

SITUATIONAL ANALYSIS OF FREE- LIVING ELDERLY IN UMLAZI TOWNSHIP

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BTech: Consumer Sciences: Food and Nutrition



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

February 2011

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ACKNOWLEDGEMENTS

Prof. Wilna Oldewage-Theron, my supervisor for the sound advice, good teaching and assisting with vast expertise.

Dr Napier my co supervisor and mentor for her assistance, patience, support and encouragement.

3rd year students at the Durban University of Technology and University of Kwa-Zulu Natal who acted as field workers, providing valuable assistance that enabled this study to be completed.

Ethekewini municipality, ward councillors and South African Social Security Agency for assistance in authorising research to be conducted to in the Umlazi community.

My family, friends and all those who contributed towards the end of the project for their support and encouragement

DEDICATION

This thesis is dedicated to my grandparents who have been a great inspiration in my life. The great contribution in my upbringing and support has been remarkable.

ABSTRACT

A situational analysis of free-living elderly people in Umlazi, KwaZulu-Natal, South Africa

Rationale & Objectives

The objective of the study was to conduct a situational analysis of elderly people on state pension living in Umlazi, KwaZulu-Natal South Africa. The research focused on the socio-economic status, dietary intake, nutritional status, and health status of this community.

Methodology

The sample comprised 270 (224 women and 46 men) randomly selected elderly people within the 12 wards of Umlazi. The methods used for assessment included a socio-demographic questionnaire which determined the socioeconomic status. A 24-hr recall questionnaire and food frequency questionnaire were used to determine dietary intake, while anthropometric measurements were conducted to determine the nutritional status. A health questionnaire, including a salt administration questionnaire was used to determine the health status of the elderly in this community. Trained field workers and nurses assisted in data collection and food consumption data was captured and analysed by a qualified dietician using Food Finder version 3.0 computer software program. Descriptive statistics (frequencies, means, standard deviations and confidence intervals) were determined with the assistance of a bio-statistician. Socio-demographic and health data were captured onto an Excel^(R) spreadsheet by the researcher. These questionnaires were analysed using the Statistical Package for Social Sciences (SPSS) for Windows version 17, 0 software program.

Results

The majority of respondents lived in brick houses (84.8%) and the living space generally consisted of more than three rooms (87.4%). However, the majority of respondents who lived with >4 to 10 members were 67.4% whilst only 32.6% of households consisted of less than 4 members. The mean household size was 5.1 (\pm SD 2.9) people, this further illustrates that the majority of respondents lived with 5 people per household. Grandchildren were present in 70% of the households with a mean of 3 (\pm SD 5) grandchildren in each household. Results also indicate that 84.6% of the elderly were the bread winners in these households. The vast majority of 87.8% of the population had no other source of income. The majority of

respondents with an income had a total monthly income of R500- R1500 (82.9%) followed by R1501- R2500 (14.1%) and only 3% had more than R2500 total income. Food expenditure for most (80%) households was >R500 of the total income. Food shortages due to limited income were frequent in 54% of households who regularly experienced this problem, whilst 26% sometimes experienced shortages, 15.4% often encountered shortages whereas 2.6% encountered shortages seldomly and 2.2% never. A large majority of respondents owned electrical assets, the most commonly owned included a television (80.3%) , a radio (75.5%) and a refrigerator (75.1).

The majority of food items consumed were carbohydrate based and the portion sizes were relatively big, on average 1348.5g per day. The energy contribution from carbohydrates was 65% which is considered to be on the high side (WHO goals 55-75%). Protein intake was fairly common, with a 15% contribution to energy from total protein (WHO goals 10-15%). The frequency of vegetable and fruit intake was very low, the portion sizes were also small and did not meet the recommended daily intake.

The energy contributions showed that 89.2% of the women consumed a diet that supplied <100% of Estimated Energy Requirements (EERs) and all the men consumed <100% of the EERs for energy. Sixty three percent of the women and 91.1% of the men consumed <100% of the EARs for protein. The mean carbohydrate intake in the sample was significantly higher than the EAR but the women consumed <100% of the EARs for carbohydrates (4.1%) and all men consumed >100% of the EARs. The majority of the vitamins for both genders indicated low intakes except for vitamin B12 and B6 in the case of men only. The majority of minerals indicated low scores for micronutrients except for iron (36.6% for men) and potassium (39.0% for men) which was consumed mostly by men than women. The mean Food Variety Score (FVS) (\pm SD) for all the foods consumed from all the food groups in a period of seven days was 25.8 (\pm 14.6). The results revealed poor dietary diversity scoring. The cereal group had the highest mean variety score 5.3 (\pm 2.5) followed by vegetables 4.5 (\pm 2.6), fruit 3.5 (\pm 3.1), flesh foods 3.2 (\pm 1.6), vitamin A-rich fruit and the vegetable group 3.1 (\pm 1.7).

