than 400 elderly people came to collect the pension payout of M450.00 and 180 questionnaires could be administered on that day.

The inclusion criteria were the following:

- The elderly primary caregivers both men and women.
- The participants should be 60 years and above.
- The participants who are residents in Mpharane village in Lesotho.

- The participant should be taking care of one or more grandchildren.

The following were exclusion from the study:

- People who are not residents in Mpharane in Lesotho or are not permanent residents.
- People under the age of 60 year.
- People with no grandchildren staying with and people who are not taking care any grandchildren.
- Any person who is not a Mosotho.
- Any person who is disabled reliant on a wheelchair.

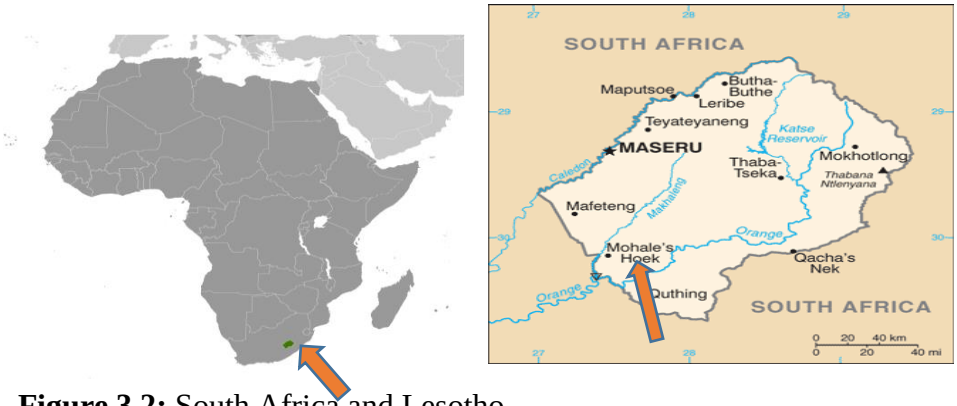

Figure 3.2: South Africa and Lesotho

3.5 DATA ENUMERATORS

The fieldworkers were allocated by the Nutrition Department of Lesotho. The allocated fieldworkers' collects data for different departments and a retired teacher and a nurse were used as additional fieldworkers. All fieldworkers were both fluent in Sesotho and English. The fieldworkers had to be trained in administering the questionnaires to the participants in order to assist the researcher with data collection. English and Sesotho were the language medium of instruction for the fieldworkers. The training session for the fieldworkers was done both in English and Sesotho and fieldworker training manual guidelines was printed in English (Annexure F). The fieldworkers' training included aspects such as, how to approach the participants: with respect, friendliness and patience the (most important factors when dealing with the elderly people). Code of conduct; which included punctuality, reliability and consistency because that is a key to successful fieldwork since participation depended on time that the participants were available.

The fieldworkers were trained on how to administer the questionnaires: Socio-demographic, Health and Behaviour, Coping strategies, Food Frequency, 24-Hour Food Recall and Agricultural Practices. A demonstration was given on how to obtain correct Anthropometric measurements and the use of food models to demonstrate correct portion size and to assist the participants to identify unfamiliar foods. An assortment of participatory facilitating methods such as case studies, role-playing, and communication skills which would allow the fieldworkers to capture the correct data as well as to feel confident when collecting data, were used in training.

3.6 STUDY POPULATION AND SAMPLING

Stratified random sampling was applied in this study. According, to The CIA World Factbook (2016), the sample population age of elderly people in Lesotho (this is inclusive of the ten districts) was categorised as follows: 4.9 percent of the population was between the age of 55-64) with the gender ratio of 1.14 of both men and women and 5.4 percent were aged 65 years and above with the gender ratio of 0.99 of both men and women. The majority of the sample population was categorised according to the WHO (2008) as young, the elderly aged (≥60≤69), the old (≥70≤75) and the very old (≥80). The population sample consisted of (n=260) which include 29.00 percent (n=75) men and 71.00 percent (n=185) women in total.

Sampling strategy

The sample size was calculated using a power calculation indicating that 257 participants presented a reliable sample (Cole, Nie and Chu 2006: 483-491) with a 95 percent confidence level. The sample size was rounded off to 260 to account for possible dropouts. The sample selection was based on the geographic location as it is a rural community with low income households. Men and women caregivers were included in the study in order to give more households the opportunity to participate in the research.

Sample Size: $ss = \frac{z^2 * (p) * (1-p)}{C^2}$

Where:

Z = Z value (e.g. 1.96 for 995% confidence level).

P = percentage picking a choice, expressed as decimal (0.5 used for sample size needed).

C = confidence interval, expressed as decimal = 0.04 (three units on both sides of normal).

The sample consisted of (76) men and (184) women aged 60-(96) years in Mpharane in Mohales' Hoek in Lesotho.

Figure 3.3: An illustration of the sample population during the pension day and one of the house to house interview.

3.7 STUDY DESIGN AND ADMINISTRATION OF MEASURING INSTRUMENTS

The study design for the research was a cross sectional observational study. A variety of variables was used to measure the objectives. A quantitative research approach with a small qualitative component was implemented with the aim of identifying important variables in an area and to provide an answer to the research problem. Different types of questionnaires were used to collect data in the study. Different activity stations were set up to streamline the data collection process as represented by Figure 3.4.

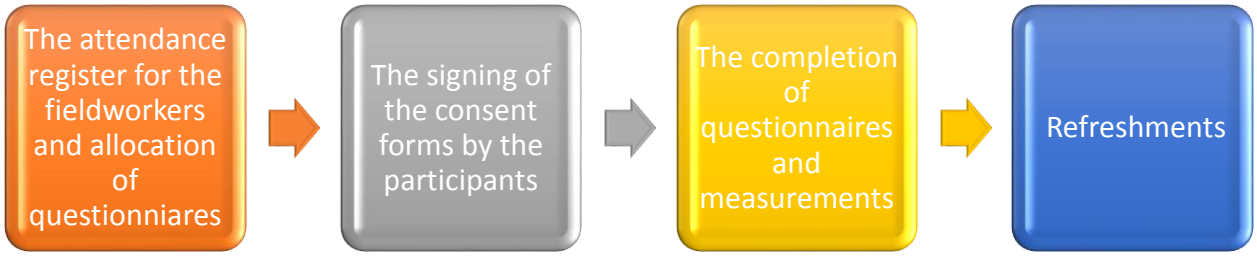

Figure 3.4: Data collection process

Figure 3.5: The data collection process

Different types of questionnaires were used, as mentioned before, as measuring instruments for all the variables of the study. Socio-demographic questionnaires determined household indicators like age, employment status, and number of dependents, living conditions and assets. Anthropometrics measurements that were conducted included height, weight and blood pressure. Health status questionnaires included indictors such as consumption of alcohol, smoking, food allergies and affected parts of the body. Food frequency score, dietary intake and nutrition adequacy were established. Coping strategies in the household were determined for the period of food insecurity. Agricultural practices questionnaires were to determined household indictors like land, types of crops and livestock. The researcher checked all the questionnaires for accuracy and completeness every day after the fieldwork was completed, in case any questions had to be repeated the next day. The gathering of the data will be discussed in more detail in the next section.

3.7.1 Socio-Demographic Questionnaires

The socio-demographic questionnaire developed by Oldewage-Theron and Kruger (2008) was adapted for this specific community by the researcher and the focus groups through the pilot study. The socio-demographic questionnaire was designed in English. The purpose of the socio-demographic is to measure the socio-economic status of the participants. The questionnaire covers sensitive topics such as personal information for example age, gender and language; accommodation status, for example access, to water supply, toilet facilities, environmental

sanitation and problems with pets; family composition for example number of people per household; work and economic status, for example, employment status, household individual contribution to income for purchase food, money to purchase food, frequency of food purchases, meals consumed per day, where most meals are consumed and cooking activities; education for example the highest education level achieved and household assets. The questionnaires were conducted in an interview setting and the questionnaires was conducted by a trained fieldworker. The participants ware made aware that all the information that was provided was going to be kept confidential (Annexure G).

3.7.2 Procedure for Collecting Anthropometrics measurements

The anthropometric measurements taken were weight, height, waist circumference and blood pressure. Among other things anthropometrics data can be used to calculate the body mass index (BMI) (Annexure H).

3.7.2.1 Weight

The weight was determined to nearest kilogram (0.1 kg) on a good quality, electronic standardized collaborate medical scale (CCPS- physical scale, sales 2000). Each participant was dressed in minimum or light clothing and the shoes and the socks were removed prior to being weighed. The scale was placed on a flat, hard, smooth and uncarpeted floor. The scale was switched on and the researcher waited until the zero indication (0, 0) appeared. The participants had to stand upright on the platform, facing the fieldworker and looking straight ahead. Feet had to be flat and slightly apart and the participants had to stand still until the measurements were recorded in the space provided on the form. The participants then stepped down from the scale and the fieldworker would wait for the zero recording to appear on the digital dial and weigh the participant for the second time. The next participant would be weighed when the scale's reading is zero. All measurements were taken twice and the average of the two measures was recorded (WHO 1995).

Figure 3.6: Elderly participant weight measurement recorded by a trained fieldworker.

3.7.2.2 Height

The portable stadiometer (scales 2000) with a sliding head plate, a base plate and three contacting rods marked with a measuring scale was used. The stadiometer stood vertically on a hard flat surface, with no molding for example skirting board, with the base at floor level. The floor surface was either made out of tiles or cement and was not carpeted or covered with other soft materials.

Height was measured according to the following procedures:

- The participant had to remove his or her shoes.
- The participant was positioned facing the fieldworker.
- The participant was requested to stand with shoulders relaxed, with shoulders, buttocks and heels touching each other against the wall.
- The participant arms were relaxed at the sides and legs straight, knees together, feet flat, heels touching.
- The participants had to look straight ahead before the headpiece was placed on top of the head.
- The fieldworker then had to record the participant's height in millimetres (mm) in the space provided on the form. The procedure was repeated twice with each participant. The two

readings should not vary by more than 5mm and these measurements were taken to the nearest 0.5cm by using a stadiometer (Lee and Nieman 2010).

Figure 3.7: The stadiometer was used to measure the elderly participant's height and the results were recorded by a trained fieldworker.

3.7.2.3 Body mass index (BMI)

The desirable range for BMI is given as 20 to 25 by the WHO, with values above 30 being associated with obesity. Similarly, values below 18 are indicatives of under-nutrition (Barasi 2003:12). Data was collected through the use of a stadiometer, electric scale and recorded on an anthropometric data form (Annexure H). The measures were then compared and evaluated to reference standards to assess underweight, overweight and obesity.

3.7.2.4 Waist circumference

The waist circumference was measured with a non-stretchable metric steel tape measure. The circumference was measured at the level midway between the lower rib margin and iliac crest with the tape all around the body in a horizontal position.

- It was recommended that measurements of the circumference of waist be taken while participants were semi-clothed.

- The participant had to remove heavy outer garments, for example, jacket or coat, before being measured.
- Measurements of the circumference of waist of the participants was taken with all the tight clothing, including the belt, loosened and with the pockets emptied.
- The fieldworker stood at the side of the participants in order to have a clear view of the measurements.
- The participants stood up straight with the feet together. The participants were requested to relax, especially the abdominal muscles by breathing normally so that the abdominal muscles did not contract and give inaccurate measurements; the reading of the measurements was taken at the end of the gentle exhaling.
- The tape was be held firmly and its horizontal position should be ensured. The tape should be lose enough to allow the fieldworker to insert one finger between the tape and the participant body.
- This procedure was conducted twice and both measurements were recorded. The average of the two measures was recorded (Barasi 2003).
-

3.7.2.5 Blood Pressure

A digital sphygmomanometer device (Omron) was used for blood pressure measurements on all the participants. The measurements were taken by a retired registered nurse at Mpharane village to determine the prevalence of hypertension. The blood pressure was measured with the participants in a seated position and the left arm was used. The participants were asked to remove any clothing on the arm so there can be a direct contact from the sphygmomanometers to the pulse. This procedure was conducted twice and both measurements were recorded. The average of the two measures was recorded.

Figure 3.8: The sphygmomanometer was used to measure the elderly participants' blood pressure which was then recorded by a trained registered nurse.

3.7.3 Dietary assessment

3.7.3.1 The 24-Hour Food Recall Questionnaires

Three 24-Hour Food Recall questionnaires were used to determine the actual food items that were consumed, including the portion size, during the previous 24 hours. This is a dietary assessment questionnaire that is used to determine the food consumed by the participants. Food models were simultaneously used to determine accurate portion sizes. The 24-Hour Food Recall questionnaires were completed twice with a week interval which comprised of two week day and one weekend recall, to get a clear indication of food consumption (Annexure I).

3.7.3.2 Food Frequency Questionnaire

The FFQ questionnaire developed by Oldewage-Theron *et al*. (2008) was adapted for this specific community by the researcher and the focus groups through the pilot study. The validated FFQ questionnaire was selected as the dietary variety assessment tool for the study to determine the food group diversity score (FGDS) and Food Variety Score (FVS) of the population. The FFQ

questionnaire consisted of a structured listing of individual foods consumed in the community over a period of seven days. The nine food groups recommended by FAO (2009) are: different types of meat/animal protein, legumes, starch, vegetables, dairy foods, fruits, sweet and oils (Annexure J). The participants were asked to indicate the food items consumed in the last seven days as listed on the questionnaire. The FFQ questionnaire was used as an instrument to validate the 24 Hour Food Recall. The FFQ questionnaires used were un-quantified as the FFQ questionnaires did not specify serving sizes (Oldewage-Theron *et al* 2008).

3.7.4 The Health Assessment

3.7.4.1 Health and Behavioural Questionnaires

The health assessment provides information of the elderly participant's current health status; this information can be used to monitor the participant's health needs over time and assists in the positive lifestyle changes. The questionnaire was completed on a one-on-one platform where a trained fieldworker interviewed the participant. The health questionnaire was completed in English and it focused on the self-report health conditions of the elderly participant over a period of time. The questionnaire included a detailed coverage of the nature of the severity as well as the duration of illness, including the change in appetite, weight loss following special diets, food allergy, level of physical activity, use of alcohol and smoking and type of medication used (Annexure K).

3.7.5 Coping Strategies

An adapted Food Coping Strategy questionnaire developed by Maxwell, Watkins, Wheeler and Collin (2003) was used for this study (Annexure L). The coping strategies used by the community in the time of food scarcity were adapted for this community by means of the Focus Group discussion with ten caregivers from the village. During the Focus Group discussion, the group discussed whether in the past 30 days there had been times when food and money to buy food was not enough and what possible strategies could be used in this community to ensure that household members had food to eat. The group had to rank strategies identified according to per

per week), 1.5 once in a while (1 to 2 times per week), 4.5 pretty often (3 to 6 per week) and 7 (all the time or every day). The highest frequency score (a maximum of 7) was multiplied by the severity weight which was 1 to 4 multiplied by 14 strategies = maximum score; thus the higher the score the more food insecure the community is.

The randomly selected 260 participants completed the adapted Coping Strategy Questionnaire with the assistance from the trained fieldworkers through a one-on-one interview. The questionnaire covers sensitive topics such as availability of food and the distribution of food among the family members either by limiting the portion size, limiting the number of meals per day, or by sending household members to go and eat with neighbours or going through the whole day without food. The second item is the availability of money to purchase food either by buying on credit, buying cheap food, or selling their belongings. Table 3.1 presents the developed coping strategies and frequency score questionnaire.

Table 3.1: Coping Strategies Index Questionnaire for Mpharene village at Mohale's Hoek

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	All the time? Everyday	Pretty often? 3-6 */week	Once in a while? 1-2 */week	Hardly At all? <1 */week	Never	Frequency Score	Severity Weight	Score= Relative Frequency X weight
Relative frequency score	**7**	**4.5**	**1.5**	**0.5**	**0**			
a) Rely on less expensive and preferred food?							**1**	
b) Borrow food, or rely on help from friend or relatives?							**1**	
c) Buy food on credit							**3**	
d)Send household member to eat elsewhere							**4**	
e)Limit portion sizes at mealtime							**3**	
f)Reduce the number of meals eaten in a day							**4**	
g)Skip entire days without eating							**4**	
h)Restrict consumption by adult in order for small children to eat							**3**	
i)Sell some belongings in order to get money to buy food							**4**	
j)Gather wild food, hunt, or harvest immature crops							**1**	
k)Consume seed stock held for next season or rent out the livestock							**4**	
l)Do small piece of work for food/money							**2**	
							3	

n)Children have to leave school in order to work for food							**4**	
Total household Score								

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

3.7.6 The Traditional Agricultural practices

An adapted Traditional Agricultural Practices Questionnaire developed by Southern African Labour and Development Research Unit-University of Cape Town (1993) was used for this study (Annexure M). Data on traditional agricultural practices was collected through a one-on-one interview by a trained fieldworker on a Traditional Agricultural Practices Questionnaire. The Traditional Agricultural Practices Questionnaire was designed in English. The purpose of this questionnaire is to measure the accessibility of resources to practice all methods of agriculture in order to produce food. Resources such as access to water both for human consumption and agricultural practices, land access, agricultural production of crops, livestock, the farm income, and farm assets were assessed.

3.8 DATA QUALITY CONTROL

The researcher used pre-tested and validated questionnaires in this study. Some of the questionnaires as mentioned previously had to be adapted from the already pre-existing questionnaires for this specific community by the researcher and the forum focus group. The researcher conducted a pilot study in order to verify and validate the questionnaires for reliability so that there was consistency.

3.8.1 Validity

Validity applies to the correctness of a measurement. When collecting data existing instrumentation can be used. Using existing instruments has some advantages such as saving cost and time, and if the instrument's validity and reliability can be confirmed then it does not have to be measured again. If the existing instrument is used, it is important that the information is

available about the construct validity and reliability of the instruments. The instruments chosen for the study had to be applicable and usable in the Lesotho context (Mouton and Babbie 2001: 9-12).

3.8.2 Reliability

Reliability is the regularity of the measurements, or the degree the instrument measures gives every time it is used with the same subjects under the same conditions. In summary it is the repeatability of the measurements. A measure is considered reliable if a person score on the same test given twice and the score is similar (Mouton and Babbie 2001: 9-12).

3.9 DATA ANALYSIS AND STATISTICS

The completed Socio-demographic Questionnaires, Health Questionnaires, Food Frequency Questionnaires, Anthropometric Measurements Forms, Coping Strategies Questionnaires and the Agricultural Practices Questionnaire were captured on a Microsoft Excel® Spreadsheet by the researcher and analyzed using the Statistical Package for the Social Sciences (SPSS), version 21.0, with the assistance of a statistician. The correlations were conducted by a statistician using the ANOVA statistical test. The ANOVA tests the significance designed to determine whether a significant difference exists among multiple sample means (Nordness 2006). The Pearson's correlation coefficient puts into quantitative terms the association implied by scatter plots of the two variables. A value r = 1 and r = -1 imply perfect positive and negative associations, respectively (Jan 2006). However, in statistical significance testing, the *p*-value, is the probability of obtaining a test statistic score at least as extreme as the one that was actually observed, assuming that the null hypothesis is true. However, the null hypothesis is rejected 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 (Naito 2006).

3.9.1 Socio-Demographic Questionnaire

All the data completed on the Socio-demographic Questionnaire were sorted and checked for completeness and accuracy by the researcher and it was found that n=260 were usable. Descriptive

statistics including frequencies, and percentages were determined. Tables were drawn up with percentages of the different variables included in the questionnaires. Data was presented in terms of frequencies and percentages for various categories.

3.9.2 Anthropometric Measurements

The weight, height and waist circumference of all the participants (n=260) were captured on a Microsoft Excel® Spreadsheet and used to classify and determine the body mass index (BMI), waist-to-height ratio (WHtR) and blood pressure. The BMI was calculated by dividing weight in kilograms (kg) by height in m^2.

$$\text{BMI (or Quetelet's index)} = \frac{\text{Weight (in kilograms)}}{[\text{Height (in metres)}]^2}$$

The results are presented in the following categories: underweight (BMI >18.50), normal weight (BMI >18.50-24.99) overweight (BMI >25.00-29.99) and the three obese categories ranged from (BMI >30.00-≥40). The BMI was used to estimate and predict the prevalence of underweight, overweight and obesity within the elderly population and the risk associated with it. The waist circumference measures for an increased risk was ≥88 cm in women and ≥102 cm in men. Changes in waist circumference indicated changes in risk factors for cardiovascular diseases. The waist to height ratio was measured by dividing waist by height. If the WHtR is ≥0.5, there is a risk of cardiovascular diseases (WHO 2005). The blood pressure measurement data were captured on an excel spreadsheet to determine the prevalence of hypertension according to the World Health Organization cut-off points (Normal blood pressure) BP systolic BP/Diastolic PB <120 mmHg/<80mmHg, Pre-hypertension SBP/DPB 120-139 mmHg /80-89mmHg, Stage 1 SBP/DPB 140-159 mmHg /90-99mmHg and Stage 2 SBP/DPB ≥160mmgH /≥100mmHg) (WHO/ISH 2003).

3.9.3 Dietary Assessments

3.9.3.1 The 24 Hour Food Recall

Data was captured and analysed by a nutrition professional using the MRC Food Finder Version 3.0 software, based on the South African Food Composition Table of South Africa (Langenhoven, Kruger, Gouws and Faber 1991 and Food Finder 3, 2002). This program was developed to analyse the nutrient content of food items consumed. The nutrient intake and top 20 food items most commonly consumed by the participants for two week days and one weekend day were recommended. Statistical analysis was performed by the researcher, correlations were drawn with certain variables and tables were used to illustrate the results by means and standard deviation for interpretation of the prevalence of the nutrient intake and nutritional status were compared to 100 percent of the DRIs (IoM 2003) for people older than 51 years. Estimated Average Requirements (EARs) were used as the reference measure and if not available, Adequate Intake (AI) as Recommended Daily Allowances (RDAs) is indicated for use in individuals and not groups of people (NICUS 2003).

3.9.3.2 Food Frequency Questionnaire

The completed food frequency questionnaire data was sorted and checked by the researcher for accuracy and completeness, and n=260 were found to be usable. The data were captured on a Microsoft Excel® Spread Sheet by the researcher and then analysed by using the SPSS for Windows Version 21.0 Software Program with the assistance of a statistician. The different DD measures, referred to as FVS and FGDS, were calculated as follows: (1) overall variety score (sample 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, and were used together to reflect DD in different ways. The Food variety score (FVS) consisted of a simple count of single foods and food groups, similar to previous studies in developing countries. The nine nutritious food groups (meat group, eggs group, dairy group, cereal group, legume group, vitamin A group, fruit group, vegetables group and fats group) recommended by the FAO were used for the classification of broad food

intakes. A low variety was indicated when less than 30 food types were consumed in a period of 7 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 dietary diversity score (FVS and FGDS) were calculated from the seven-day FFQ (n=260). Tables were drawn up with percentages of different variables included in the questionnaire. Data were presented in terms of frequencies, percentages and standard deviation for the various categories. The FGDS and the NARs were correlated to determine if nutrient adequacy improves as the food group variety increases.

3.9.4 Heath Assessment

3.9.4.1 Health and Behavioural Questionnaire

The completed health questionnaire data were sorted and checked for completeness and accuracy by the researcher and n=260 were found to be usable. The data was captured on a Microsoft Excel® Spread Sheet by the researcher and then analysed by utilizing the SPSS version 21.0 for windows program with the assistance of the statistician. Descriptive statistics including frequencies, means, and percentage were determined. Tables were drawn up with percentages of the different variables included in the questionnaires. Data were presented in terms of frequencies and percentages for the various categories.

3.9.5 Coping Strategies Questionnaire

The completed Coping Strategy Questionnaire data was sorted and checked for completeness and accuracy by the researcher and n=260 were found to be usable. The data was captured on excel spread sheet by the researcher and then analyzed by utilizing the SPSS Version 21.0 for Windows Program with the assistance of the statistician. Descriptive statistics including frequencies, means, and standard deviations percentages were determined. Tables were drawn up with different variables included in the questionnaires. Data were presented in terms of frequencies and percentages for the various categories.

3.9.6 Agricultural Practices Questionnaire

All the data completed on the Traditional Agricultural Practices Questionnaire were sorted and checked for completeness and accuracy by the researcher and n=260 were found to be usable. The data were captured on an Excel Spread Sheet by the researcher and then analysed by utilising the SPSS version 21.0 for Windows program with the assistance of the statistician. Tables were drawn up with percentages of the different variables included in the questionnaires. Data was presented in terms of frequencies and percentages for various categories.

3.10 Correlations

Bivariate correlations (Pearson correlation- 2 tailed) were drawn between some of the variables to establish a relationship: household income and BMI, money spent on food and BMI, household food security score and household income, household income per month and food security and BMI and household food security score. A $p<0.05$ was used as an indication that the correlation between two variable was significance.

3.11 CONCLUSION

This chapter has offered an outline action of the research methodology approach to identifying the nutritional status and dietary intake patterns, the socio-demographic status, food insecurity status and agricultural practices encountered by the elderly in the Mpharane village by providing explanation with the use of all the instruments. The principles and procedures of this study, and epistemological underpinnings, were described, along with the evolution of the practice. Details of the approach in conducting the research were provided as well as all respondents indicating the measuring apparatus were given, as was an indication of the roles and ethics involved in the research study. The next chapter will disclose the interpretation of the results of the study.

CHAPTER FOUR - RESULTS AND DISCUSSION

4.1 INTRODUCTION

The purpose of the study was to determine the interaction between the socio-economic conditions, health status, dietary diversity, nutritional adequacy, food consumption patterns, coping strategies, and agricultural practices in relation to food insecurity and nutrition status relating to chronic diseases of elderly caregivers within the rural households of Mpharane in Lesotho.

This chapter reports on the results of the processed data, which have been tabulated, interpreted and evaluated. The findings include socio-economic factors, anthropometric results, health status, food frequency score, dietary intake, nutritional adequacy and coping strategies and investigate the agricultural practices used by the village in times of food scarcity. The sampling techniques resulted in n=260 participants, forming part of the sample population with a total of 100 percent participants which included n=75 men and n=185 women from the age of 60 years and above. However, the mean age for men was 74.76 and the mean for women was 74.06, which is in close proximity. The results will be presented in percentages (%) which will also reflect the numbers (n) as 100% village members participated unless otherwise stated.

4.2 RESULTS OF MPHARANE VILLAGE STUDY

4.2.1 SOCIO-DEMOGRAPHIC RESULTS

The socio-demographic results present the study population categorized in percentages and numbers according to the sample size, accommodation, family composition, work status, income, education and assets.

4.2.1.1 Personal Information

Table 4.1: The role in the family and language

Variable	Number (n=260)	Percentage (%)
The language spoken in the house		
Sesotho	**260**	**100.00**
The role in the family		
Grandmother	185	71.00
Grandfather	75	29.00
Total	**260**	**100.00**

The information in Table 4.1 indicates that all the participants (100%) spoke Sesotho. The majority (71.00%) (n=185) of the participants were grandmothers and almost a third of the participants (n=75) were grandfathers.

4.2.1.2 Accommodation and Family Composition

Table 4.2: The living conditions of the household

Variable	Number (n=260)	Percentage (%)
The type of the location the house is located at		
Rural village	**260**	**100.00**
The living situation at the moment		
Own house/flat	**260**	**100.00**
The duration period of residence		
1-5 years	15	5.80
> 5 years	245	94.20
Total	**260**	**100.00**
The type of the house		
Brick	107	41.20
Clay	17	6.50
Grass	57	21.90
Wood	15	5.80
Zinc/shack	64	24.60
Total	**260**	**100.00**
The type of floor material		
Cement	110	42.30
Dirt	1	0.400
Sand/mud	90	34.60
Dung	59	22.70
Total	**260**	**100.00**
The number of rooms per household		
1 rooms	154	59.20
2 rooms	75	28.80
3 rooms	31	11.90
Total	**260**	**100.00**

Other houses/ shacks within the yard		
Yes	**260**	**100.00**
Other people residing in the house		
Yes	**260**	**100.00**
Number of permanent resident members		
4	61	23.50
5	47	18.10
6	39	15.00
7	41	15.80
8	41	15.80
9	27	10.40
10	4	1.50
Total	**260**	**100.00**

The results in Table 4.2 show that all the participants (100%) are situated in a rural area and all the participants have full ownership of the housing uni,t which also includes other buildings within the yard. Ninety-four point two percent (94.2%) (n=245) of the participants have lived in the house for more than five years and only 5.80% (n=15) of the participants have lived there for less than five years. All the participants reside with other people. Moreover, 46.60% (n=121) of the households had between six to eight people residing permanently in the household, 23.50% (n=61) of the households housed four people, and four (1.50%) of the households had 10 residents. Brick houses made up 41.20% (n=107) of the group, 24.60% (n=64) of the houses were made out of zinc and 21.90% (n=57) were made out of grass. One-hundred and ten (42.30%) of the households had cement floors while 34.60% (n=90) of the participants' floors were made out of sand/mud and 22.70% (n=59) used dung as the floor covering. A large number (59.20%) (n=154) of the houses had one room and 28.80% (n=75) of the houses had two rooms while 11.90% (n=31) of houses consisted of three rooms.

Table 4.3: Amenities

Variables	Number (n=260)	Percentage (%)
Accessibility of water		
Tap outside the house (public)	113	43.50
Borehole	1	0.40
Spring/river/dam water	34	13.10
Fetch water from elsewhere	112	43.10
Total	**260**	**100.00**
Do you fetch water every day?		
Yes	228	87.70
No	32	12.30
Total	**260**	**100.00**

The distance travelled when fetching water		
Less than 100 m	155	59.60
100 m less than 500 m	66	25.40
500 m less than 1 km	35	13.50
1 km less than 5 km	4	1.50
Total	**260**	**100.00**
Toilet facilities		
None	61	23.50
Other	199	76.50
Total	**260**	**100.00**
Waste removal		
No	**260**	**100.00**
Tarred road in front of the house		
No	**260**	**100.00**
Gravel road in front of the house		
Yes	**260**	**100.00**

Table 4.3 indicates that 87.70% (n=228) of the participants had to fetch water on a daily basis. Forty-three point five percent (43.5%) (n=113) of the participants had taps outside used by the general public and 43.10% fetched water from elsewhere. The majority (59.60%) (n=155) of the participants travelled less than one hundred metres to fetch water, 25.40% (n=66) travelled more than one hundred metres but less than five hundred metres and 1.50% (n=4) of the participants travelled for more than one kilometres but less than five kilometres to fetch water. All the participants (100%) have no waste removal services or tarred road in front of their houses. The majority (76.50%) (n=199) of the participants had access to toilet facilities but 23.50% (n=61) had no access to toilet facilities.

Table 4.4: Pest problems and problems with the house

Variables	Number (n=260)	Percentage (%)
Mice/Rats	133	51.20
Cockroaches	26	10.00
Ants	44	16.00
Fleas	27	10.40
Mosquitoes	50	19.20
Snakes	4	1.50
Bed Bugs	73	28.10
Problems with the house		
Broken windows	21	8.07
Doors not closing properly	18	6.92
Floors cracked	30	11.53
Walls cracked	14	5.38
Leaking roof	29	11.15

Too small	19	7.30
Not applicable	129	49.61
Total	**260**	**100.00**

Table 4.4 illustrates the presence of pests in the household: 51.20% (n=133) of the households experienced mice or rats, 28.10% (n=73) bed bugs, 19.20% (n=50) mosquitoes, 16.00% (n=44) ants, 10.40% (n=27) fleas and 1.50% (n=4) snakes as a problem in the household. With regard to structural household problems, 11.53% (n=30) indicated that the house had cracked walls, 11.15% (n=29) reported leaking roofs, 8.07% (n=21) reported broken windows and 7.30% (n=19) indicated that the houses were too small.

4.2.1.3 Work Status and Income

Table 4.5: Employment Status

Variable	Number (n=260)	Percentage (%)
Currently employed		
Number	**260**	**100.00**
Current status		
Unemployed	**260**	**100.00**
Currently looking for employment		
Number	**260**	**100.00**
The period of unemployment		
>3years	**260**	**100.00**
Currently looking for part-time job		
Number	**260**	**100.00**
The total income in the household per month		
R0 – R500	**260**	**100.00**

According to Table 4.5, all the participants were currently unemployed over a period of three years and all the participants were not looking for employment or part-time jobs. The total income of the households per month ranged from zero to five hundred.

4.2.1.4 Education

Table 4.6: Education

Variable	Number (n= 260)	Percentage (%)
The highest education level:		
None	92	35.40
Primary school	136	52.30
Standard 8	32	12.30
Total	**260**	**100.00**

As indicted in Table 4.6, 52.30% (n=136) of the participants achieved a primary school education as the highest education level, 12.30% (n=32) of the participants had standard eight as the highest education level and 35.40% (n=92) had no formal education.

4.2.1.5 Food Security and Household Assets

Table 4.7: Food security

Variable	Number (n= 260)	Percentage (%)
Number of people that contribute to the household income:		
0	235	90.40
1	17	6.50
2	6	2.30
3	2	0.80
Total	**260**	**100.00**
How often do you buy food?		
Every day	14	5.40
Once a week	23	8.80
Once a month	220	84.60
Other	3	1.20
Total	**260**	**100.00**
Shortage of money to buy food:		
Always	29	11.20
Often	159	61.20
Sometime	38	14.60
Seldom	31	11.90
Never	3	1.20
Total	**260**	**100.00**
Where food is purchased:		
Tuck shop	221	85.00
Supermarket	39	15.00
Total	**260**	**100.00**
The type of transport used:		
Taxi	46	17.70
Bus	9	3.50
Walk	260	100.00
The amount of money spent on food per month:		
R 0 - R 200	29	11.20
R 201 - R 300	89	34.20

R 301 - R400	115	44.20
R 401 - R 500	23	8.80
R 501 – 600	4	1.50
Total	**260**	**100.00**

Table 4.7 shows results pertaining to household food security and household income. A large number of participants (90.40%) (n=235) did not receive any financial contribution from the inhabitants in their household, while 6.50% (n=17) of the participants had one inhabitant contributing to the household income. The majority (84.60%) (n=220) of the participants bought food for the household once a month, 8.80% (n=23) once a week and 5.40% (n=14) every day. Sixty one point two percent (61.2%) (n=159) of the participants often did not have enough money to buy food, 14.60% (n=38) of the participants sometimes did not have enough money to buy food and 11.20% (n=29) of the participants always did not have enough money to buy food. Most (85.00%) (n=221) of the participants' food was purchased at the tuck-shop and 15.00% (n=39) of the participants' food was purchased at the supermarket. All the participants (100%) walked to buy food, 17.70% (n=46) of the participants used taxis as a means of transportation while 3.50% (n=9) used buses as a source of transportation to buy food. Less than half (n=115) of the participants spend R300.00 to R400.00 (M300.00 to M400.00) per month on food, 34.20% (n=89) of the participants spend R200.00 to R300.00 per month on food, 11.20% (n=29) of the participants spend less than R200.00 on food per month and 1.50% (n=4) spend R500.00-R600.00 per month on food.

Table 4.8: Household duties

Variables	Number (n=260)	Percentage (%)
The person responsible for preparing the food in the house:		
Father	4	1.60
Mother	11	4.20
Sibling	3	1.20
Grandmother	224	86.20
Grandfather	15	5.80
Aunt/Uncle	2	0.80
Other	1	0.40
Total	**260**	**100.00**
The person responsible for buying food in the house:		
Father	1	0.40
Mother	10	3.80
Grandmother	237	91.20
Grandfather	9	3.50
Aunt/Uncle	2	0.80

Other	1	0.40
Total	**260**	**100.00**
The person responsible for feeding the children:		
Mother	11	4.20
Sibling	1	0.40
Grandmother	234	90.00
Grandfather	12	4.60
Aunt/Uncle	1	0.40
Other	1	0.40
Total	**260**	**100.00**
The head of the house:		
Father	1	0.40
Mother	9	3.50
Sibling	1	0.40
Grandmother	211	81.00
Grandfather	36	13.80
Aunt/Uncle	1	0.40
Other	1	0.40
Total	**260**	**100.00**
The person responsible for how much money to spend on food:		
Father	2	0.80
Mother	12	4.60
Grandmother	220	84.60
Grandfather	24	9.20
Aunt/Uncle	1	0.40
Other	1	0.40
Total	**260**	**100.00**

Table 4.8 indicates that most of the household duties were carried out by grandmothers. Grandmothers (86.20%; n=224) prepared food in the household on a daily basis and grandmothers (91.20%; n=237) also purchased most of the food for the household. Ninety percent (n=234) of the participants who were responsible for feeding the children were grandmothers. The majority (84.60%; n=220) of the grandmothers decided on how much to spend in the household and (9.20%; n=24) of the people responsible for deciding how much to spend were grandfathers. Both the grandmothers (81.00%; n=211) and grandfathers (13.80%; n=36) had the responsibility of being the head of the household.

Table 4.9: Consumption of meals

Number of meals consumed per day:	Number (n= 260)	Percentage (%)
1	1	0.40
2	25	9.60
3	183	70.40
>3	51	19.60
Total	**260**	**100.00**
The place used for the consumptions of meals:		
Home	**260**	**100.00**

According to Table 4.9, a large number (70.40%) (n=183) of participants consumed three meals a day, 19.60% (n=51) of the participants consumed more than three meals a day and less than 10% (n=25) of the participants consumed two meals a day. All the participants (100%) consumed all the meals at home.

Table 4.10: Household assets

Variables	Frequency	Percentage (%)
Paraffin stove	208	80.00
Gas stove	54	20.80
Telephone/ cell phone	36	13.80
Radio	105	40.00
Bed with mattress	193	74.20
Mattress only	243	93.50
Lounge suite	11	4.20
Dining room suite	3	1.20

Table 4.10 indicates that 80.00% (n=208) of the participants owned paraffin stoves, 20.80 (n=54) owned gas stoves, 13.80% (n=36) owned cell phones, 40.00% (105) owned radios, 74.20% (n=193) owned a bed with a mattress, 93.50% (n=243) owned mattresses only, 4.20% (n=11) owned lounge suites and 1.20% (n=3) owned dining room suites.

Table 4.11: Fuel and material used for pots used to cook food

Variables	Frequency	Percentage (%)
The type of fuel used to prepare food:		
Wood	218	83.80
Paraffin	171	65.80
Gas	46	17.70
Other (animal dung)	21	8.10
The type of material used to make pots:		
Cast iron	161	61.00
Aluminum	42	16.00

Stainless steel	15	5.80
Clay	162	62.30
Other	1	0.40

The results in Table 4.11 show that 83.80% (n=218) of the participants used wood as fuel in the preparation of food, 65.80% (n=171) used paraffin, 17.70% (n=46) used gas and 8.10% (n=21) used other sources of fuel, for example, cow dung. The most-used cookware was clay pots (62.30%) (n=162) and cast iron pots (61.00%) (n=161), with 16.00% (n=42) using aluminum pots and 5.80% (n=15) used stainless steel pots.

Table 4.12: Information on the children living in the house

Variables	**Number (n=260)**	**Percentage (%)**
The number of children with birth certificates in a household:		
1	38	14.60
2	28	10.80
3	71	27.30
4	47	18.10
5	28	10.80
6	27	10.40
7	8	3.10
8	6	2.30
9	7	2.70
Total	**260**	**100.00**
The number of children who have completed their immunization schedule in a household:		
1	16	6.20
2	83	31.90
3	72	27.70
4	46	17.70
5	20	7.70
6	15	5.80
7	3	1.20
8	3	1.20
9	2	0.80
Total	**260**	**100.00**
The number of children attending school in a household:		
None	55	21.00
1	52	20.00
2	90	34.00
3	53	20.40
4	10	3.80
Total	**260**	**100.00**
The type of transportation used by the children in a household:		
Walk	**260**	**100.00**

The most common place the children eat most meals in a household:		
Home	**260**	**100.00**
School	**205**	**100.00**
The number of children that have died in a household:		
Yes	**106**	**40.80**
No	**153**	**58.80**
The cause of death:		
Sickness	73	28.07
Not answered	187	71.96
Total	**260**	**100.00**

Table 4.12 indicates that a large number of households (77.40%; n=201) had between two to six children with birth certificates. Furthermore, 90.80% (n=236) of households had between two to six children who had completed the immunization schedule. In 78.20% (n=205) of the households, between one and four of the children attended school whereas 21.00% (n=55) of the children did not attend school. Of all the children that attended school, 100% of the children walked to school and consumed all the meals between home and school. A large number of participants (40.80%; n=106) had experienced the death of a child in the household but 58.80% (n=153) had not experienced the death of a child in the household and 28.07% (n=73) of the participants explained the cause of death as sickness.

4.2.2 ANTHROPOMETRIC AND HEALTH INDICATORS

4.2.1 Anthropometric Findings

Table 4.13: The mean and standard deviation for age, weight, BMI and waist (n=260)

Variable	Mean age years	Mean height (m)	Mean weight (kg)	Mean BMI	Mean Waist (cm)
Whole group	74±8.055	1.54±0.086	65.01±12.978	27.52±5.930	82.98±13.669
Men >60 years (n= 75)	74±7.667	1.59±0.090	67.22±13.717	26.96±6.027	83.93±13.502
Women >60 years (n= 185)	74±8.218	1.52±0.078	64.12±12.594	27.75±5.891	82.59±13.754

Table 4.13 describes the mean age, height, weight, BMI and waist circumference of the total group; however, women and men aged 60 years and above are calculated separately. The mean age for men was 74 years with a ±SD of 7.66 and the mean age for women was 74 years with a ±SD of

8.21 were relatively similar. The results indicated that men are slightly heavier than women with a mean weight of 67.22 kg and women with a mean weight of 64.12kg. However, the women had a mean BMI of 27.75 that was slightly higher than the mean BMI of men at 26.96 but this was not statistically significant (p=0.354).

Table 4.14: The summary of Body Mass Index

Parameter	Classification	% Men (n=75)		%Women (n=185)	
Body Mass Index-BMI classifications WHO (1995)	Underweight (<18.5)	9.30 (n=7)		4.30 (n=8)	
	Normal weight (> 18.5- 24.99)	29.30 (n=22)		30.80 (n=57)	
	Overweight (> 25.00-29.99)	34.70 (n=26)		30.80 (n=43)	
	Obese I (> 30.00- 34.99) Obese II (> 35.00-39.99) Obese III (≥40)	18.70 (n=14) 5.30 (n=4) 2.70 (n=2)	26.70	23.20 (n=16) 8.60 (n=16) 2.20 (n=4)	34.00
	TOTAL	**100%**		**100%**	

Table 4.14 shows that 9.30% (n=7) of the men are underweight as compared to the 4.30% (n=8) of the women who are underweight. Slightly over one third (34.70%; n=26) of the men and 30.80% (n=43) of the women are overweight. Of the men, 26.70% (n=20) fall under the obese category, whereas there were 34.00% (n=36) of the women in the obese category.

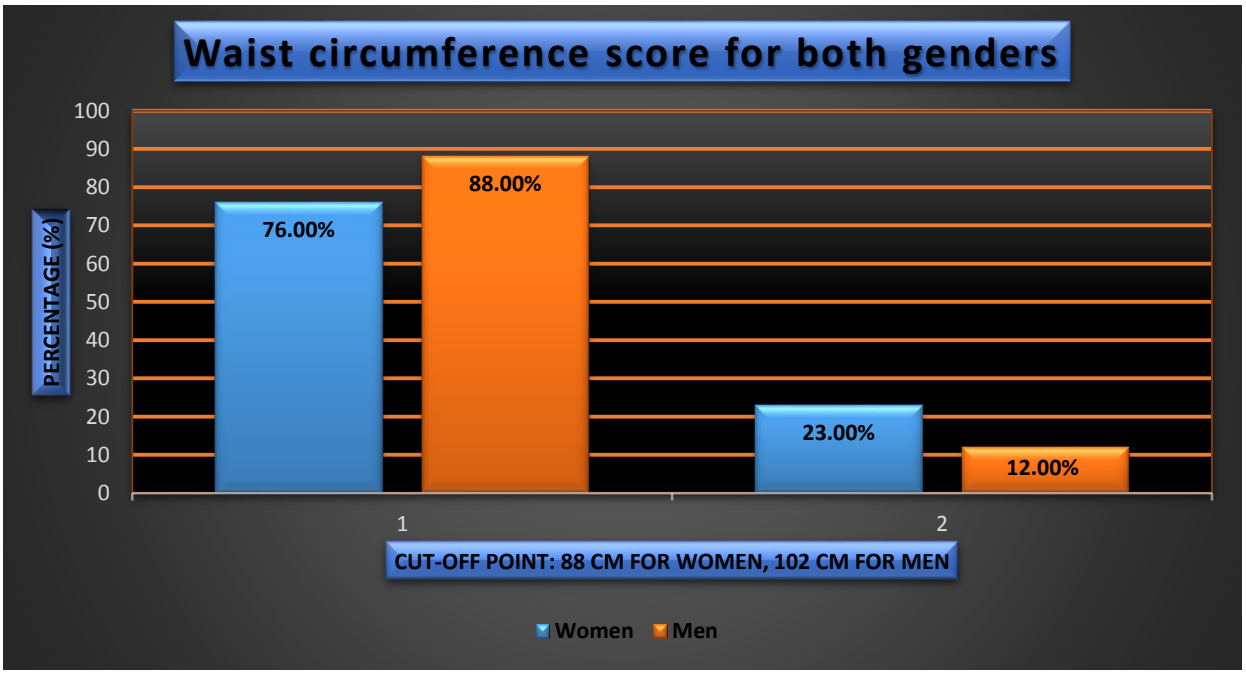

Figure 4.1: Cut-off points for waist circumference (WC) for men (n= 75) and women (n=185)

The majority (88.00%) (n=66) of the men showed abdominal fat distribution within the recommended cut-off point (≤102 cm) and only n=9 of the men exceeded the recommended score of (≥102 cm) with a mean WC of 83.93 cm. The majority of the women 76.00% (n=142) were within the normal cut-off point (≤ 88 cm); only 23.00% (n=43) were above the cut-off point of (≥ 88cm) with a mean WC of 82.59 cm. No statistical significance was observed between the men and the women (*p*=0.464).

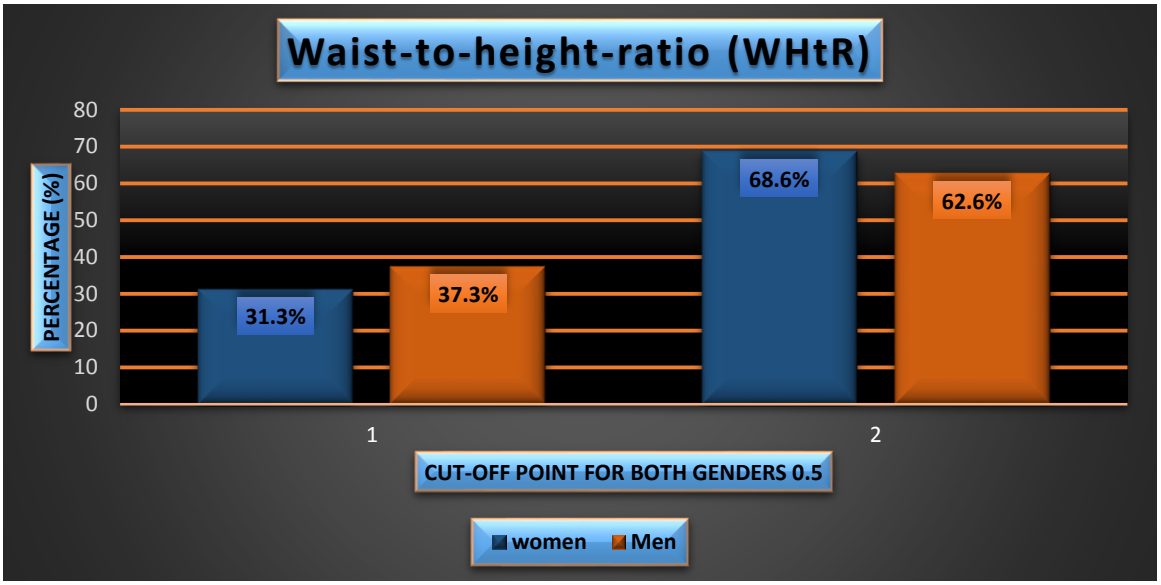

Figure 4.2: Waist-to-height-ratio score (WHtR) of the men (n=75) and women (n=185)

The score of waist-to-height-ratio (WHtR) in Figure 4.2 was determined by dividing the waist circumference by height measurement in centimetres. WHtR is used as a predictor of coronary risk and metabolic syndrome. The results revealed that the majority (68.60%) (n=127) of the women were at risk of metabolic syndrome and coronary disease as the WHtR scores were ≥0.5, and 62.60% (n=47) of the men were at risk of metabolic syndrome and coronary disease as the WHtR scores were ≥0.5. Approximately a third (n=58) of the women had a WHtR that was <0.5, which indicates a normal value and 37.30% (n=28) of the men had a WHtR that was <0.5, which indicates a normal value. No statistical significance was observed between the men and the women (*p*=0.341).

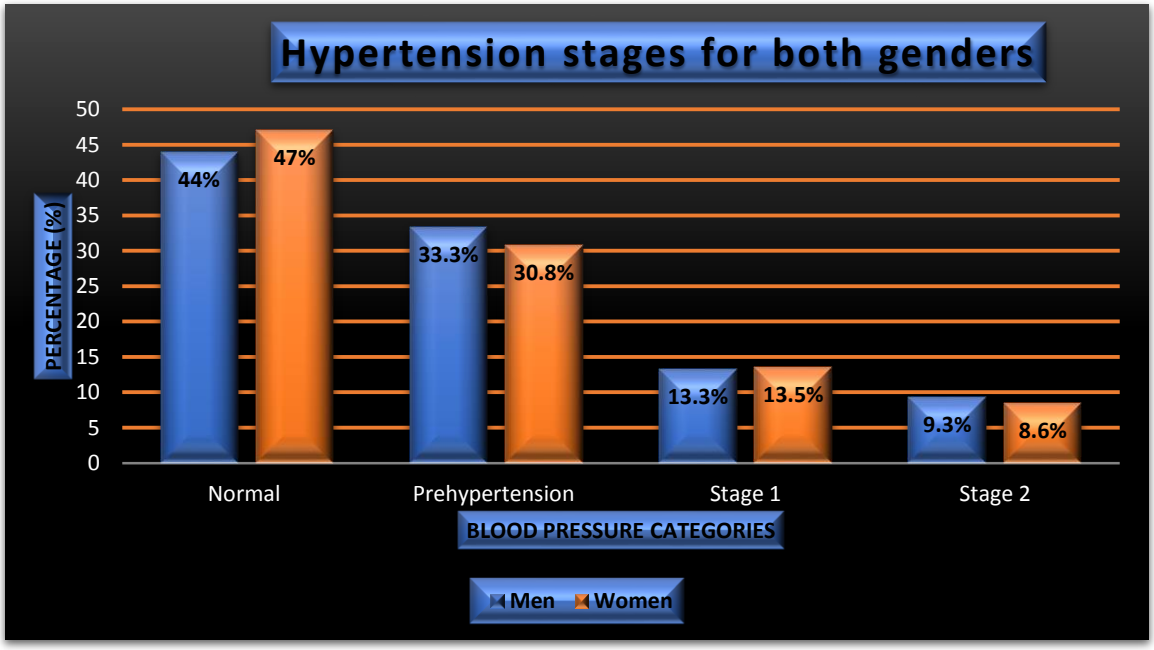

Figure 4.3: Hypertension stages for both genders (men n=75; women n=185)

Figure 4.3 indicates that 44% (n=33) of the men and 47% (n=87) of the women have normal blood pressure, 33.3% (n=25) of the men were pre-hypertensive, both the men and the women 26.8% (n=35) were at stage 1 and 9.3% (n=7) of the men were at stage 2. No statistical significance was observed between the men and the women for systolic blood pressure (p=0.656) or diastolic blood pressure (p=0.514).

4.2.3 HEALTH ASSESSMENT

4.2.3.1 Health and Behavioural Survey

Table 4.15: History of disease

Variables	Number (n=260)	Percentage (%)
Skin disease:		
Yes	64	24.60
Affliction of the skeleton and/ or joints:		
Yes	185	71.20
Infection of the eyes, ears, nose, and/ or teeth:		
Yes	213	81.90
Affliction of the heart or circulatory system:		
Yes	124	47.70
Affliction of the chest and/ or respiratory system:		

Yes	132	50.80
Affection of the digestive system:		
Yes	80	30.80
Affection of the urinary system and or genital organs:		
Yes	76	29.20
Nervous affliction or mental abnormality:		
Yes	124	47.70
Headaches:		
Yes	118	45.40
Other illness:		
Yes	24	9.20
Any defects of hearing, speech or sight?		
Yes	216	83.10

The health information was self-reported and not assessed by the researcher. The history of health associated with diseases is summarized in Table 4.15, indicating that 24.60% (n=64) of the participants had reported skin diseases, 71.20% (n=185) of the participants suffered from diseases of the skeleton or joints and 81.90% (n=213) of the participants had problems with the eyes, ears, nose and teeth. Forty seven point seven percent (47.7%) (n=124) of the participants suffered from diseases of the heart or circulatory system. Diseases of the chest or respiratory system were experienced by 50.80% (n=132) of the participants. Moreover, 47.70% (n=124) of the participants reported suffering from nervous illnesses or mental abnormality and 45.40% (n=118) of the participants suffered from headaches. A small percentage of the participants (9.20%) (n=24) reported suffering from other illnesses. A large number of the participants (83.10%) (n=216) had some form of defects of hearing, speech or sight.

Table 4.16: Changes in the functionality of the body

Variables	Number (n=260)	Percentage (%)
Weight lost:		
Yes	156	61.20
Change in appetite:		
Yes	123	47.30
Problem with chewing:		
Yes	86	33.10
Problem with swallowing:		
Yes	52	20.00
Problem with nausea:		
Yes	67	25.80
Problem with diarrhea:		
Yes	62	23.80
Problem with vomiting:		
Yes	53	20.40

Problem with constipation:		
Yes	104	40.00
Special diet:		
No	**260**	**100.00**
Allergic to any food:		
No	**260**	**100.00**

Table 4.16 illustrates some of the functional changes that the participants had experienced. Forty seven point three percent (47.30%) (n=123) of the participants had a change in appetite, 33.10% (n=86) of the participants had problems with chewing, twenty percent (n=52) of the participants had experienced problems with swallowing, 25.80% (n=67) of the participants had experienced nausea, 20.40% (n=53) had experienced vomiting and 23.80% (n=62) had experienced diarrhoea. Forty percent (40.0%) (n=104) of the participants had experienced constipation but none of the participants had special diets or food allergies.

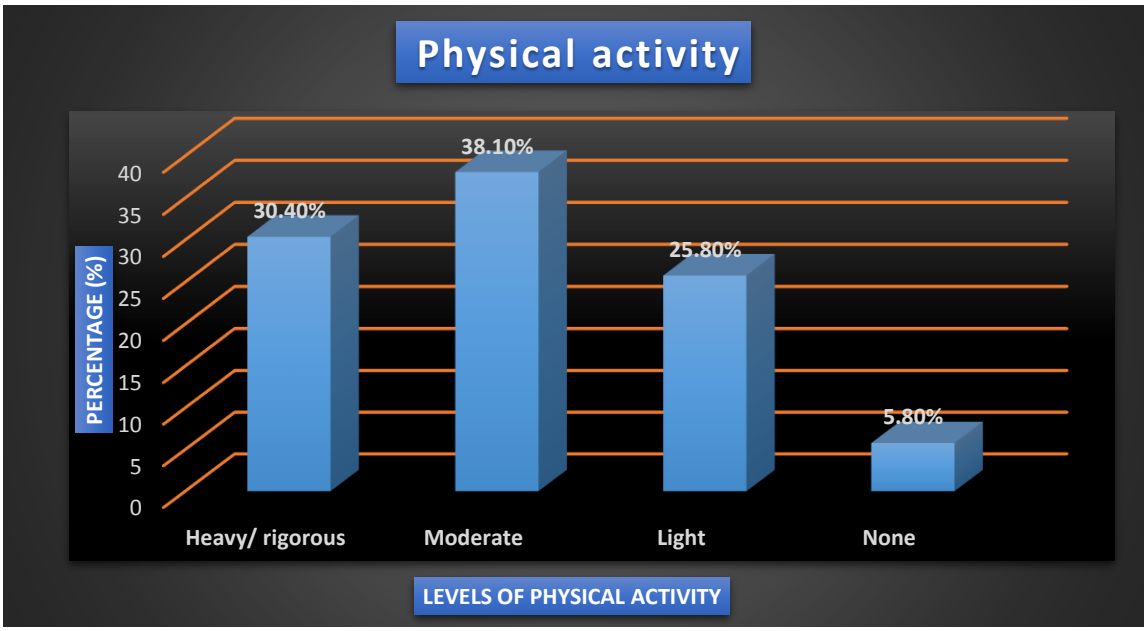

Figure 4.4: The level of physical activity for the whole group (n=260)

According to Figure 4.4, 38.10% (n=99) of the participants were moderately active, 30.40% (n=79) were heavily active, 25.80% (n=67) were lightly active and a small number of the participants (5.80%; n=15) were physically inactive.

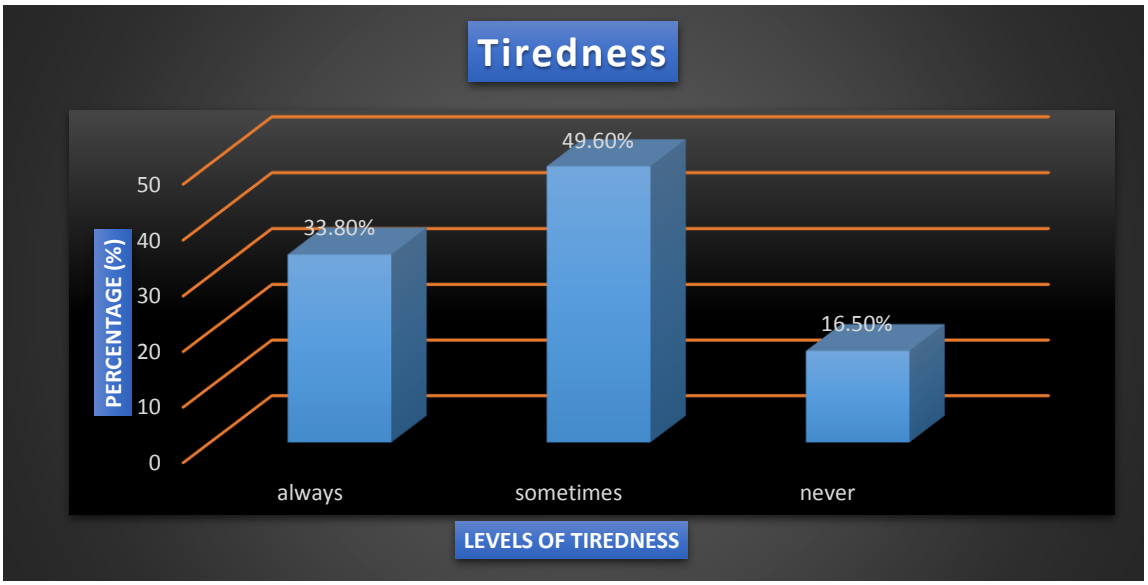

Figure 4.5: The level of tiredness (n=260)

Figure 4.5 illustrates the level of tiredness that the participants experienced: 49.60% (n=129) of the participants sometimes experienced tiredness, 33.80% (n=88) of the participants always experienced tiredness and 16.50% (n=43) of the participants never experienced any level of fatigue.

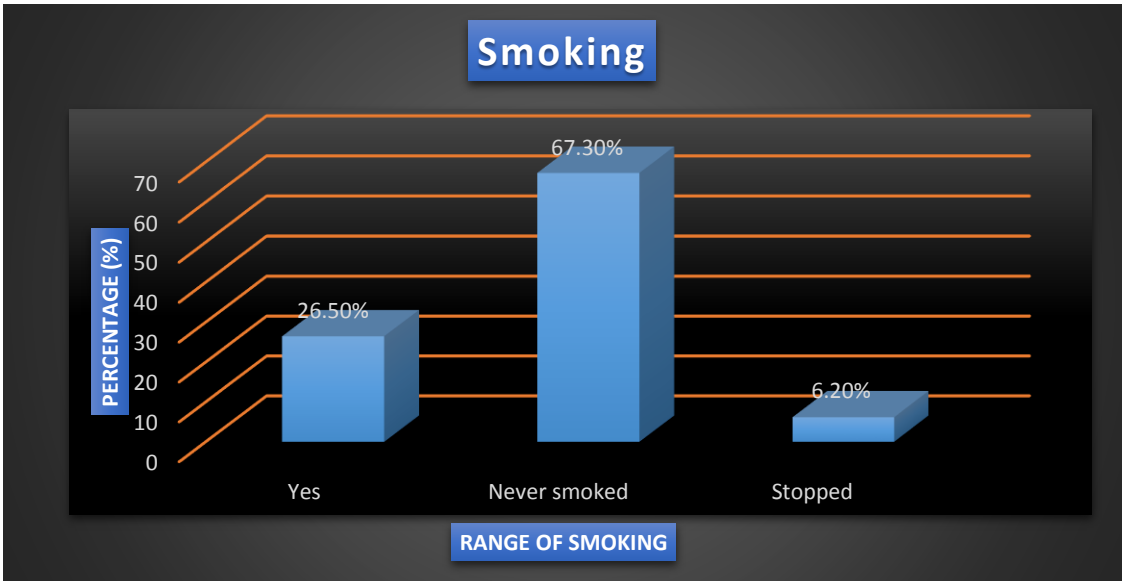

Figure 4.6: Substance usage (smoking) (n=260)

Figure 4.6 shows the usage of a substance (smoking). A large number of participants (67.30%; n=175) had never smoked, 26.50% (n=69) of the participants smoked, and a small number of participants (6.20%) (n=16) had stopped smoking.

Table 4.17: Substance usage

Variable	Number n=260	Percentage %
Cigarettes (homemade):		
Yes	33	12.70
Cigarettes (bought):		
Yes	7	9.60
Pipe		
Yes	25	9.60
Does your partner smoke?		
Yes	91	35.00
Do you use snuff?		
Yes	79	30.40
Never used	168	64.60
Stopped	13	5.00
Total	**260**	**100.00**
Do you use alcohol on a regular basis?		
Yes	104	40.00
Frequent use of alcohol:		
Every day	50	19.20
Once a week	14	5.40
Occasionally	37	14.20
Not applicable	156	61.20
Total	**260**	**100.00**
Type of alcohol consumed:		
Commercial beer	26	10.00
Home brewed beer	93	35.40
Not applicable	141	54.20
Total	**260**	**100.00**

With regard to substance abuse, Table 4.17 indicates that 12.70% (n=33) of the participants smoked homemade cigarettes, 9.60% (n=7) of the participants smoked bought cigarettes, 9.60% (n=25) of the participants smoked a pipe and 30.40% (n=79) of the participants used snuff. Thirty five percent (35.0%) (n=91) of the participants lived with partners who smoked. Forty percent (40.0%) (n=104) of the participants consumed alcohol on a regular basis and of those that consumed alcohol, 19.20% (n=50) consumed alcohol every day, 14.20% (n=37%) consumed alcohol occasionally and 5.40% (n=14) consumed alcohol once a week. A small number of the participants (10.00%) (n=26) consumed commercial beer and 35.40% (n=92) of the participants consumed home-brewed beer.

Table 4.18: Usage of medication and a health facility

Variables	Number n=260	Percentage %
Do you use any medication?		
Yes	103	39.60
Do you take any supplements?		
No	**260**	**100.00**
Have you undergone any operation?		
Yes	58	22.30
Health facility used:		
Clinic	220	84.20
Hospital	11	4.20
Traditional healer	18	6.90
Means of travelling:		
On foot	**260**	**100.00**
Taxi	41	15.80
Bus	8	3.10
Other (horse or donkey)	34	13.10

Table 4.18 presents the results on the use of chronic medication, where 39.60% (n=103) of the participants reported the use of chronic medication and 100% of the participants did not take any supplements. A small number of the participants (22.30%) (n=58) had undergone some form of surgical operation. In addition, 84.20% (n=219) of the participants indicated using a clinic, 4.20% (n=11) of the participants used a hospital and 6.90% (n=18) of the participants used a traditional healer as the type of health facility. All (100%) of the participants walked to the health facilities; 15.80% (n=41) of the participants used a taxi, 3.10% (n=8) a bus and 34% (n=13.10) used others sources (horses or donkey) as alternative means of transportation to the health facility.

4.2.4 DIETARY ASSESSMENT RESULTS

Dietary assessment was conducted by using three 24-Hour Food Recall questionnaires including two week days and one weekend day and a Food Frequency questionnaire indicating variety over a seven-day period. Extrapolated is the nutrient intake, top 20 foods consumed, energy distribution, fruit and vegetable intake, food variety score and food group diversity score as well as the nutrient adequacy ratio.

4.2.4.1 Dietary Nutrients Intake and Top 20 Food Items Consumed

Table 4.19: The Dietary Intake Nutrients Analysis, Nutrient Adequacy Ratio (NARs) and % of the participants not meeting the DRIs measured using the average of three 24 Hour Food Recall, for men and women separately (loM 2003)

Nutrients p/day	Men (n=75) Mean ± SD	Men NARs Mean % of the DRIs	% Men consuming <100% of DRIs	Women (n=185) Mean ± SD	Women Mean % of the DRIs	% Women consuming <100% of DRIs	DRI'S
Energy (kJ) EER	4945.61 ±2014.09	38.39	100.00	4920.77 ±1900.07	48.75	97.87	♂12881kJ ♀10093 kJ
Total protein (g)	33.64 ± 14.29	60.07	93.3	34.93 ±15.94	75.94	82.70	♂56 RDA ♀46 RDA
Total fat (g)	17.82 ±9.30			16.69 ±9.32			
Carbohydrates (g)	201.25 ±90.73	201.25	8.00	201.05 ±85.36	201.05	10.81	♂100 EAR ♀100 EAR
Total dietary fibre (g)	17.27 ±8.33	57.57	69.00	17.22 ±9.08	82.01	72.43	♂30 AI ♀21 AI
Calcium (mg)	186.74 ±134.27	15.56	100.00	208.53 ±170.35	17.38	100.00	♂1200 AI ♀1200 AI
Iron (mg)	13.41 ±5.79	223.51	6.66	12.82 ±5.50	256.40	5.94	♂6.0 EAR ♀5.0 EAR
Magnesium (mg)	208.27 ±96.66	59.51	90.66	236.53±117.37	89.25	61.08	♂350 EAR ♀260 EAR
Phosphorus (mg)	665. 54 ±286.32	114.75	57.33	683.92 ±51.38	117.92	38.37	♂580 EAR ♀580 EAR
Zinc (mg)	6.83 ±3.02	72.69	81.33	6.71 ±3.01	98.66	51.89	♂9.4 EAR ♀6.8 EAR
Selenium (µg)	6.79 ±7.94	15.09	100.00	7.11 ±8.42	15.81	98.91	♂45 EAR ♀45 EAR
Iodine (µg)	116.17 ±51.89	122.28	32.00	121.49 ±140.15	127.88	39.45	♂95 EAR ♀95 EAR
Vitamin A (µg)	546.46 ±629.11	87.43	76.00	403.85 ±307.35	80.77	74.59	♂625 EAR ♀500 EAR
Thiamin (mg)	1.18 ±0.57	117.92	42.66	1.14 ±0.52	126.80	31.89	♂1.0 EAR ♀0.9 EAR
Riboflavin (mg)	0.65±0.32	59.21	92.00	0.66 ±0.33	72.90	82.70	♂1.1 EAR ♀0.9 EAR
Niacin (mg)	12.07 ±6.08	100.58	54.66	11.60±5.95	105.46	49.72	♂12 EAR ♀11 EAR
Vitamin B6 (mg)	0.90±0.49	64.49	88.00	0.79 ±0.43	60.67	92.43	♂1.4 EAR ♀1.3 EAR
Folate (µg)	398.99 ±208.13	124.68	41.33	369.29 ±204.36	115.40	44.86	♂320 EAR ♀320 EAR
Vitamin B12 (µg)	1.26 ±3.51	63.15	88.00	0.86 ±2.26	43.14	90.81	♂2.0 EAR ♀2.0 EAR

Pantothenate (mg)	1.93 ±1.52	38.64	96.00	1.98 ±1.98	39.61	95.13	♂5.0 AI ♀5.0 AI
Biotin (µg)	19.54 ±25.56	65.15	93.33	15.28 ±11.61	50.93	94.05	♂30 AI ♀30 AI
Vitamin C (mg)	14.37 ±23.05	19.16	98.66	13.11 ±23.72	21.85	98.37	♂75 EAR ♀60 EAR
Vitamin D (µg)	0.80 ±2.31	5.30	98.66	0.89 ±1.86	8.93	98.37	♂15 AI ♀10 AI
Vitamin E (mg)	5.57 ±4.07	46.43	92.00	4.93 ±3.56	41.05	94.59	♂12 EAR ♀12 EAR
Vitamin K (µg)	471.96 ±449.68	393.30	22.00	403.92 ±451.81	448.79	31.89	♂120 AI ♀90 AI

♀Women 185, ♂Men 75
EER: Estimated Energy Requirements (Institutes of Medicine, 2003)
AI: (Adequate Intake) used where EAR (Estimated Average Requirement) is not available
EAR: estimated average requirements
RDA (Recommended Dietary Allowance)

Table 4.19 indicates the EER for energy in this group was recommended at 12 881kJ for men and 10 093kJ for women. All the men (4945.61kJ) and women (4920.77 kJ) took in less than 100% of the EER for energy, with no statistical difference between the men and women (p=0.923). Carbohydrate intake was high for both men (201.25g; ±90.73) and women (201.05g; ±85.36), the DRI for carbohydrates in this group was recommended at 100g for both men and women. Protein intake for both men and women was low at 33.64g (±14.29) for men and 34.93g (±15.94) for women, compared to the recommended DRI of 56g for men and 46g for women. The men consumed on average more total dietary fibre than the requirement (57.57g); however, 69.00% of the men did not meet 100% of the requirement. The men consumed on average more total dietary fibre than the requirement (82.01g); however, 72.43% of the men did not meet 100% of the requirement. The results of the diet indicated a mineral deficiency intake of calcium as seen in men of 186.74mg (±134.27) and in women 208.53g (±170.35) compared to the recommended DRI, which was 1200g for both men and women. The men and women consumed only 15.56% and 17.38% respectively of the Al required for calcium. The phosphorus intake for men and women was high at (665.54mg; ±286.32) and (683.92mg; ±51.38) respectively, the DRI for phosphorus in this group was recommended at 580g for both men and women. The NARs for both men (114.75%) and women (117.92%) in phosphorus was more than 100%. The iron intake was more than double the required amount of the NARs at 223.51% for men and 256.40% for women. A deficient intake of selenium in men and women was noted at 6.79µg (±7.94) and 7.11µg (±8.42) respectively compared to the recommended 45µg. Iodine intake for men was 116.17µg (±51.89)

and for women it was 121.49 µg (±140.15), where the recommended DRI for iodine in this group was 95g for both men and women. The deficient intake of folate in men was 398.99µg (±208.13) and in women 369.29µg (±204.36), which was higher than the recommended DRI for folate for both men and women which is 320µg. The men consumed on average more folate than the requirement (124.68g); however, 41.33% of the men did not meet 100% of the requirement. The women consumed on average more folate than the requirement (115.50g); however, 44.86% of the women did not meet 100% of the requirement. The pantothenate intake for men was 1.93mg (±1.52) and 1.98mg (±1.98) for women, lower than the recommended intake at 5.0mg for both men and women. Vitamin C intake for men was 14.37mg (±23.05) and 13.11mg (±23.72) for women, which was lower than the recommended DRI of 75mg for men and 60mg for women. The deficiency of vitamin D 0.80µg was (±2.31) for men and 0.89µg (±1.86) for women; this was low compared to the recommended DRI at 15g for men and 10g for women and the NARS were also lower at 5.30% for men and 8.93% for women. The vitamin K for men at 471.96µg (±449.68) and for women at 403.92µg (±451.81) exceeded the DRIs in males at 120µg and 90µg for women, and the NARs for men were almost triple (393.30%) and for women the NARS were above triple (448.79%) the requirements. NARs for niacin for men was 100.58% and for women 105.46%, just slightly above the required 100%.

4.2.4.1.1 Top 20 Foods Intake

The Top 20 most frequently consumed food items are presented in the total intake by the group of women (n=185) and men (n=75) aged 60 and above. The main source of food intake across the genders was from the carbohydrate food groups: maize meal appears at number one in all groups. Table 4.20 and Table 4.21 reveal the Top 20 most popular food items and the average daily intake of the participants that consumed these items over two weekdays and one weekend day included in the 24-hour Food Recall.

Table 4.20: The mean Top 20 food items consumed by men over three days ranked by frequency consumed as measured by three 24-Hour Food Recalls (n=75)

No.	Food Item	Total Intake (g)	Mean Intake over 1 day (g)	Frequency for 1 day by the group	Per capita intake for 1 day (g)
1	Maize meal, porridge, stiff	119 865.00	39 955.00	127	532.73
2	Salt, table, iodised	763.00	254.33	85	3.39
3	Sunflower oil	1 394.00	464.67	67	6.20
4	Spinach (Swiss chard), boiled	12 365.00	4 121.67	47	54.96
5	Mabella/ sorghum, cooked	34 940.00	11 646.67	26	155.29
6	Cabbage, boiled	8 035.00	2 678.33	25	35.71
7	Maize meal, porridge, soft	31 040.00	10 346.67	19	137.96
8	Steamed bread	6 080.00	2 026.67	14	27.02
9	Sugar	1 038.50	346.17	11	4.62
10	Tea, brewed	8 385.00	2 795.00	10	37.27
11	Beer, Sorghum	3 2320.00	10 773.33	9	143.64
12	Beans, sugar, dried, cooked	4 250.00	1 416.67	8	18.89
13	Chicken, meat and skin, frozen, boiled	1 785.00	595.00	5	7.93
14	Milk, full fat/ whole	6 390.00	2 130.00	4	28.40
15	Beef, brisket, cooked	555.00	185.00	2	2.47
16	Egg, fried in Sunflower oil	605.00	201.67	2	2.69
17	Salami, beef/ pork (also Russians)	350.00	116.67	2	1.56
18	Soup powder, prepared with water	1 315.00	438.33	2	5.84
19	Carrots, boiled	200.00	66.67	2	0.89
20	Lard	120.00	40.00	2	0.53

The frequency consumed (the number of times the food items was consumed by the group)**. The mean (SD±) intake as well as the per capita** (the average amount each person would have consumed if the whole group had consumed some)**.**

Table 4.20 indicates that the group of men consumed a large amount of cereals: maize meal, porridge, stiff (39 955.00g), mabella/sorghum, cooked (11 646.67g), maize meal, porridge (10 346.67g), steamed bread (2 026.67g); beer, sorghum (101 773.33g), which appears at number 1, 5, 7, 8 and 11 respectively on the Top 20. Salt, table, iodized appears at number 2 as the first mineral and it was only consumed 85.33 times by the group; however, the portion was 254.33g. Sunflower oil appears at number 3 and it is only consumed 67.00 times by the group. Sugar appears at number 9 and it is only consumed 11 times by the group and only 4.62 per person per day. Tea, brewed appears at number 10 and it is consumed 37.27 times per person per day. Protein such as beans, sugar, dried, cooked (1 416.67g), chicken, meat and skin, frozen, boiled (595.00g), beef, brisket,

cooked, moist (185.00g), eggs, fried in oil (201.67g) and salami, beef/pork (also Russian) (116.67g) appear at numbers 12, 13, 15, 16 and 17 respectively. Spinach (Swiss chard), cabbage and carrots (flesh and skin) boiled are presented at numbers 4, 6 and 19 as the first vegetable items with portion sizes of 4 121.67g, 2 678.33g and 66.67g respectively. Under dairy and dairy products, milk, full fat appears at number 14 with the portion size of 2 130.00g. Fats and oils as sunflower oil (464.67g) and lard (40.00g) appear at number 3 and 20 respectively. No fruit appeared in the Top 20 in this group.

Table 4.21: The mean Top 20 food items consumed by women over three days ranked by frequency consumed as measured by three 24-Hour Food Recalls (n=185)

No.	**Food Item**	**Total Intake (g)**	**Mean Intake over 1 day (g)**	**Frequency for 1 day**	**Per capita intake for 1 day (g)**
1	Maize meal, porridge, stiff	230 227.50	76 742.50	265	414.82
2	Salt, table, iodised	1 732.50	577.50	184	3.12
3	Sunflower oil	2 482.50	827.50	138	4.47
4	Spinach (Swiss chard), Boiled	24 835.00	8 278.33	84	44.75
5	Mabella/ sorghum, cooked	10 4875.00	34 958.33	75	188.96
6	Cabbage, boiled	13 272.00	4 424.00	51	23.91
7	Steamed bread	17 270.00	5 756.67	41	31.12
8	Maize meal, porridge, soft	61 975.00	20 658.33	37	111.67
9	Tea, brewed	31 660.00	10 553.33	36	57.05
10	Sugar, brown	2 839.00	946.33	35	5.12
11	Beans, sugar, dried, cooked	18 860.00	6 286.67	32	33.98
12	Beer, sorghum	127 550.00	42 516.67	32	229.82
13	Milk, full fat	18 295.00	60 98.33	16	32.96
14	Chicken, meat and skin, frozen, boiled	5 165.00	1 721.67	14	9.31
15	Egg, fried in Sunflower oil	2 310.00	770.00	9	4.16
16	Maize, samp/rice, cooked	7 440.00	2 480.00	8	13.41
17	Peas, split, cooked	2 985.00	995.00	8	5.38
18	Leaves, nettle, raw	925.00	308.33	7	1.67
19	Cold drink, squash, diluted	6 690.00	2 230.00	6	12.05
20	Soup powder, prepared with water	3120.00	1 040.00	6	5.62

The frequency consumed (the number of times the food items was consumed by the group)**. The mean (SD±) intake as well as the per capita** (the average amount each person would have consumed if the whole group had consumed some).

Table 4.21 indicates that the women consumed a large amount of cereals as maize meal, porridge, stiff (76 742.50g), mabella/sorghum, cooked (34 9958.33g), steamed bread (5 756.67g), maize meal, porridge, soft (20 658.33g), beer, sorghum (42 516.67g), maize, samp/ rice, cooked (2 480.00g), which appear at number 1, 5, 7, 8, 12, and 16 respectively on the Top 20. Salt, table, iodized appears at number 2 as the first mineral and it was only consumed 185.00 times by the group; the portion, however, was 577.50g. Sunflower oil appears at number 3 and it is only consumed 138 times by the group. Sugar appears at number 10 and it is only consumed 35 times by the group and 5.12 times per person per day. Tea, brewed appears at number 9 and it is consumed 57.05 times per person per day. Protein as beans, sugar, dried, cooked (6 286.67g), chicken, meat and skin, frozen, boiled (1 721.67g), eggs, fried in oil (770.00g) and peas, split, cooked (995.00g) appears at number 11, 14, 15 and 17 respectively. Spinach (Swiss chard) and cabbage, boiled are presented at number 4, and 6 as the first vegetable items with portion sizes of 8 278.33g and 4 424.00g respectively. Under dairy and dairy products, milk, full fat appears at number 13 with the portion size of 6098.33g. Fats, oils and sugars such as sunflower oil (827.50g) and cold drink, squash, diluted (2 230.00g) appears at number 3 and 19 respectively. No fruit appeared on the Top 20 on this group.

Table 4.22: The fruit and vegetable intake measured by three 24-Hour Food Recalls (WHO, 2003)

Men (n=75)	**Women (n=185)**
Mean intake per individual	**Mean intake per individual**
279.50g	321.73g

Table 4.22 presents the fruit and vegetable intake, as mean (±SD) of the three 24-Hour Food Recall indicated that the sample was consuming far less than the ≥400g per day recommended by the WHO. The overall frequency of fruit and vegetable consumption was too low and the portion size of the fruit and vegetables of the three 24-Hour Food Recall by both men and women was too small; at 279.50g for men and 321.73g for women. The amount consumed did not meet the recommended intake of at least 400g or five or more portions of fruit or vegetables a day (WHO, 2003**)**

Table 4.23: The percentage of energy distribution of the macronutrient from the average of three 24-Hour Food Recalls (WHO, 2003)

Macronutrients	Mean ± SD	Mean % Energy contribution	WHO Goal
Men (n=75)			
Total fat (g)	17.82 ±9.30	13.33	15-30 %
Protein (g)	33.64 ±14.29	11.56	10-15 %
Carbohydrate (g) & fibre (g)	218.52±99.06	75.12	55-75 %
Women (n=185)			
Total fat (g)	16.69 ±9.32	12.55	15-30 %
Protein (g)	34.93 ±15.94	12.07	10-15 %
Carbohydrate (g) & fibre (g)	218.27 ±94.44	75.41	55-75 %

Table 4.23 presents the results of the energy distribution of the macronutrients from the average of the three 24-Hour Food Recalls according to the World Health Organization dietary factor goals (2003). The total fat intake of all the groups was slightly below the recommended goal by the WHO (15-30%), with men obtaining 13.33% and women 12.55% of energy from fat. Carbohydrates contributed 75.12% for men and 75.41% for women of the daily energy needs in the groups, slightly above the levels recommended by the WHO (55-75%). The contribution of protein to total daily energy intake for all the groups was within the recommendation of 10-15%, with (11.56%) for men and (12.07%) for women. As a result this proves that the average participant consumed a balanced diet in terms of the macronutrient intake. Carbohydrates were the main source of food consumption.

4.2.5.2 Food Variety Score, Dietary Diversity Score and Nutrient Adequacy

Table 4.24: Household food access as measured by food variety within the food consumed over a period of seven days (n=260)

Meat Group (n=4)	Eggs Group (n=1)	Dairy Group (n=2)	Cereal Group (n=7)	Legume Group (n=3)	Vitamin A Group (n=4)	Fruit Group (n=3)	Vegetable Group (n=4)	Fats Group (n=4)	Total Individual foods Items Eaten from all Groups (n=20)
0=58 1=138 2=55 3=7 4=2	0=146 1=114	0=162 1=82 2=16	1=10 2=75 3=81 4=61 5=23	0=81 1=153 2=24 3=2	0=32 1=152 2=59 3=15 4=2	0=137 1=96 2=24 3=3	0=44 1=97 2=77 3=35 4=7	0=59 1=189 2=10 3=1 4=1	0-5=12 6-10=139 11-15=102 16-20=7

			6=6 7=4						

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.

The Food Variety Score (FVS) consisted of a count of single foods within the nine nutritional food groups. The Food Group Diversity Score (FGDS) indicates the number of food groups consumed over a period of 7 days as measured by the FFQ which is summarized in Table 4.24. In total, a maximum of 20 different individual food items were consumed within the seven-day period by any one participant. The total range of individual food items consumed by individuals during the seven-day data collection period was between 5–20 foods.

The highest number of individual foods consumed by the majority of the participants was between 6–10 individual foods (53.46%, n=139) followed by 11–15 individual foods (39.23%; n=102). The mean Food Variety Score (FVS) (±SD) for all the foods consumed from the food groups during seven days was 10.06 (±6.726), which indicated a low food variety score.

The food group with the most variety was the cereal group. Seven different cereals were consumed by (1.53%, n=4) participants, a large number of the participants (31.15%, n=81) only consumed three different cereals within a seven day period and (23.46%, n=61) of the participants consumed four different cereals (refer table 4.12).
This was followed by the meat group with four food items consumed and 53.07% (n=138) of the participants only consumed one food item and n=58 of the participants did not consume any food from the meat group. The vitamin A group consisted of four food items and 58.46% (n=153) of the participants consumed one food item. The vegetable group had four food items and 29.61% (n=77) of the participants consumed two food items. The fruit group had four food items and 36.92% (n=96) of the participants had consumed one food item and lastly the fats group consisted of four food items, and 72.69% (n=189) consumed one food item.

The least frequently consumed food item was eggs with only 43.84% (n=114) of the participants consuming eggs during the seven day period. Moreover, 62.30% (n=162) of the participants did not consume dairy products and 31.53% (n=82) of the participants consumed one food item from

the dairy group. A large number of the participants (58.84%) (n=153) consumed one food item from the legume group and 9.23% (n=24) of the participants only consumed two food items from the legume group.

Table 4.25: Summary of Food Variety Score within the Food Groups (n=260)

Food Group	Mean	±SD	Range of Scores
Cereals, roots and tubers	3.16	1.186	1-7
Other vegetables	1.48	1.009	0-4
Vitamin A-rich fruits and vegetables	1.25	0.768	0-4
Flesh foods meat , poultry, fish	1.07	0.779	0-4
Fats and oils	0.83	0.535	0-4
Dairy	0.44	0.609	0-2
Other fruit	0.59	0.706	0-3
Legumes and nuts	0.80	0.627	0-3
Eggs	0.44	0.497	0-1
Mean number of food items	10.06	6.726	3-20

A summary of the food group variety is presented in Table 4.25. A mean ±SD of 10.06 (±6.726) was observed for all the food consumed from all the food groups over a period of seven days, which indicated a low food variety score (low variety score =<30). The cereals, roots, and tubers group was reported to have the highest ranging score of 1 to 7 , followed by other vegetables, Vitamin A-rich fruits and vegetables, fresh foods, meat, poultry, fats and oils, legumes and nuts, other fruits, dairy and eggs with the mean FVS ±SD of 3.16 (±1.186), 1.48 (±1.009), 1.25 (±0.768), 1.07 (±0.770), 0.83 (±0.535), 0.80 (±0.627), 0.59 (±0.706), 0.44 (±0.609), and 0.44 (±0.497) respectively.

Table 4.26: Summary of Food Group Diversity (n=260)

Number of Food Groups Consumer n=9	Frequency	Percentage
1	0	0
2	2	0.80
3	8	3.10
4	20	7.70
5	39	15.10
6	65	25.70
7	77	29.70
8	44	17.00
9	5	1.5
Total	**260**	**100.00**

In Table 4.26 the majority of the participants (73.46%, n=191) could be classified with a good dietary diversity score for FGD because of the consumption of food from six to nine different food groups, followed by a medium dietary diversity score with 22.69% (n=59) of the group consuming from four to five different food groups and a lowest dietary diversity score (3.84%, n=10) because of the consumption of food from zero to three different food groups respectively. However, in this sample, five of the participants consumed all the nine food groups during the seven-day data collection but it is important to note that even though the mean is low on food variety score (10.06), there is a high diversity score of six to nine food groups consumed by the majority of the participants in this group.

4.2.4.3 The mean NAR of energy and nutrients at different levels of FGDS (Total Sample)

Data was not statistically adjusted for variance; full databases were used to draw correlations. The mean nutrient adequacy ratio (expressed as %) of energy, nutrients and vitamins at different levels were correlated to the FGDS. Very few people consumed from 2 (n=2), 3 (n=8) and 9 (n=5) food groups so any increase in nutrient intake in these groups should be read with caution; the majority of the group consumed between four and eight food groups.

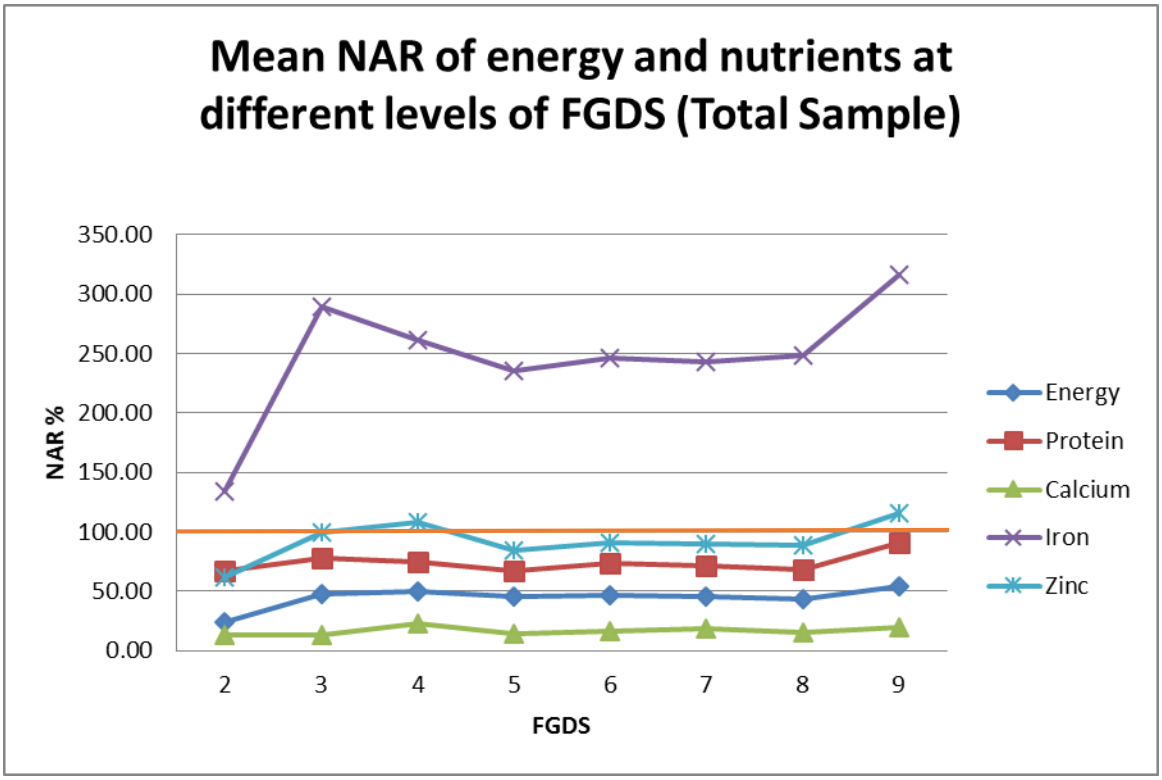

Figure 4.7: The mean NAR of energy and nutrients at different levels of FGDS (n=260)

Figure 4.7 indicates the relationship between the FGDS and the NAR of energy, protein and other minerals showed increased dietary diversity but there was no increase in the NAR for all the nutrients except for iron that shows a slight increase between food groups 5 and 9. All the nutrients except for the iron were below 100% NAR.

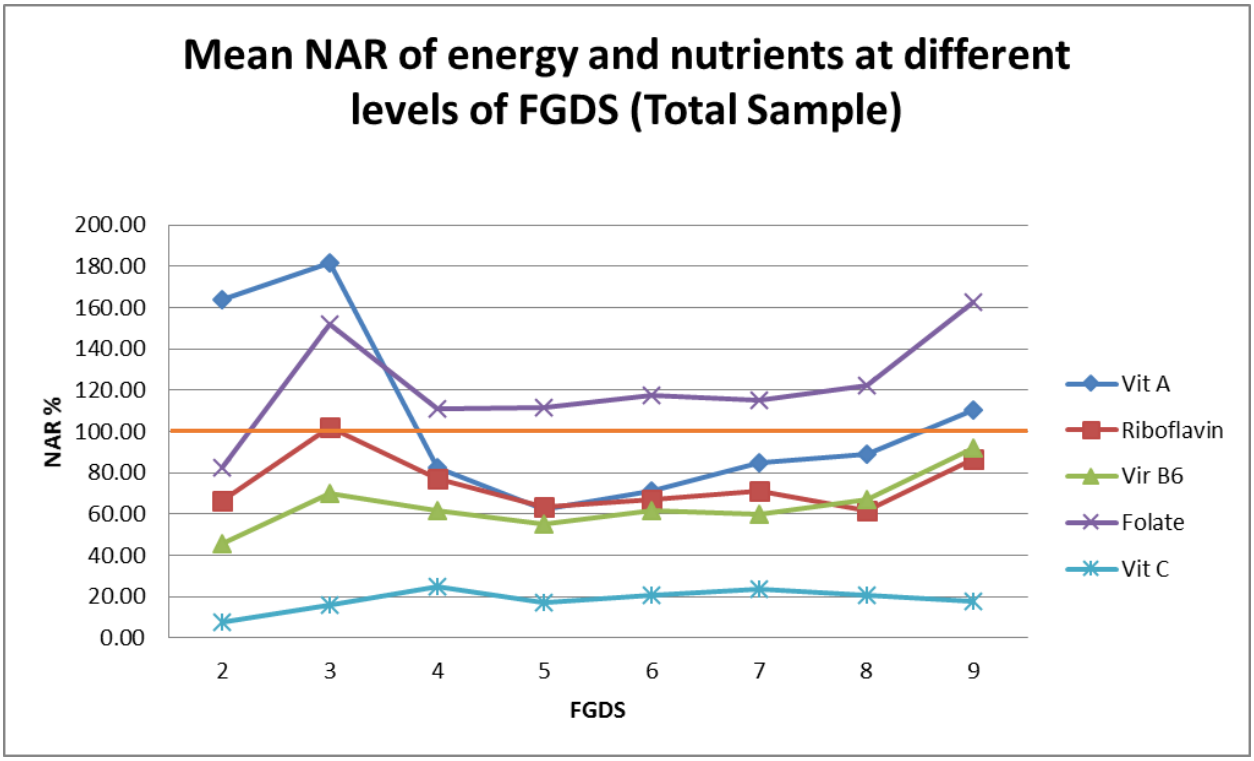

Figure 4.8: The mean NAR of energy and nutrients at different levels of FGDS (n=260)

Figure 4.8 indicates the relationship between FGDS and NAR of energy, protein and other minerals showed increased dietary diversity with a steady increase in vitamin A and vitamin B6 intake from food group 5 to 9. Folate is presented at above the 100% required intake and still showed a slight increase.

4.2.5 FOOD SECURITY AND COPING STRATEGIES

This section reports on the food security and coping strategies implemented by the village population (n=260) in order to gain access to food. The maximum food security score that could have been generated was 273 which would indicate severe food insecurity with the minimum as 0, which indicated food security. The higher the score, the greater the prevalence of food insecurity and the lower the score, the less food insecure the households were. Individual coping strategies were determined through a Focus Group discussion in the village and the sixteen coping strategies used in the village are reflected in Table 4.27. The main coping strategy that was used by the village was ‘reduce the number of meals eaten in a day’ and the main severity index score was 4.

Table 4.27: Individual coping strategies (mean) and the cumulative foods security index (n=260)

Participants (n=260)	Rely on less expensive and preferred food?	Borrow food, or rely on help from friends or relatives?	Buy food on credit?	Send household members to eat elsewhere?	Limit portion sizes at mealtimes?	Reduce the number of meals eaten in a day?	Skip meals for entire day?	Restrict consumption of food by adult in order for small children to eat?	Sell some belongings in order to get money to buy food?	Gather wild food, hunt, or harvest immature crop?	Consume seed stock held for next season or rent out the livestock?	Do piece work for food/money?	Contribute to food stokvel in order to ensure food over a scarce period?	Children have to leave school in order to work for food?	Cumulative index
	Frequency x severity														(min-max)
	(0-7) ~x1º (max score 7)	(07) ~x1º (max score 7)	(0-7) ~x3º (max score 21)	(0-7) ~x4º (max score 28)	(0-7) ~x3º (max score 21)	(0-7) ~x4º (max Score 28)	(0-7) ~x4º (max Score 28)	(0-7) ~x3º (max Score 21))	(0-7) ~x4º (max Score 28)	(0-7) ~x1º (max Score 7)	(0-7) ~x4º (max Score 28)	(0-7) ~x2º (max Score 14)	(0-7) ~x3º (max Score 21)	(0-7) ~x4º (max Score 28)	14.5-273
Mean food security score	6.63	5.36	14.08	13.68	17.15	22.26	12.97	16.74	8.40	5.79	8.47	5.88	6.42	8.27	140.35
±Standard deviation	1.299	2.705	9.122	12.864	6.946	9.413	12.806	7.154	11.545	5.495	11.672	6.365	9.029	11.897	56.499

~ Frequency scoring: 0 never (zero times per week); 0.5 hardly at all (once or fewer times per week); 1.5 once in a while (1 to 2 per week); 4.5 fairly often (3-6 times per week); 7 (all the time/every day).
º Severity weight: Based on ordinal ranking by focus group respondents (1 least severe and 4 most severe).

The individual coping strategies, the mean cumulative food security index and ±SD were determined and the results are expressed in Table 4.27. The cumulative scores range from 14.50 to 273 with the mean score of 140.35. The highest commonly used coping strategy was 'Reduce the number of meals eaten in a day' with the mean score of 22.26 (±9.413); the second highest was 'Limit portion sizes at mealtimes' with the mean score of 17.15 (±6.946), while other strategies were 'Restrict consumption by adults in order for the small children to eat', 16.74 (±7.154), 'Buy food on credit', 14.08 (±9.122), 'Send household members to eat elsewhere', 13.68 (±12.864), 'Skip meals for the entire day', 12.97 (±12.806), 'Consume seed stock held for next season or rent out the livestock', 8.47 (±11.672), 'Sell some belongings in order to get money to buy food', 8.40 (±11.545), 'Children have to leave school in order to work for food', 8.27 (±SD 11.897), 'Rely on less expensive and preferred food', 6.63 (±1.299) and 'Contribute to food stokvel in order to ensure food over a scarce period', 6.42 (±SD 9.029). The least used coping strategies were 'Do piece work for food/money', 5.88 (±6.365), 'Gather wild food, hunt, or harvest immature crops', 5.79

(±5.495) and 'Borrow food, or rely on help from relatives, or friends', 5.36 (±2.7050) by the total group of n=260.

4.2.7 TRADITIONAL AGRICULTURAL PRACTICES

Table 4.28: Access to land for crop plantation

Variable	Number (n= 260)	Percentage (%)
Access to land:		
Yes	208	80.00
Type of ownership:		
Private	208	80.00
Not applicable	52	20.00
Total	**260**	**100.00**
Usage of land:		
Crops	211	81.20
Not applicable	49	18.80
Total	**260**	**100.00**

The results in Table 4.28 indicate that a large number of the participants (80.00%; n=208) had access to land and the participants had full ownership of the land, while 20.00% (n=52) of the participants did not have access to land. The majority of the participants (81.20%; n=211) used the land for planting of crops.

Table 4.29: Water sources on the crop plantation

Variable	Number (n= 260)	Percentage (%)
Water sources		
River/Stream	103	39.60
Dam	28	10.80
Tank	4	1.50
Rain	162	62.30
How much land can be watered?		
Less than half	54	20.80
About half	47	18.10
More than half	39	15.00
All	68	26.20
None	52	20.00
Total	**260**	**100.00**

According to Table 4.29, 39.60% (n=102) of the participants used either river or stream water to water their crops, 62.30% (n=162) used rain water, 10.80% (n=28) used dam water and 1.50%

(n=4) used tank water to water their crops. Slightly over a quarter (26.20%, n=68) of the participants could water all of the land, 15.00% (n=39) of the participants could water more than half of the land, 18.10% (n=47) of the participants could water about half of the land and 20.80% (n=54) of the participants could only water less than half of the land.

Table 4.30: Other uses of land

Variable	Number (n= 260)	Percentage (%)
Can the land be sold?		
Yes	25	9.60
No	183	70.40
Not applicable	52	20.00
Total	**260**	**100.00**
Did the land get rented out?		
Yes	4	1.50
No	204	78.50
Not applicable	52	20.00
Total	**260**	**100.00**
Did you pay rent for the land?		
Yes	2	0.80
No	258	99.20
Total	**260**	**100.00**
In the past 12 months did land get rented out?		
No	**260**	**100.00**
Did you receive subsidies?		
No	**260**	**100.00**
Payment for services		
No	**260**	**100.00**

Table 4.30 indicates that 70.40% (n=183) of the participants reported that the land could not be sold, 78.50% (n=204) of the participants did not rent out the land and 99.20% (n=258) of the participants did not pay rent for the land. All the participants (100%) did not receive any subsidies or payment for services in the past twelve months.

Table 4.32: Types of crops on the plots or fields

Variable	Number (n= 260)	Percentage (%)
Types of crop:		
Maize grain	122	46.90
Maize (fresh)	158	60.80
Sorghum	145	55.80

Wheat	58	22.30
Potato	75	28.80
Orchard fruit	84	32.30
Dry beans	158	60.80
Pumpkin/Squash	128	49.20
Green vegetables	43	16.50
Tomato	85	32.70
Onion	49	18.80
Other vegetable	95	36.50
Keeping livestock:		
Yes	205	78.80
No	55	21.20
Total	260	100.00
Type of livestock:		
Cattle	123	47.30
Sheep	74	28.40
Goats	27	10.30
Pigs	83	31.90
Poultry	130	50.00

In Table 4.31, 46.90 % (n=122) of the participants had harvested maize grain as one of the crops, 60.80% (n=158) of the participants had harvested fresh maize as one of the crops, 55.80% (n=145) had harvested sorghum and 22.30% (n=58) of the participant had harvested wheat. A small number of participants (28.80%; n=75) harvested potatoes. Thirty-two point three percent (32.3%) (n=84) of the participants had harvested orchard fruit, 60.80% (n=158) dry beans, 49.20% (n=128) pumpkin, 16.50% (n=43) green vegetables, 32.70% (n=85) tomatoes, 18.80% (n=49) onions and 36.50% (n=95) other vegetables. The majority of the participants 78.80% (n=205) had reported keeping livestock, of which 47% (n=123) of the participants kept cattle, 28.40% (n=74) had sheep, 10.30% (n=27) had goats, 31.90% (n=83) had pigs and 50.00% (n=130) of the participants had poultry.

4.3 DISCUSSION OF RESULTS

4.3.1 Socio-demographic data

UNFP (2012) reported that elderly people contribute a great deal in societies, especially in African societies, with the responsibility of caring for children orphaned by HIV and AIDS. Moreover, Higgins *et al* (2010 1189) highlighted that the number of grandchildren that grandparents provide care for increases with age and the UN (2012:5–8) reinforced this view by pointing out that in 2008 the Census Bureau reported that 2 617 580 children were under the care of grandparents in America. This could be correlated to the results in the study done in Mpharane which confirms that all the elderly participants resided with children and 29.00% were grandfathers and 71.00% were grandmothers. Grandmothers (81.00%) were the head of the households and most grandmothers (91.20%) were responsible for deciding how much money should be spent on food, preparation of food and feeding the grandchildren.

The Lesotho Disaster Management Authority (LDMA), Lesotho Vulnerability Assessment Committee (LVAC), the UN World Food Programme (2008) and WHO (2009: 3–4) explain how the transformation of the family structure occurred in Lesotho. One of the major causes was the HIV and AIDS epidemic because HIV and AIDS left several orphaned grandchildren per family under the care of elderly people who were the head of the household. This transformation contributed to the overcrowded households in Lesotho. The same results of the HIV and AIDS epidemic, based on changing the family structures can be depicted in the Oldewage-Theron *et al* (2008: 4) study conducted in SA, which yet again emphasizes that elderly people were usually caregivers for the grandchildren orphaned by the HIV and AIDS epidemic.

The number of children residing in the households differs in the results from the Mpharane study, where 45.40% of the participants had fewer than ten children in the household. Not all the children attended school but 54.40% of the grandparents had between two to three children in school and the children consumed all meals at school and at home. The remaining children (69.65%) consumed meals at home.

It was reported in this study that all the participants resided in houses owned by the participants and 94.20% had lived in the same houses for more than 3 years. Most of the houses were made out of zinc with cement floors and 59.20% of the houses had one room. The results also highlighted that all the participants had other people residing in the household beside the grandchildren. These findings were consistent with the WHO report (2003: 32) which revealed that a large number of elderly people in Lesotho resided with extended family members. Studies done by the UN (20212: 5–8) also support the research findings in the Lesotho study that in developing countries, especially in the rural areas, multigenerational co-residence occurred among elderly people, relatives and grandchildren regardless of any motivators or factors; it is a norm.

The UNPF (2012: 11–12) explains that the ageing population faces challenging demands when providing care for grandchildren. These challenges include providing excellent economic stability and household attributes, which in effect can result in extreme poverty because the elderly people in the households are the main net providers of care and support. The same challenges that the ageing population face were similar to those reported in the study done in Mpharane because all the participants in the study were unemployed for over a period of three years and were currently not seeking employment. One of the supporting reasons for unemployment for a long period of time could be that the participants were perceived as being too old for employment. Of the participants, the majority stated that 90.40% had extended family members residing in the households who did not contribute to the household income. The current state of unemployment created some form of vulnerability to poverty because of limited finances. The Lesotho Disaster Management Authority (LDMA), Lesotho Vulnerability Assessment Committee (LVAC) and the UN World Food Programme (2008) provided confirmation of the above results by outlining that the elderly population in Lesotho was unemployed and for those who were employed, the highest income per month was two hundred and twenty eight Maluti (M228.00) (R228.00), which is equivalent to $16.91. UNICEF (2003) indicates the impact of this minimum income by stating that more than 50% of the orphans in Africa are living with grandparents who have inadequate resources and unstable incomes to provide for the households.

The standard household income in Mpharane village ranged from R0.00 to R500.00 which was relatively high compared to the M228.00 that was stipulated by The Lesotho Disaster Management

Authority (LDMA), Lesotho Vulnerability Assessment Committee (LVAC) and the UN World Food Programme (2008). One of the reasons for this was the fact that the money was not an income but could have been a pension payment received. This statement is further clarified through the studies done in Lesotho by Nyanguru (2007: 11) and Chaka (2007: 28-29), which explain the financial budget structure of the households in Mpharane by elaborating that the Lesotho Government created the Lesotho Poverty Reduction Strategy (PRS), which was an initiative directed towards alleviating the existing socioeconomic challenges. In 2004, Lesotho provided economic assistance to members of the old age population in an attempt to eradicate poverty because Basotho people were faced with extreme chronic poverty. The Old Age Pension paid in 2004 was M150.00 (US$25.00) per person per month but in 2014, the same pension payment was revised to M450.00 per month per elderly person. This information further supports how the participants utilized the pension money since 44.20% of the participants spent R301.00 to R400.00 per month on food and 34.20% spent R201.00 to R300.00 per month on food. This could also highlight the fact that the majority (84.60%) of the participants bought food once a month and 61.20% often encountered a shortage of money to buy food and 11.20% always had a shortage of money to buy food. The results can also be related to the UNFPA (2012: 11–12) report since it explains that households that have elderly caregivers are marginally food insecure and at the risk of hunger because of financial problems. Moreover, it is suggested that investments in pension systems should be encouraged because it is one of the many ways to ensure economic independence and a decline in poverty in old age especially in developing countries.

Stewart and Yermo (2012) are in support of a pension scheme for the elderly because it contributes a vital part in poverty by alleviating demographic pressures among the elderly and providing support for households headed by grandparents. Boersch-Supan and Ludwig (2009: 1) stress that some of the problems that occur in pension systems are caused by decreased economic success. In most cases, when people turn 50 years old and above, they are no longer economically active. This causes a strain on the quality of resources and also a reliance on reserved (pension) funds. This could be one of the reasons why Golaz, Nowik, and Sajoux (2012: 2–3) emphasise that a large number of African people still do not have old age pension funds and the existing old age-related Welfare payments seem to be inadequate to sustain an appropriate standard of living. Notably, all the participants in this study were unemployed for more than three years.

4.3.2 Anthropometric data

The anthropometric findings from the study done in Mpharane village indicated different categories of the BMI values between men and women. The results showed that 13.70% of both men and women were underweight. The normal weight range for men and women was relatively similar with 29.30% for men and 30.80% for women. There were 34.70% of the men and 30.80% of the women who were overweight. Using the three categories of obesity, almost one third of the men and women were classified as obese. One of the factors that could have contributed to the overweight and obesity of the participants was the high amount of cereals that were consumed and are reflected in the FVS and FGDS of the Top 20 consumed food items (Table 4.20 and Table 4.21). This evidence was also presented in Table 4.19 which indicated that the carbohydrate intake was double the recommended DRIs for both men and women. Bahat, Tufan, Saka, Akin, Ozkaya, Yucel, Erten, and Karan (2012) and Kimyagarov, Klid, Levenkrohn, Fleissig, Kopel, Arad, and Adunsky (2012) illustrated similar BMI categories with their Mpharane study by highlighting that the participants were either well-nourished with the BMI of 22–27 kg/m^2 or malnourished with a low BMI of <22 kg/m^2 and overnourished with the highest BMI of >27 kg/m^2.

Oliveira, Fogaça and Leandro-Merhi (2009: 8) and the Population Reference Bureau (2007: 1) support the above statement regarding the nutritional status of elderly populations by pointing out that a significant portion of elderly populations all over the world were underweight and undernourished because of insufficient kilojoule intake and inadequate nutrient intake. Africans have experienced persistent poor food intake, resulting from the consumption of an insufficient amount and poor quality of food. Food and Health Innovation Services (FHIS) (2012) explains that malnutrition includes both under-nutrition and over-nutrition and the concern regarding an elderly population in the UK was that the elderly population did not consume sufficient amounts of food in order to maintain good nutrition. In old age, being underweight poses a far greater risk to health than being overweight, which is contrary to the study done in 2009 by Charlton and Rose.

Nowson (2010: 26) explained that obesity and overweight have become an epidemic in old age and the other emerging BMI condition was underweight (18.5-20kg/m^2) in people over the age of 80 years. In addition, Negin, Cumming, Remirez, Abimbola and Sachs (2011: 640-642) indicated

that the BMI of men gradually decreases with age and men at the age of 70 years and above have the lowest mean BMI, and prevalence of overweight in older women was double that of the older men. A study by Wyka, Biernat, Mikolajczak, and Piotrowska (2012) comparing elderly people staying at home and elderly people staying at a nursing home indicated that the environment plays a major role. Elderly people staying at home have been observed to have a worse nutritional status because the BMIs were higher than 29.9kg/m^2 in women and 26.6kg/m^2 in men compared to the elderly people staying in the nursing homes.

As indicated in the findings of the current study, the majority of men and women in Mpharane were either overweight or obese. A degree of supporting evidence for this result was shown in some of the findings of the waist circumference and WHtR scores. The waist circumference results indicated that both men and women exceeded the normal abdominal fat distribution. The WHtR scores revealed that the majority of women and men were at risk of metabolic syndrome and coronary disease because the WHtR scores were ≥0.5. Brunner, Herndler-Branstetter, Weinberger and Grubeck-Loebenstein (2011)states that the burden of disease does not only affect the elderly population but it also affects the whole family, especially if the elderly person was the source of income and this is mostly the case in developing countries.

4.3.3 Health Assessment data

Landi, Liperoti, Russo, Capoluongo, Barillaro, Pahor, Brnabei and Onder (2010: 752-753) and Nabalamba and Chikoko (2011: 2-3) explain that ageing increases the vulnerability of an elderly person to chronic health problems and in most cases the elderly population are faced with multi-morbidity, which is the presence of multiple diseases in an individual simultaneously. Co-morbidity affects the development of the concurrent diseases and reduces quality of life and increases the risk and severity of disability and death. The major challenges elderly people deal with are physical and mental disability, chronic disorders and financial instability. Fisher, Cruickshanks, Klein, Schuber and Wiley (2009: 4) conducted a study which was comparable to the study done in Mpharane village because the elderly people within the study had multiple sensory impairment such as: vision impairment, hearing impairment and olfactory impairment. Hearing and vision impairments were also linked to a deterioration in physical and social function

among the elderly population. A paper by Hardin (2014) also indicated that hearing loss was the third most common chronic-condition impairment in the United States. Hearing loss increased among adults between the age of 45 and 69. This impairment was predicted to lead to miscommunication, social withdrawal, confusion, depression and reduction in functional status. The results in the Mpharane study showed similarity to the above statement since the participants had previously suffered from health aliments affecting various parts of the body, such as skin diseases, headaches, ailments affecting the ears, nose, eyes and teeth, as well as skeletal and joint problems. A study in South India focused on an elderly population group aged 60 years and above also showed similar results found in the Mpharane study by indicating that 38.8% of the elderly population suffered more from problems related to the musculoskeletal system which is directly associated with arthritis and lumbar pain (Katta, Gopalakrishnan and Ganeshkumar 2015). Moreover, in the Mpharane study a reasonable number of the participants reported other health problems affecting the circulatory, respiratory, digestive and urinary systems and mental abnormality. Christensen, Doblhammer, Rau and Vaupel (2009: 1197-1205) explain that the rate of diseases in the elderly population increases with age and some of the prevalent diseases are diabetes mellitus, cardiovascular disease and lower back pain.

A study conducted by Oliveira, Fogaça and Leandro-Merhi (2009: 8) of participants aged 65 and older who were assisted by Home Care Program (PAD) indicated that most (61.20%) of the participants had experienced weight loss, and not more than 50.00% of the participants had experienced changes in their appetite, problems with chewing, swallowing, nausea, diarrhoea, vomiting and constipation. The Population Reference Bureau (2007: 1) indicated the above changes can cause inadequate nutritional intake since ageing decreases the immunity of an elderly person and these factors alter the digestion, absorption and utilization of certain nutrients in the body, thereby possibly increasing the chances of infections. In most cases, nutrients that decrease because of malabsorption are: carbohydrate, protein, and micronutrients so nutritional adequacy is crucial in elderly population.

Bloom *et al* (2011: 6) summarized the results from the Population Reference Bureau by outlining the major contributing risk factors that may attribute to a decrease in the quality of life, namely,

the use of tobacco, physical inactivity and harmful usage of alcohol in relation to a non-modifiable risk factor which is age.

In terms of physical activity, a third of the participants engaged in rigorous activity, while most of the participants engaged in moderate activity and only some participants engaged in light activity. The types of physical activity that might contribute to the above findings could be daily activities that the participants engage in, for example walking a distance of less than 5km when fetching water. The other reasons for walking could be walking to purchase food, visiting the health facility (Table 4.26) or undertaking the household responsibilities, for example, fetching wood, as the majority of the participants used this medium as a source of fuel in the preparation of food (Table 4.11). Working in the fields as indicated in the traditional agricultural practices also contributed towards physical activities; 80.00% of the participants owned fields in which crops were grown (Table 4.29 and Table 4.32).

The results in the Mpharane study reported on different levels of tiredness and found that a third of the participants were always tired and half were sometimes tired. Some of the factors that could have contributed to the two levels of tiredness were the intense physical activity that the participants had to undertake on a daily basis as previously reported; age could also be one of the factors because all the participants in the study were elderly people aged 60 years and above. The other reason for the high levels of fatigue could be problems affecting the skeletal, respiratory and circulatory systems as indicated in Table 4.7. Some of the coping strategies that the participants used, such as limiting the portion sizes at mealtimes, reducing the number of meals eaten in a day, skipping meals for an entire day and restricting consumption of food by adults in order for small children to eat could have contributed to poor food intake and decreased levels of energy.

Alcohol consumption was low among the participants in Mpharane village. The majority of the participants did not consume alcohol. The participants that consumed alcohol did so either on a daily basis or occasionally. The most-consumed type of alcohol was home-brewed beer (sorghum beer), which appears in position number 11 for men and number 12 for women in the Top 20 foods consumed list; in Table 4.32, 55.80% of the participants planted sorghum, which could be utilized for beer production, as one of the crops for consumption. The above results are comparable to the

Hamer, Sempértegui, Estrella, Tucker, Rodrígueez, Egas, Dallal, Selhub, Griffitths and Meydani (2009: 115) study, which found that the participants acknowledged consumption of alcoholic beverages, and that 50% reported drinking occasionally, 10% consumed alcohol on most days and only 4.6% consumed alcohol on a daily basis. Alcohol consumption and smoking are reflected as contributing risk factors to lifestyle diseases such as hypertension. The hypertension results in the Mpharane study indicated that about two thirds of the participants experienced pre-hypertension and the rest were experiencing either stage 1 or stage 2 hypertension. The high prevalence of pre-hypertension or stage 1 and stage 2 hypertension might be explained by the fact that salt appears as the second most consumed food item in the Top 20 for both men and women, but as mentioned by Hamer *et al* (2009), alcohol can also be a contributing factor. In support of the above study, Negin, Cumming, Remirez, Abimbola and Sachs (2011: 640-642) conducted a similar study in sub-Saharan Africa (SSA), which found that the elderly population (both men and women) smoked and consumed alcoholic beverages more than adults under the age of 50 years. This can explain the higher rate of hypertension in older men and women because hypertension increases with age, alcohol consumption and smoking. Ibrahim and Damasceno (2012: 611) stated that hypertension was increasing in developing countries, mostly in urban areas, because the awareness, treatment and control rates were very low. It is predicted that the prevalence of hypertension will increase to more than 500 million in 2025. Research has shown that in less than a decade the number of deaths in South Africa due to high blood pressure has increased to 25%. In India the prevalence of hypertension has increased 30 times in urban areas over a period of 25 years and up to 10 times in the rural areas. Furthermore, the study mentions that in Ghana, hypertension prevalence was 4.5% of the population in rural areas and 10% in the rural areas in Nigeria. Ejim, Okafor, Emehel, Mbah, Onyia, Egwuonwu, Akabueze and Onwubere (2011: 1) and Lloyd-Sherlock, Bread, Minicuci, Ebrahim and Chatterji (2014: 116-121) elaborated on the extent of hypertension in developing countries such as South Africa and India with the prevalence of hypertension being 77.9% and 32.3% respectively.

The majority (60.40%) of the participants in the Mpharane study did not use any form of medication and all the participants did not consume any supplements. This might provide an explanation for the fact that some participants experienced health difficulties affecting the skeleton and joints and fatigue. The stated results on the substance usage in Mpharane village showed that

26.50% of the participants smoked and 35.00% of the participants' experienced secondhand smoke due to partners that smoked. The items most used for smoking were pipes, and homemade and bought cigarettes. Snuff was the least used substance with 65.60% of the participants never using it.

4.3.4 Dietary Assessment data

According to Ahmed and Haboubi (2010: 207), nutrition contributes significantly to the health state of the elderly population and affects the ageing process. If nutritious food intake is inadequate, the elderly population gets affected by malnutrition. The elderly population encounters malnutrition because they often experience decreased appetite and energy expenditure; this results in a degeneration of biological and physiological functions. In addition, there is an increased chance of contracting chronic diseases and psychological illness as one gets older. Vitolins, Tooze, Golden, Arcury, Bell, Davis, Devellis and Quandt (2007) found in a cross-sectional study of 63 women and 59 men aged 65–93 years residing in two rural North Carolina counties that the vast majority of this low socio-economic status of rural adults were not meeting the recommended nutritional guidelines based on the year 2000 version of the Food Guide Pyramid recommendations. The study population did not consume minimum servings of the grains, fruits, vegetables, and dairy groups. These participants have been identified to be at risk for deficiencies in folic acid, magnesium, calcium and vitamin A, since the dietary sources of those nutrients are grains and dairy products. The results of the above study are similar to the dietary intake nutrient analysis of Mpharane village (both men and women) because the findings indicated that the participants either did not meet the recommended DRIs, or met the recommended DRIs, or exceeded the recommended DRIs.

The average intake of energy for men (4945.61kJ) is equivalent to 38.39% of the NARs and for women it was 4920.77kJ, which is equivalent to 48.75% of the NARs. The above results can be compared to the findings by Mudg, Ross, Young, Isenring, Banks (2012), which revealed similar results. The above study was conducted in the general medical wards of the Royal Brisbane and Women's hospitals in Brisbane Australia, on participants aged 65 years or older. The study confirmed that an inadequate energy intake may lead to worsening malnutrition during

hospitalization and contribute towards poor recovery outcomes. Poor appetite and difficulties with chewing or swallowing have been identified as risk factors as a result of poor intake of nutrients. Chewing and swallowing difficulties were also experienced by the participants in Table 4.16.

The energy distribution by protein for both men and women reached the WHO goals. The participants' protein intake was, however, slightly above the recommended DRIs. Men had a NAR of 60.07% compared to the DRIs of 56 RDA and women had a NAR of 75.94% compared to the recommended DRIs of 46 RDA. These results could be elaborated with the use of the Top 20 consumed food items (Table 4.20, Table 4.21). Beans, chicken, beef, eggs and salami appeared in number 12,13,15,16 and 17 spots in respect of men and in respect of women, beans, chicken, eggs and peas appeared in number 11, 14, 15 and 17 spots. As depicted in the top 20, women consumed a lower variety of animal protein food items than men. Men consumed beef and salami, while women consumed peas (a plant protein) more often. On the one hand, men had a much higher actual intake per frequency of protein in beans, chicken and eggs and, on the other hand, women had a lower actual intake per frequency of protein than men. Similar observations on the above results on protein are also echoed in the FVS and the FGDS. The participants (n=193) consumed one or two different types of meat. With reference to the Top 20, chicken and beef were the protein that appeared in respect of both men and women most frequently. Eggs were consumed by more than half the group.

Both men's and women's energy contribution from carbohydrates met the WHO requirements. However, the carbohydrate's DRIs were double the DRIs of 100 NAR for both men and women; men had a NAR of 201.25% and women 201.05%. The above results are reflected in the Top 20 consumed food items. Maize meal stiff porridge appeared at number one for both men and women as the most consumed food item on the Top 20 food list. Some of the foods that appear in the Top 20 are sorghum, bread, sorghum beer, samp, potatoes and sugar. These foods are the main source of carbohydrates in the participants' diets. There are great similarities among the carbohydrates consumed in the Top 20 and the variety of cereals in the FVS and the FGDS under the cereal group. A total of seven food items consumed were in the cereal group but the majority of the participants consumed between 2–5 types of cereals. Table 4.32 indicated that participants planted

either grain or fresh maize, sorghum, wheat and potatoes in addition; this could provide more clarity on the high intake of carbohydrates since the participants had access to the crops.

The men reached a NAR of 57.57% for total dietary fibre intake, which was almost double the DRIs of 30Al; the women had a NAR of 82.01%, which was almost triple the recommended DRIs of 21AI. In the FVS and the FGDS guidelines it was indicated that all the participants consumed cereals between 1 to 7 types and n=178 participants consumed between 1 to 2 types of legumes which contribute to fibre intake.

The calcium intake for men was very low with only 15.56% of the NAR being met and the NAR for women at 17.38%, compared to the DRIs of 1200Al for both men and women. The poor intake of calcium can be explained by the fact that even though milk appears in the Top 20, it only featured at number 14 for men and 13 for women of the most consumed food items. Moreover, the results in the FVS and the FGDS showed that n=162 of the participants did not consume any dairy and n=82 of the participants consumed one type of dairy. Table 4.32 indicated that 47.30% of the participants owned cattle and 28.40% kept goats and this could have been another source of milk, which leaves 84.30% of the participants with no access to free milk because the participants did not have either cattle or goats.

A large variety of the foods on the Top 20 food items were good sources of iron, including chicken, beef, dark, leafy vegetables (spinach and nettle leaves), other vegetables (cabbage, and carrots), eggs and cereals, explaining the high iron intake.

The results in this study confirm that magnesium, phosphorus, selenium, vitamin A, folate, vitamin C and vitamin D were nutrients that were below the DRIs for both men and women. The low intake of these nutrients could have been the result of a low variety of food sources such as nuts, seeds, fish, fish oil, soya, soya products, fruits (bananas, mango, berries and citrus fruits), dairy products (cheese and yoghurt), mushrooms and liver just to mention a few. All these food items do not appear in the rest of the Top 20 food items and this could explain the low intakes. Zinc, iodine, thiamin, riboflavin, niacin, vitamin B6, vitamin B12, pantothenate, biotin, vitamin E and vitamin K were consumed in sufficient amounts by both men and women. The high levels of these nutrients

were obtained from foods such as beef, bread, spinach, chicken, beans, salt, potatoes, milk, eggs, peas, oil, and fortified cereals which all appear in the Top 20 consumed food items. In support of these findings the poor nutritional status of the elderly population in African countries is caused by multiple dynamics, which include insufficient household food security, war, famine, and the indirect impact of HIV and AIDS infection.

4.3.5 Coping Strategies data

The WHO (2009: 3-4) projected that 352 000 people in the world were food insecure and 43% of the global population lived below the poverty line, which was $1.00 per day. The UN (2010) indicated that 40% of the people in African countries were labeled as 'ultra-poor' and Lesotho was regarded as one of the poorest countries by the World Bank (2006) because of limited resources. Charlton and Rose (2001: 2424) explained that the majority of Africans come into old age after a prolonged life of poverty, and have access to insufficient healthcare resources or are deprived of healthcare resources. There is also a persistently poor food intake, which results in an insufficient amount and quality of food being consumed.

The DMA, LVAC and the UN World Food Programme (2008) indicated that the elderly people in Lesotho spent most of their money on food but the majority of the households were still food insecure because sometimes the households did not have enough money to buy food. In cases where money for food was insufficient, the most common coping strategies that were used ranged from: 'depending on a lesser amount of costly or a lesser amount of favoured food', 'borrow food' and 'depend on help from relations' to 'reducing the number of meals in a day'. These findings are similar to those coping strategies used by elderly people in Mpharane village as indicated in Table 4.27, which indicated that all the participants used all 15 coping strategies in times of food scarcity.

Due to the transformation of the family structures, the UNPF (2012: 11-12) showed that 30% of households with elderly caregivers are marginally food insecure and at risk of hunger; as a result the most common coping mechanism used was to reduce the portion size of food given to

grandchildren, which created inadequate nutritional intake. This coping strategy was different from the coping strategies that were used in Mpharane village and other studies mentioned in this study.

Beaumier and Ford (2015: 197-198) further explained that the rate of food insecurity is increasing rapidly and people are experiencing food insecurity on a daily basis, and as a result people skipped meals, cut down on the size of meals or let other family members, especially children, eat first; women were usually the last to eat. These were similar to the results in Mpharane village because the participants used to 'reduce the number of meals in a day', which had the mean food security score of 22.26 with the severity score of four and maximum score of 28. The second most used coping strategy was 'limiting the portion sizes of food at mealtimes' and this resulted in a mean food security score of 17.15. The third most used coping strategy was 'restricting the consumption of food by adults in order for small children to eat', which had the mean score of 16.74 and a severity score of three. The above findings could be linked to the results in Table 4.5 where the total income per month of all the participants in the household ranged from R0.00 to R500.00, a very low income range when compared to food prices. Moreover, Table 4.7 further explains that 89.60% of the participants spent between R0.00 to R400.00 on food in a month and that 61.20% of the participants often run out of food and 11.20% always run short of food and this could be explained by the fact that 84.60% of the participants bought food once a month. The American Dietetic Association (2006) elaborated that not only are elderly people staying with grandchildren food insecure but even elderly people staying alone were food insecure. Food insecurity is increasing because of the increasing number of elderly people. Food insecurity is associated with poor physical and mental status as well as depression in women and this statement is reflected in Table 4.6 and 4.7 of the results in Mpharane village. According to Charlton and Rose (2001: 2424) the food insecurity in African countries and poor nutritional status of the elderly population has an indirect impact on HIV infection and acquired AIDS.

4.4 CONCLUSION

The results analysed in this chapter clearly indicate that members of the elderly population are faced with challenging factors such as health problems, food and nutrition insecurity, financial insecurity (low household income and unemployment) and the responsibility of having to care for

grandchildren. Poverty was a major threat for the elderly population due to low income and insufficient pension assistance. Further conclusions that supplement the results in this chapter will be addressed in Chapter 5.

CHAPTER FIVE - CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents the main aim of the study, the limitations, the main findings, the conclusions and recommendations based on the analysis of the data. In Chapter four the results of the study were presented, discussed, analysed and compared to the literature review in Chapter two in relation to the objectives of this study. As global food prices have increased in the past years, so have the global climate, population structure, income growth and dietary habits. All these elements have an impact on the levels of poverty, which contribute to food insecurity, and the health and nutrition status of an individual and in most cases, vulnerable groups such as women, children and elderly people. As the population of Africa ages, elderly people continue to face isolation, poverty and limited access to health services and legal protection. With little or no income from pensions, the elderly population is forced to work in low-paid or demeaning jobs to provide for themselves and their dependents. In many cases, the elderly people are taking care of children orphaned by HIV and AIDS, and have to meet the costs of daily living, which include providing food and clothes as well as funding their grandchildren's education.

The aim of this study was to describe the effects of food insecurity and nutrition status relating to chronic diseases of the elderly caregivers within the rural households of Mpharane in Lesotho with the additional aim of identifying the contribution of coping strategies and dietary diversity to household food security. The interpreted results of this study will help formulate practical recommendations for a sustainable and reliable intervention strategy to improve the food security and nutrition status of the elderly population in Mpharane village.

5.2 LIMITATIONS OF THE STUDY

- The first limitation was the distance between houses where participants lived. In rural areas, houses are far apart and there are no roads in-between the houses suitable for a vehicle.

The researcher and the fieldworkers had to walk long distances from one house to another, often on rocky pathways while carrying heavy research equipment.

- The second limitation was that the process of the administration of the questionnaires was time-consuming; this made it tiring for both the fieldworkers and the elderly participants.

- The third limitation was that there was no electricity for charging the scales since the location of the study was in a remote rural area. The researcher purchased a solar panel charger, which was charged during the day and then used to charge the electronic scale.

5.3 MAIN FINDINGS

5.3.1 Literature

The literature in this study clearly illustrates that the world's population is ageing because of the decline in the mortality rate and an increase in life expectancy. The elderly population is increasing in developed countries but more so in developing countries, especially in rural areas. Poverty is a major threat for the elderly population due to low income, insufficient pensions, poor health and malnourishment. Progressive ageing increases the vulnerability of an elderly person to chronic health problems and in most cases the elderly population is faced with multi-morbidity (the presence of multiple diseases in an individual simultaneously). Co-morbidity accelerates the development of the concurrent diseases, reduces quality of life and increases the risk of disability and death. Unemployment leads to financial instability as a result of insufficient welfare assistance from the government and in turn this leads to low food security and poor health. The elderly caregivers' households are marginally food insecure and at risk of hunger as a result of exposure to chronic poverty exacerbated by their responsibility to care for orphaned grandchildren mainly because of the HIV and AIDS pandemic. In addition, there is the problem of overcrowded households since relatives with little or no income are forced to live with them.

5.3.2 Socio-demographic

Significant socio-demographic variables that were identified in the study were socio-economic status, accommodation, gender, age and family composition (mostly grandchildren). All the participants that took part in the study were unemployed, which explains the low total income in the households and as a result less money is available to spend on food. All the participants care for more than one grandchild in the household. The participants relied on their pensions, which proved to be insufficient to maintain a healthy lifestyle. The low levels of education have also contributed to poor nutrition knowledge. The information above indicates that the community's food security state is extremely affected.

5.3.3 Anthropometric indicators

The results of the study indicate that even though there was a significant number of men and women who were of normal weight, overweight and obesity were the most outstanding anthropometric features in both men and women. The major contributing factor has been the high consumption of a carbohydrate-based diet and poor dietary diversity and possible lack of physical activity by the participants; which could have contributed to the elevated BMI.

5.3.4 Health and behavioral survey

The result of the study showed that the majority of the participants reported having health problems involving the skeleton, the digestive and urinary systems as well as diseases of the sensory organs. Furthermore, the regular use of alcohol and tobacco can lead to the development of chronic lifestyle diseases such as hypertension. The results indicated that some of the participants, both men and women, had pre-hypertension, stage 1 hypertension and stage 2 hypertension.

5.3.5 Dietary intake and nutrient adequacy

The results of the study confirmed the total range of individual food items consumed by all the participants during the sevendays and the results indicated that the participants consumed a good

variety of foods but not in amounts sufficient to meet required levels of individual nutrient intake. The results showed a low consumption of fruit, vegetables and fats. The results indicated that the diet of this community was largely carbohydrate-based and contained primarily starchy staple foods and there is an insufficient intake of animal products (eggs and dairy).

The findings of the study have indicated a mean score for all the coping strategies used by the community in times of food scarcity and these results indicate that the community is food insecure. The results of the study confirmed that a lower income resulted in low dietary diversity, which led to poor dietary intake. Poor dietary intake, especially with regard to energy, calcium and vitamin A, contributes to poor health.

From the 24 Hour Food Recall the extrapolated NAR (nutrient adequacy ratio) confirmed the findings of the FFQ (food variety and dietary diversity). The 24 Hour Food Recall is a simple tool used to identify poor communities at risk of food and nutrition insecurity and the consequent effects on health. This tool is very useful especially in rural illiterate communities where food assessing strategies are limited. The results will assist in prompt nutritional assessment, which will enable swift food and nutrition interventions.

5.4 CONCLUSION

This study has found that in the households researched there were high levels of poverty, a high unemployment rate and very low pension funding which has contributed to food insecurity and poor dietary intake. Although a wide variety of food is consumed, the dietary intake of most nutrients did not meet the DRIs in this community. The progression of malnutrition, especially over-nutrition, was experienced by the majority of the participants in this study.

5.5 RECOMMENDATIONS

The elderly members of the community contribute substantially to the growth of the community. However, many elderly people are faced with chronic poverty, neglect, inadequate health care services, lack of health insurance and even abuse by family members. The high prevalence of

inadequate nutrient intake among the participants demonstrates the need for effective and far-reaching strategies aimed at improving nutrient intake, financial security and health services.

5.5.1 Recommendation to policy makers

- **Government initiatives**

The positive initiatives taken by the Lesotho government with regard to financially assisting the elderly people through pension funding has been very effective. However, the government needs to review the pension funding since the funding is still inadequate to meet the daily requirements of the elderly people. More attention should be paid to the proper administration of the pension funding received by the elderly people. Equally important, the government should improve the food parcels that the elderly people receive on pension day as donations from the UN.

- **Integrated Nutrition Programme (INP)**

The community-based nutrition programmes formulated by the government ensure that households receive food from emergency food providers, for example, pantries (food pantries and food shelves) kitchens (soup kitchens, and emergency dining rooms) and shelters (emergency shelters and shelters for the homeless). These initiatives should be made permanent as this will improve nutrient adequacy and food security. However, consistent monitoring should be undertaken by senior authorities in charge of the community-based nutrition programmes to ensure that the programmes are received by the elderly, and well maintained by individuals in charge. Appropriate government interventions should thus be aimed at improving the health status of the elderly, which will lead to a healthier community.

- **Non-Government Organizations (NGOs)**

Non-government organizations (NGOs) are well known to be essential institutional instruments in mobilizing community assets, motivating people and applying social welfare programmes effectively at grassroots level. The NGOs work towards the alleviation of poverty by directly

involving the poverty-stricken communities in the programmes. In the sector of agriculture and food security, the NGOs should involve the Department of Health, farmers and the communities so that the vulnerable groups can be made aware of the existing opportunities, which will encourage and create a development-oriented community in respect of agricultural practices (both large scale and small scale), nutrition knowledge and sustainability of food security.

- **Nutrition interventions for older people in need**

HelpAge International helps older people to be aware of and access their rights, challenge discrimination and overcome poverty, so that the elderly can live dignified, secure, active and healthy lives. The right to food and to be free from hunger is a fundamental right essential for human dignity. The Committee on Economic, Social and Cultural Rights, the body responsible for monitoring the International Covenant on Economic, Social and Cultural Rights, calls these the 'underlying determinants of health'. The South African Government approved the National Policy on Food and Nutrition Security and the Household Food and Nutrition Security Strategy in 2013, which continues to respond to the hunger challenges in the country. The National Policy on Food and Nutrition Security provides a common reference for all players in tackling the problem of food and nutrition insecurity with emphasis on synergy that will minimize undue duplication and inefficient deployment of resources. It is important that the regulators of other developing countries such as Lesotho implement similar polices in order to benefit the population, especially the elderly population, when it comes to food and nutrition security.

5.5.2 Recommendation for agricultural interventions

Most agricultural interventions increase food production, but do not necessarily improve nutrition security or the health of individuals (Berti, Krasevec and FitzGerald 2004). In this case, more interventions should be implemented to verify Dorward's (2013) theory, which indicates that there are strong conceptual links between agricultural development and nutrition improvements, which may be categorized into three main pathways: the development, own-production and market pathways. The most effective pathways and interventions linking agricultural change to improved

nutrition outcomes change with economic growth and development, with declining importance of the development and own production pathways and increasing importance of the market pathway.

5.5.3 Recommendation for nutrition education

- **Nutrition education**

Nutrition problems broadly fall into two categories, namely: those resulting from insufficient intake relative to nutrition needs, and those resulting from an excessive and unbalanced intake of food or a particular dietary component. The main problems in Africa and other developing countries pertain to the first group. Therefore, it is necessary to provide people in rural and urban areas with adequate information, skills and motivation to procure and consume appropriate diets. Such education should cover the improvement of family food supplies and more efficient utilization of available food and economic resources. For those richer sectors of society, where affluence-related diseases are also taking an increasing toll, nutrition education should be directed to proper food selection, consumption and lifestyle (FAO).

5.6 RECOMMENDATIONS FOR FUTURE RESEARCH

The results of the research indicate that further research is needed as follows:

- Nutrition and agricultural research to create interventions to prevent the development of malnutrition. This intervention will enable the community to take present food intake into account when planting food and to establish healthier food preparation methods to address the increased prevalence of food insecurity and undiversified diets leading to micronutrient deficiencies.
- The three day-or-less recall should be investigated to determine households' dietary diversity as the seven-day recall is too long a period for effective recall and this affects the reliability and validity of the results.
- The association between socio-economic status, food intake patterns and the overweight status of the elderly should be considered together with suitable interventions to improve dietary intake patterns.

- Community support to improve nutrition and food security for the elderly and community-based interventions should be considered.
- Investigation of micronutrient malnutrition in both elderly males and females should be researched in depth.
- Investigation of the insufficient energy requirement compared to DRIs should be researched in depth.

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ANNEXURE A:

DURBAN UNIVERSITY of TECHNOLOGY

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC)

18 July 2013

IREC Reference Number: **REC 39/13**

Ms L B Mothepu
P O. Box 4089
Westville
Durban
4000

Dear Ms Mothepu

Food insecurity and nutritional status relating to chronic disease of elderly caregivers within the rural households of Mpharane in Lesotho

I am pleased to inform you that Full Approval has been granted to your proposal REC 39/13.

The Proposal has been allocated the following Ethical Clearance number IREC 058/13. Please use this number in all communication with this office.

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

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

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

Yours Sincerely

Prof J K Adam
Chairperson: IREC

ANNEXURE B

C 3126

Illovo

Amanzimtoti

4126

04 March 2013

Lesotho Kingdom Ministry of Health and Social Welfare

P. O 514

Maseru 100

Lesotho

Re: Request for permission to conduct research

To whom it may concern

I am Lisebo Barbara Mothepu currently doing my M. Tech: Consumer Sciences: Food and Nutrition and would like to request permission to conduct a nutritional research study in Mpharane. The Title of the study is: The food insecurity and nutritional status relating to chronic disease of elderly caregivers within the rural households of Mpharane in Lesotho.

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 determine the food security, health and nutritional status of elderly caregivers within the rural households of Mpharane in Lesotho in order to inform the Lesotho government on food insecurity and nutritional status of elderly caregivers so to create possible interventions.

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 chief and any parties that are 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

Lisebo Barbara Mothepu (Researcher)

Cell: 0848761673 (Email Address: lisebomothepu@yahoo.co.uk

ANNEXURE C

ID 95 - 2013

Ministry of Health
PO Box 514
Maseru 100

September 4, 2013

Liseho Barbara Mothepu
Masters Tech. in consumer Sciences candidate
Durban University of Technology

Dear Mrs. Liseho,

Re: Food insecurity and nutritional status of elderly caregivers within the rural households of Mpharane in Lesotho (ID85-2013)

Thank you for submitting the above mentioned proposal. The Ministry of Health, Research and Ethics Committee having reviewed your protocol hereby authorizes you to conduct this study among the specified population. The study is authorized with the understanding that the protocol will be followed as stated. Departure from the stipulated protocol will constitute a breach of the permission.

We are looking forward to have a progress report and final report at the end of your study.

Sincerely,

[redacted]
Director General Health Services (acting)

[redacted]
Dr. Jill Sanders
Co-Chairperson
National Health Research and Ethics Committee

ANNEXURE D

C 3126

Illovo

Amanzimtoti

4126

04 March 2013

Chief

Mpharane

Mohale's Hoek

600

Re: Request for permission to conduct research

Mr. Morapeli

I am Lisebo Barbara Mothepu currently doing my M. Tech: Consumer Sciences: Food and Nutrition and would like to request permission to conduct a nutritional research study in Mpharane. The Title of the study is: The food insecurity and nutritional status relating to chronic disease of elderly caregivers within the rural households of Mpharane in Lesotho.

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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

Lisebo Barbara Mothepu (Researcher)

Cell: 0848761673

ANNEXURE E

Lengolo la thakisetso

Moahi ea ratehang oa Mpharane

Ke le leboha homenahane ka nako le mamello ena ekhethehileng eo ke efiloeng hore ke hlalose maikemisetso a lipatlisiso tsa thuto eaka ea sekolong mabapi le tikoloho ena ea Mpharane.

Sehloho sa lipatlisiso tsa lithuto.

Lipatlisiso tsa khaello ea lijo le kemo e ntlafetseng ea mmele mabapi le hokula 'meleng ea bonkhono le bontatemoholo hara sebaka sene sa Mpharane, Lesotho.

Motsamaisi oa lipatlisiso tsa lithuto

Lisebo Barbara Mothepu, B. Tech: Consumer Sciences Food and Nutrition

Hloho ea motsamaisi oa lipatlisiso tsa lithuto

Professor Carin Napier

Bohlokoa ba ho etsa lipatlisiso tsena

Lipatlisiso tsa thuto ena libohlokoa haholo sechabeng, hobane lifana ka kutluisiso le tharollo mabapi le bophelo ba bonkhono le bontatemoho. Hobane ho fumanehile hore bonkhone le bontatemoholo ke sehlopha sa batho se shebaneng le mathata a mangata malebana le hohlokomela malapa le likhutsana hara tlala tsena tse kholo, hobane muso o fana ka lipenshene tse tlase, hona hoetsa hore bophelo bobe thata haholo.

Lintho tseo litlabe li akarelelitse lipatlisiso tsa

- Lekala la Muso oa Lesotho la Bophelo le Social Welfare le Morena oa motse oa Mpharane ba se ba kopiloe hore lipatlisiso tsena tsa lithuto li tsoele pele.
- Moahi ea tlang ho nka karolo mabapi le li patlisiso tsa lithuto tsena o tla tlameha ho hlapanya kapa ho itekena lengolong hore o oa lumela hore o tla nka karolo lipatlisiso tsa lithuto. Tsena ka ofela litla etsahala ha hoqetoa hohlalosa lipatlisiso tsa thuto ena ka kakaresto.
- Ha o lumelana le seboletsueng, o tla kupuoa ho araba litokomane tse supileng tsenang le lipotso. Litokomane ka kakareletso litla nka hora e lengoe ho araba lipotso tsa teng kaofela
- Litokomane tsena li tla be liakaretsa:
- A Socio- demographic questionnaire (ke ho hlahloba boemo ba bophelo ba motho ka kakaretso)
- Three 24-hour food recall questionnaires (ke ho hlahloba lijo tseo motho a lijeleng maelana le lihora tsena)
- A Food Frequency Questionnaire to determine the food variety and dietary diversity (ke ho hlahloba hore na motho o ja mefuta efe ea lijo ka hofapana)

- Anthropometrics measures (Boima ba mele, bophara ba letheka, bolele ba motho, hape le khatelo ea tsamaiso ea mali etla lekoloa. Ho tla lebeloa hore motho ea etsoang li tlhatlhubo a hlobole li a paro tse buima le lieta, eseng liphahlo kaofela).
- Coping Strategy questionnaire (ke hohlahloba hore na motho o etsa joang hore u funane lijo ka nako ea tlala).
- Health and Behavioural questionnaire (ke hohlahloba horena maemo a bophelo ba hao a maemong a joang le mekhoa ea bophelo bamotho bo joanng)
- Agricultural practices and traditional food intake questionnaire (ke hohlahloba hore na maemo a temo a eme joang)
- Ho nka karolo liphatlisiso tsena ke ka ho rata hoa motho, motho a ka ikhula nako efe kapa efe ha a batla

Melemo ea ho etsa lipatlisiso tsa lithuto tsena motseng o na ke hore:Morena oa motse o tla fuoa litokomane tsa qetelo ea lithuto, hore a tle a khone ho matlafatsa motse oa lona, hape ha e ba hona le motho eana le lipotso malebana le bophelo ba hae o tla fumana tlhakisetso ka mora hore lipatlisiso li phetlalatsoe.

Lintlha tsa bohlokoa:

- Ha motho a nka karolo lipatlisisong tsena tsa lithuto ke ka ho rata hoa motho, motho a ka tlohela ha a batla.
- Ha hona motho ea tla pataloa hore a nke karolo ho lipatlisiso tsena tsa lithuto.
- Ha hona sebelisoa lebetso la motho, motho ea tlang ho nka karolo lipatlisisong tsena tsa llithuto o tla fuoa nomoro.

Ha hona le likotsi tse ka etsahalang malebana le lipatlisiso tsena tsa lithuto

- Ha o batla tlhakisetsomaelana le lipatlisiso tsa lithuto ke kopa o botse Professor Carin Napier, kapa Ethics committee.

Batho bao o ka iteanyang le bona ha o na le lipotso, kapa mathata mabapi le lipatlisiso tsa lithuto tsena

- **Hloho ea lipatlisiso tsa lithuto:** Prof. Carin Napier D Tech: Food Service Management **:** +27 31 373 2326 carinn@dut.ac.za
- **Motsamaise oa lipatlisisos:** Lisebo Barbara Mothepu B Tech Consumer Science Food and Nutrition: Cell: 0848761673 lisebomothepu@yahoo.co.uk
- **The Institutional Research Ethics administrator (Lekala la lipatlisiso tsa thuto)** **:** +27 31 373 2900.
- Litletlebo li ka lebisoa ho: DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC)
CONSENT

Litumelano tsa honka karolo lipatlisisong tsa lithuto tsena

Ke ea lumela hore ke fuoe lithlalosetso tse hlakileng maelaIa li lipatlisisos tsa thuto ho tsoa ho motsamaise oa lipatlisiso. _____ (Lebitso la motsamaisi oa lipatlisiso) le mabapi le karolo e ke tla be ke e etsa - Research Ethics Clearance Number: _____,

- Ke balalile lengolo me ke utluisisa karolo e ketla beng ke e etsa maelana le lipatlisiso tsa thuto ena (**Lengolo la tlhakisetso)** .
- Ke ea elelloa hore liphumano tsa lipatlisiso tsa thuto ena li tla buoa ka lilemo, letsatsi la thlaho, le boemo ba ka.
- Ke fana ka tumello hore mosebetsi ona o ka kengoa ka hara komphutha ea motsamaise oa li patlisiso tsa lithuto
- Ke ea lumela hore hara nako fela nka ikhula lipatlisisong
- Ke ile ka fuoa menyetla e mengata ea hore ke botse lipotso maelana li lipatlisiso tsa thuto e na
- ke ea utluisisa hore lintho tsohle tse ka fumanoang lipatlisisong tsena tsa thuto ke ka lifumana hake libatla

_____	_____	_____	_____
Lebitso le feletseng la motho ea	**Letsatsi**	**Nako**	**Ho itekena hoa monona**

nka karolo lipatlisisong tsa thuto

Ke ea hlapanya hore motho enoa ea tekeneng ka holimo ka mona ke mohlaluselitse mabapi le maemo,ka kakaretso a lipatlisiso tsena tsa thuto e tlotsoroa ke, _____ (Lebitso la motsamaisi oa lipatlisiso).

_____	_____	_____
Lebitso la matsamaisi oa lipatlisisos	**Letsatsil**	**Itekena**
_____	_____	_____
Lebitso la mopaki	**Letsatsi**	**Itekena**

(Known to the participant and is literate)

LETTER OF INFORMATION

Dear Mpharane resident

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

Title of the Research Study:

The food insecurity and nutritional status relating to elderly caregivers within the rural households of Mpharane Mohale's Hoek in Lesotho.

Principal Investigator/s/researcher:

Lisebo Barbara Mothepu, B. Tech: Consumer Sciences Food and Nutrition

Co-Investigator/s/supervisor/s:

Professor Carin Napier

Why is it important to do this study?

The elderly population in developing countries are vulnerable and very few studies concentrate on the food security and nutritional status of the elderly, the changing role of the elderly from caring for themselves to caring for children and grandchildren have exposed these elderly to poverty and food insecurity. No studies in Lesotho were found to address the nutritional needs of the elderly. Therefore this study is essential to alert the government of Lesotho the nutritional needs of this group of the population. The study may also provide information on the relationship between the food intakes, socio-economic, nutritional status and the chronic diseases that elderly care givers are at the risk of getting. UNFPA (2012:40-41) indicts that 20% of the world's population lived below the international poverty line US$ 1.25 a day in 2005. Poverty is a major threat for older population due to low income, lack of pension benefits, poor health and malnutrition.

What will it involve?

- The Lesotho Kingdom Ministry of Health and Social Welfare and chief village of Mpharane 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 7 questionnaires in an interview situation it could take up to 1:30 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, waist circumference and blood pressure, we will not ask you to remove your clothing except for shoes and jerseys
- Coping Strategy questionnaire.
- Health and Behavioural questionnaire.
- Agricultural practices and traditional food intake questionnaire.
- 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 chief 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:

- Pparticipation 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: Lisebo Barbara Mothepu Cell: 0848761673

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.

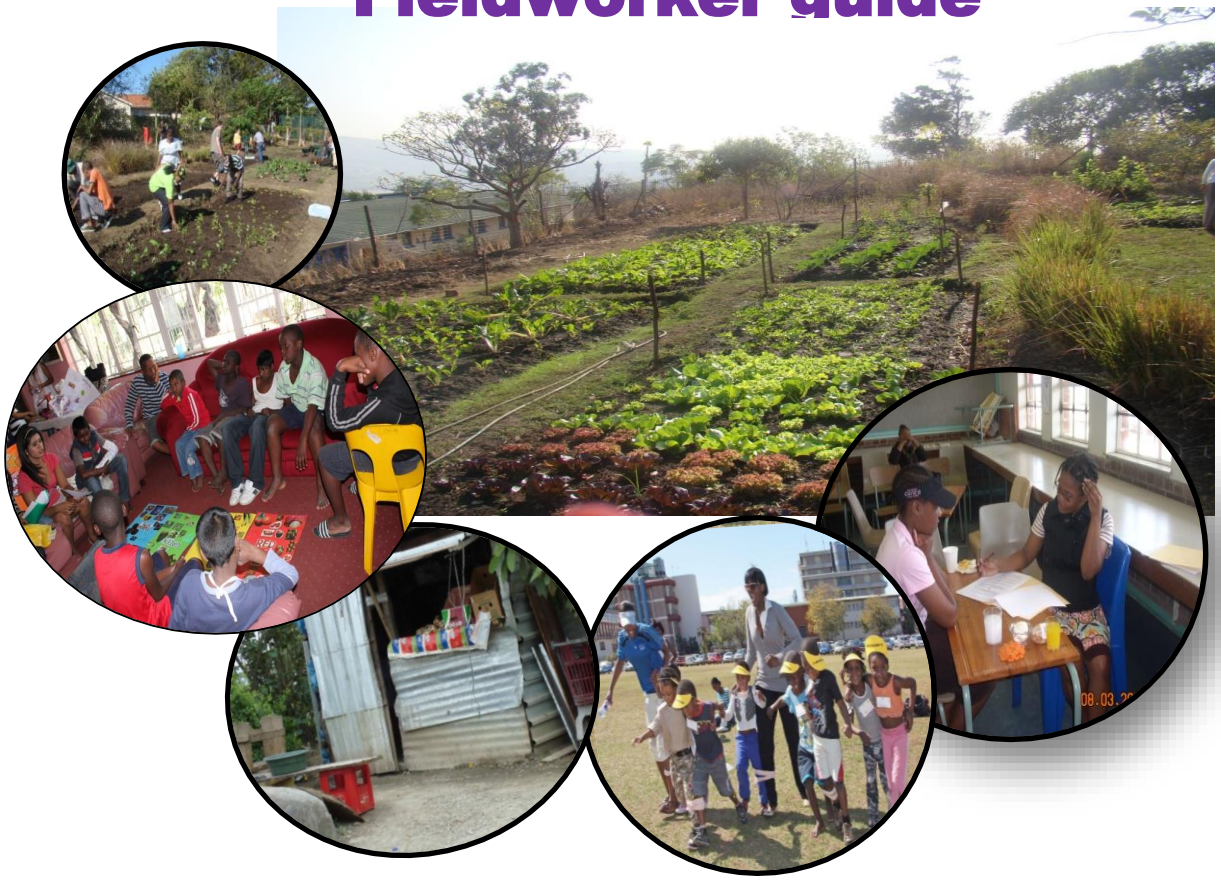
_____	_____	_____
Full Name of Researcher	**Date**	**Signature**
_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**
_____	_____	_____

ANNEXURE F

Department of Food and

Service Learning

Fieldworker guide



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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 people who must interview the subjects (the people chosen to take part in the research) and get correct and accurate information from them. The subjects must feel at ease with the field worker so that they will not feel threatened or intimidated and will willingly answer the questions to the best of his or her ability

2. ENQUIRIES

The following staff members are concerned with field work:

Senior Lecturer/Researcher : Prof C. Napier
S9 Level 3, Room 312

Tel. No. : 031 373 2326

E-mail	:	carinn@dut.ac.za
Service Learning lecturer/Researcher	:	Miss H Grobbelaar S9 Level 3, Room 308
Tel. No.	:	031 373 2328
E-mail	:	heleeng@dut.ac.za
Research Assistant	:	Andile Mtolo S9 Level 3
Tel. No.	:	
E-mail	:	

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 20 hours of Service Learning of which include 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 20 hours of Service Learning completed, any fieldwork completed by a fieldworker over and above the 20 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.

- Service Learning marks add up to approximately 20% of the final mark for WIL.
- Students can be expected to do any of the following tasks as part of their 20 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	excellent 5	Good 4	Fair 3	Poor 1-2	Unacceptable 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(if applicable)						
All details included in completion of forms(if applicable)						
Followed the task through to the end(if applicable)						

Number of hours completed: _____ Total Score_____

General comments:

_____
_____
_____

Researcher Signature: Date:

_____ _____

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 must pay attention to detail, record all answers accurately, not skip over questions or make up answers herself.

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.

7. 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
	10 g	30 g	60 g		100 g

FOOD	Smaller than smallest	Between small and medium	Between medium and large	Between large and very large	Larger than large/very large
Tomato and onion gravy					
Pumpkin	15 g	35 g	60 g		80 g
Carrots, potato	45 g	65 g	80 g		95 g
Green mealie	50 g	110 g	180 g		260 g
Beetroot salad	10 g	30 g	65 g		85 g
Fat cake	20 g	50 g	70 g		90 g
Bread	15 g	45 g	80 g		120 g
Margarine	2,5 g	7,5 g	12,5 g		17,5 g
Dumpling	20 g	70 g	125 g		175 g
Apple	70 g	130 g	195 g		265 g
Banana	40 g	60 g	95 g		130 g
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

FOOD	Smaller than smallest	Between small and medium	Between medium and large	Between large and very large	Larger than large/very large
Cheese curls	6 g	18 g	38 g		62 g

Other questionnaires

The researcher may also use any of the following questionnaires:

Food Frequency Questionnaire

Socio-demographic questionnaire

Nutrition knowledge questionnaires

Health questionnaires

Coping strategy index questionnaire

Smaller questionnaires drawn up by each individual researcher e.g. lunch box content of school children.

ANNEXURE G

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	9

4.12. How often do you buy food?

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

4.13. Where do you buy food?

Tuck shop	Street vendor	Wholesalers	Supermarket	Other, specify……

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

Taxi	
Bus	
Train	
Own 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
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.

ANNEXURE H

DUT DURBAN UNIVERSITY OF TECHNOLOGY

FOOD AND NUTRITION CONSUMER SCIENCES

Anthropometric Measurements

Section A:

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

2. Community:.....

3. Date of birth	Year	Month	Day

4. Gender	Male	Female

Section B:

1. Body weight (kg)	1. Body weight (kg)	2. Height/Length (cm)	2. Height/Length (cm)
kg	kg	cm	cm

3. Waist circumference	3. Waist Circumference	4. Blood pressure	4. Blood pressure
cm	cm	/	/

ANNEXURE I

24 – HOURS RECALL

Subject ID number: _____ Interviewer: _____

Name: _____ Date: _____ / _____/ _____

Address: _____

Tick what the day was yesterday:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

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

Yes	1	No	2

If not, why? _____

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

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

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

During the morning at work or at home					

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

ANNEXURE J

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)		
Meat (Goat)		
Dried Meat (Biltong)		
Meat (Horse)		
Meat (Donkey)		
All Mince		
All Tribe/Offals/Runners and Heads		
Tinned Fish (Pilchards/Tuna)		
Processed Meats (Viennas / Polony, Russians, Boerewors Sausage)		
GROUP 2: Eggs Diversity	**Y**	**N**
Eggs		
GROUP 3: Dairy Products Diversity	**Y**	**N**
All Milk		
Maas/ Inkomasi		
Custard		
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)		
Sorghum (Pap, Porridge, Likhobe tsa Mabele, Traditional beer)		

Wheat (Bread, Likhobe tsa Koro, Traditional Beer)		
Macaroni/Pasta/Spaghetti		
All Bread (White/ Brown/ Whole Wheat)		
Dumpling/Steamed Bread/Fat Koek)		
Scones/Biscuits		
Mageu/ Mahleu		
All Tubers/Roots (Amadumbe, Sweet Potato)	**Y**	**N**
Potatoes		
GROUP 5: Legumes and Nuts	**Y**	**N**
All Beans Dried		
Dried Peas		
Lentils		
Peanuts and Nuts		
Soya		
GROUP 6: Vitamin A Rich Fruits and Vegetables Diversity	**Y**	**N**
Pumpkin		
Carrots		
Wild Leafy Vegetables Fresh and Dried		
Spinach		
Butternut		
Apricots		
Peach		
GROUP 7: Other Fruits (and juices) Diversity	**Y**	**N**
Deciduous Fruits		
Apple		
Peaches		
Pear		
Grapes (black/green)		
Plum		
Berries		
Sub – Tropical Fruit	**Y**	**N**
Lemon		
Orange		
Naartjie		
Banana		
Pineapple		
Watermelon		
Guava		
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)		
Chili (red/green)		
Green\ Yellow\ Red Pepper		
Ginger & Garlic (Fresh)		
GROUP 9: Oils and Fats Diversity	**Y**	**N**
Sunflower oil		
Margarine		
Lard		
Potato Crisps		
Coffee Creamer (Cremora, Ellis Brown)		

ANNEXURE K

ELDERLY ANTHROPOMETRIC, HEALTH, MEDICAL AND BEHAVIOURAL QUESTIONNAIRE

Section A:

1.

Surname		ID number (if applicable)	
First Names		Age	
Height	m	Weight	kg
Gender	Male ❑ Female ❑		

Section B:

HEALTH QUESTIONNAIRE:

2.

ARE YOU SUFFERING OR HAVE YOU SUFFERED FROM	YES	NO	IF ANY ANSWER IS YES, GIVE DETAILS OF THE NATURE, SEVERITY AND DURATION OF ILLNESS
1. Any skin disease?			
2. Any affection of the skeleton and/or joints?			
3. Any affection of the eyes, ears, nose or teeth?			
4. Any affection of the heart or circulatory system?			
5. Any affection of the chest or respiratory system?			
6. Any affection of the digestive system?			
7. Any affection of the urinary system and/or genital organs?			
8. Any nervous affection or mental abnormality?			
9. Any headaches			
10. Any other illness?			

3.

	YES	NO

Have you lost weight during the past month?		
Have you had a recent change in appetite?		
Do you have problems with the following:		
* chewing?		
* swallowing?		
* nausea?		
* diarrhoea?		
* vomiting?		
* constipation?		
Do you follow a special diet?		
If yes, specify…….		
Are you allergic to any foods?		
If yes, specify		

4.

Would you say your usual level of physical activity is:	**Tick the correct block**
1. Heavy/ rigorous (running, playing tennis, swimming, doing heavy gardening, etc., at least three times per week)	
2. Moderate (Taking rigorous exercise once or twice a week, or steady walking, or other moderate activities at least three times per week)	
3. Light (playing golf, taking a stroll, or doing none rigorous activities occasionally)	
4. None (No exercise whatsoever)	

5.

How often do you get tired?	**Always**	**Sometimes**	**Never**

6.

	YES	**NO**
1. Do you suffer from any defect of hearing, speech or sight?		
2. Are you physically disabled and do you use artificial limbs?		
GIVE DETAILS OF THE NATURE AND SEVERITY OF THE DISABILITY …… …… ……		

7.

Do you smoke at this moment?	**Tick the correct block**
1. Yes	
2. No (Never smoked	
3. No (Stopped)	

8. If yes in question 5, answer question 6.

What do you smoke and how many per day?	**YES**	**NO**	**NUMBER per DAY**
Cigarettes, home made			
Cigarettes, bought			
Cigarettes, bought, light			
Cigars			
Pipe			
Other, specify			

9.

Does you're spouse or partner smoke at this moment?	**Tick the correct block**
1. Yes	
2. No	
3. Not applicable	

10.

Do you make use of snuff at this moment?	**Tick the correct block**
1. Yes	
2. No (Never used)	
3. No (Stopped)	

11.

Do you use alcohol on a regular basis ?	**Tick the correct block**
1. Yes	
2. No	
3. Not applicable	

12.

If you use alcohol, How often?	**Tick the correct block**
1. Every day	
2. Once a week	
3. Occasionally	

13.

What type of alcoholic drinks do you drink?	**Tick the correct block**
1. Commercial beer / cider	
2. Home brewed beer	
3. Strong liquor ex. Whiskey, brandy, Vodka etc.	
4. Wine	

14.

	YES	**NO**
Have you undergone any operations?		
GIVE DETAILS OF THE NATURE AND DATE OF THE OPERATION/S …… …… ……		

Section C:

MEDICATION AND HEALTH FACILITY QUESTIONNAIRE:

1.

1. Do you use any medication?	Yes	No
2. If no, go to the next block.		
3. If yes, what for/why? …… …… …		
4. What is the name of the medication you are taking? …… …… …		

5. What is the dosage and how often do you take this medication?. …… ……..	**Dosage**	**How often?**

2.

Do you take any supplements?	**YES**	**NO**

3. If yes in previous question.

Specify the type	Vitamins, specify…… …… ……	Minerals, specify……. ……. …….	Multivitamin	Other, specify…… …… ……

4.

Which health facility is commonly used by you?	**Tick the correct block**
1. Private Doctor	
2. Clinic	
3. Hospital	
4. Traditional Healer	
5. Other (please state)	

5.

How do you travel to the health facility?	**Tick the correct block**
1. On foot	
2. Taxi	
3. Bus	
4. Own transport	
5. Other (please state)	

I declare that the above-mentioned information is true and correct and that I have not withheld any information.
Signature……..Date……..

Thank you very much for your co-operation.

ANNEXURE L

FOOD AND NUTRITION CONSUMER SCIENCES

COPING STRATEGIES FOR MPHARENE MOHALE'S HOEK

Subject number: _____ Date: _____

Interviewer: _____

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	All the time? Every day	Pretty often? 3-6 */week	Once in a while? 1-2 */week	Hardly at all? <1* /week	Never	Raw score	Severity weight	Score = Relative Frequency x weight
Relative frequency score	**7**	**4.5**	**1.5**	**0.5**	**0**			
a. Rely on less expensive and preferred food?							1	
b. Borrow food, or rely on help from friends or relatives?							1	
c. Buy food on credit?							3	
e. Send household members to eat elsewhere?							4	
f. Limit portion sizes at mealtimes?							3	
g. Reduce the number of meals eaten in a day?							4	
h. Skip entire days without eating?							4	
i. Restrict consumption by adults in order for small children to eat?							3	

j. Sell some belongings in order to get money to buy food?							4	
k. Gather wild food, hunt, or harvest immature crops?							1	
l. consume seed stock held for next season or rent out the livestock?							4	
m. Do small pieces of work for food/money?							2	
n. Contribute to food stokvel in order to ensure food over a scarce period?							3	
o. Children have to leave school in order to work for food?							4	
TOTAL HOUSEHOLD SCORE								

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

ANNEXURE M

DUT DURBAN UNIVERSITY OF TECHNOLOGY

Food and Nutrition Consumer Sciences

The traditional agricultural practices in Mparane Mohales' Hoek Lesotho

The purpose of the study is to find out about your agricultural practices in order to plan future development in Mpharene. The information you give to us will be kept confidential. You and your household members will not be identified by name or address in any of the reports we plan to write.

1. GENERAL INFORMATION

Participant number:…….…… Date:……

Fieldworker name: ……

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

1.1 Population group of respondent (circle one):

	X
African	
Coloured	
Indian	
White	
Other (Specify)	

1.2 Language of respondent (main language spoken at home):

English.....
South Sotho.....
Afrikaans.....
North Sotho.....
Other (Specify).....

2. WATER

In this section we are going to talk about the water used by a household for drinking, cooking, bathing, or washing clothes, watering the garden and other household purposes like these.

2.1 Does the water used for drinking come from the same source as the water used for other purposes like bathing or washing clothes?

Mostly yes.....
Sometimes.....
Mostly no.....

2.2 What is the source of water used most often in this household for things like drinking or bathing and watering plants? **(SINGLE MENTION ONLY)**

	X
Piped - yard tap	
Piped - public tap/kiosk (free)	
Rainwater tank	
Protected spring	
Other (specify).....	

2.3 Is the household able to get all the water it needs for normal household purposes?

Mostly yes.....
Sometimes.....
Mostly no.....

2.4 Does the household have to fetch and carry water to the house each day?

Yes.....
No.....

2.5 About how far away is the water that has to be fetched?

Less than 100m.....
100m - less than 500m.....
500m - less than 1km.....
1km - less than 5km.....
5km or more.....

2.6 What kind of toilet does the household use?

Flush toilet.....
Improved pit latrine - with ventilation (VIP)...
Other pit latrine.....
Bucket toilet.....
Chemical toilet.....
None.....

3. Land Access and Use

3.1 Land for Farming: Plot or Field

3.1.1 Does any person in this household have the right to use (have access to) any land for arable farming, that is, to grow and cultivate crops on? **Including small gardens attached to the dwelling.**

Yes.....
No.....

IF YES: Is this land

Private (Own Farm).....
Private (Rented).....
Other (Specify).....

3.1.2 What is the total size of all land that is available to household members for growing crops? Record in hectares for those who can give this information.
_____hectares

If information cannot be given in hectares, think of a soccer field - is the total area smaller, about the same or bigger than a soccer field?

If bigger: Determine about how many soccer fields the land the household could use for growing crops would cover?

Interviewer: Remember: (i) A soccer field is about ½ hectare. (ii) One hectare equals approx. 2 acres

3.1.3 What are the sources of water, if any, used on the land used for growing crops? **(Allow for multiple responses, up to three).**

Main Source	**X**
River/Stream	
Dam	
Borehole	
Tank	
Municipality	
Rain	
Neighbour	
Other (Specify)	

3.1.4 About how much of the land used for growing crops is the household able to water from these sources?

Less than half.....
About half.....
More than half.....
All.....
None.....

3.1.5 Does the household have the right to sell any part of the land it uses for growing crops?

Yes.....
No.....

3.1.6 How much do you think the household would be able to get for the land if it sold the land it uses for growing crops?
R _____

3.1.7 Of the land that is available to the household for growing crops, was any of it rented out to other people in the past 12 months?

Yes.....
No.....

3.1.8 Did the household have to pay rent for any of the land used for growing crops in the past 12 months?

Yes.....
No.....

4. AGRICULTURAL PRODUCTION

4.1 In the past 12 months, did this household grow crops or keep livestock for sale, exchange or home consumption?

Yes.....
No.....

If YES: Was the household able to sell what was farmed over the year for more than R20,000?

Yes.....
No.....

---

5 Agriculture - Small-Scale

5.1.1 Crop Production Home Consumption
Interviewer Ask: What crops, if any, did the household harvest in the past year? **(Write down the relevant name and record the code from the box for each crop harvested.)**

What unit would you use to measure your crop of _____? **(Repeat for each crop).**
Either: exchanged or bartered, include units given to any workers who were not members of the household, but who helped with the crop and include units given to people who were not members of the household in return for the right to use the land.

Codes for Questions Types of Crops
Maize Grain
Maize Fresh
Sorghum
Wheat
Tomato
Potato
Onion
Orchard Fruit
Other Vegetables
Dry Beans
Pumpkin/Squash
Green Vegetables

6. LIVESTOCK: CATTLE, PIGS, ETC.

6.1 Does the household own or farm with any animals or poultry of any kind?

Yes.....
No.....

6.2

Cattle	Sheep	Goats	Pig	Poultry

6.3 **Ask all who have cattle or goats:**

6.3.1 About how many litres of milk were obtained from your herd during the past week (last 7 days)?
_____ Litres

6.3.2 And, how much of this was for **this household's own** use?
_____ Litres

6.3.3 And, how much of it was **for sale or exchange**?
_____ Litres

6.3.4 What was the value of milk sold or exchanged?
R _____

6.4 **Ask all who have hens or ducks or other poultry:**

6.4.1 About how many eggs were obtained from your poultry during the past week (last 7 days)?
_____

6.4.2 And, how many of these did the household **use**?
_____

6.4.3 And, how many did the household **sell or exchange?**
_____

6.4.4 What was the value of eggs sold or exchanged? R _____

6.5 Ask all who have sheep: In the past 12 months, how much did the household make, if anything, from the **sale of wool and mohair**?

R _____

---

7. OTHER FARMING INCOME

7.1 Did the household receive anything in the form of subsidies or drought relief in the past 12 months?

Yes.....
No.....

If YES: How much was it worth in rand? R _____

7.2 In the last 12 months, did the household receive anything by providing a service to other farmers, for example, ploughing or planting?

Yes.....
No.....

If YES: How much was it worth in rand? R _____

7.3 Does this household own other non-mechanical farm tools (Spades, hoes, etc.)?

Yes.....
No.....

If YES: Approximately how much could you sell them for?
R _____

The end
Thank you

ANNEXURE N

MOUNTVIEW SECONDARY SCHOOL

STRIVING FOR EXCELLENCE

1 RUSSOM STREET, VERULAM, KWAZULU NATAL P.O. BOX 114, VERULAM 4340
TEL : (032) 533 2887 - FAX : (032) 533 7721

10 DECEMBER 2015.

TO WHOM IT MY CONCERN

This is to state that:

Mr R. Govender, a teacher of English Main Language at the above school from 1987 to 2012 holds the following qualifications:

(1) B. Paedagogics (UDW – 1975), majoring in English, History and Education.
(2) B.A. Hons. (UNISA – 1979) in History.
(3) B. Ed. Hons (UNISA - 1985).
(4) B.A. Hons (UNISA – 1989) in English Language and Literature.
(5) Certificate for English Medium Teachers (CEMT) Cambridge University Extension Programme – Durban – 1994. A certificate for teaching English as a Second language.
All the above qualifications were obtained through the medium of English as a main language.

Mr Govender has taught (1) in primary schools in the period 1976 -1977

(2) in secondary schools in the period 1978 – 2012 (English Main Language.

[redacted]

MR J. VARDARAJAN (PRINCIPAL)

MISSION STATEMENT

We, at Mountview Secondary School, endeavour to promote a culture of learning and teaching by providing an education of progressively high quality for all our learners and to so doing lay a strong foundation for the development of all our people' talents and capabilities; protect and advance our cultures and languages and uphold the rights of all learners, parents and educators.