The anthropometric indices indicated that the mean age was 69.7 years (\pm SD 7.1) and mean weight of 76.5 kg (\pm SD 17.3). The BMI scores for the total group indicated that 52% of the respondents fell into the obese category (BMI = obese 1 >30, obese 2 >35 and obese 3 > 40) and 24% of the respondents were overweight (BMI = 25-29.9). Only 20% were of moderate weight (BMI 18.5- 24.9). Although more men were overweight (34.2%) compared to 21.9%

of women, more women (60.1%) were obese compared to men (18.8%). The majority (83%) of the women were above the cut-off points for waist circumference ($\geq 88\text{cm}$) and 17% were within the normal values whilst 74% of the men were within recommended cut-off points ($\geq 102\text{cm}$) and only 26% exceeded the recommended scores. The results indicate that 77% of respondents were at risk of developing metabolic syndrome exceeding >0.5 waist-to-height-ratio (WHTR) and 23% were at lower risk. However, the women showed a higher risk of 87.4% and men only 47.9% for metabolic risk. The correlation was significant at the $p=0.01$ level. There was thus a highly significant relationship between BMI and WHTR ratio for women.

The health survey results indicated that 90% of the elderly population were in various stages of hypertension and 6% showed signs of developing hypertension. However, hypertension was more prevalent in women (91%) than in the men (83%). There was a statistical significant correlation ($p=0.01$) between waist circumference and systolic pressure for both women and men. A high percentage (82%) of the participants reported that they were currently on chronic medication whereas 18% were not using any chronic medication at the time. Although hypertension was prevalent in most respondents, it was followed by self reported diabetes (26.7%) and cancer (1.9%). Results show that elderly experienced problems with following areas in the body skeletal joints (72.6%) as well as eyes and teeth were problematic in 75.9% of the respondents, followed by skin problems (29.6%) and ears and nose problems (28.6%).

Results in the salt administrative questionnaire indicate that sodium intakes were below WHO goals $<2000\text{mg}$. Results also show that a high percentage of respondents (60%) generally never added salt to cooked food as the majority saw it as a health risk. Only 13% added it always to cooked food and 21% added it sometimes.

Conclusions

The results in the study indicate the high prevalence of poverty, food insecurity and poor nutritional and health status that compromises the quality of life of elderly living in this community.

Recommendations

Long-term intervention studies must be prioritised to address economic, health, social and demographic factors and future research is needed to cater for the growing needs of this population group.

LIST OF FIGURES	PAGE
Figure 1.1: Population percentage of South African residents by age group	31
Figure 1.2: Population percentage of Umlazi residents by age group map of Umlazi and surroundings	31
Figure 1.3: Percentage population for both elderly women and men in Umlazi	32
Figure 1.4: The top food imports in South Africa in 2007	33
Figure 1.5: Top exports of commodities in South Af rica in 2007	34
Figure 1.6: Elderly of Umlazi's largest ward waiting at a payout point on pension day	34
Figure: 1.7: The conceptual frame work of the study	35
Figure 2.1: 110 year-old woman with severe weight loss who was excluded from the study	38
Figure 2.2: Disabled elderly captured on pension day	49
Figure 2.3: Obese and blind woman captured on pension day	61
Figure 2.4: Cooked meals sold on pension day- 2008	85
Figure 2.5: Traditional food sold on pension day- 2008	88
Figure 3.1: Umlazi map with all the wards	111
Figure 3.2: The model of the study variables	112
Figure 3.3: Researcher during a sampling section	115
Figure 3.4: Respondents completing consent forms	115
Figure 3.5: Field worker during an interview with various questionnaires	116
Figure 3.6: An elderly man's height measurement being taken	119
Figure 4.1: Percentage population reporting major problems with faulty housing	124
Figure 4.2: Households with animal infestation problems	125
Figure 4.3 Percentage of the sample population who are breadwinners	125
Figure 4.4 Number of people having other sources of income	126
Figure 4.5: Mean nutrient adequacy ratio (NAR) of energy and nutrients at different levels of FGDS (women)	141
Figure 4.6: Mean nutrient adequacy ratio (NAR) of vitamins at different levels of FGDS (men)	142
Figure 4.7: Cutoff points for waist circumference in both male and female groups	144
Figure 4.8: Metabolic syndrome risk scores as measured by waist- to- height ratio (WHTR)	144

LIST OF FIGURES-continued	PAGE
Figure 4.9: Metabolic risk scores for women and men	145
Figure 4.10: Hypertension stages in Umlazi elderly	145
Figure 4.11: Hypertension stages by gender	146
Figure 4.12: The percentage population with self reported lifestyle diseases	148
Figure 4.13: Percentage of respondents currently on chronic medication	148
Figure 4.14: Frequency of the addition of salt when cooking food	149
Figure 4.15: Frequent addition of salt to cooked food	150
Figure 4.16: The relationship between BMI and waist- to- height ratio for women	150
Figure 4.17: The relationship between BMI and systolic BP in women	151
Figure 4.18: The relationship between BMI and systolic BP in men	151

LIST OF TABLES	PAGE
Table 1.1: The dimensions of food insecurity and malnutrition in Southern Africa looking at chronic poverty	17
Table 1.2: Measures of poverty in South Africa	18
Table 1.3: Estimated life expectancy at birth for the period, 2001-2006	29
Table 2.1: Top leading causes of death in KwaZulu Natal for both genders age 60-84	45
Table 2.2: The top ten histologically diagnosed cancers in South Africa, by gender	59
Table 2.3: Categories for physical activity levels	66
Table 2.4: Energy requirements for sedentary individuals (51-70 yrs)	67
Table 2.5: Dietary reference intakes for macro and micronutrients in age 51-70 years	68
Table 2.6: Critical nutritional investment relates to achieving the MDG's	92
Table 2.7: A combination of dietary assessment methods	96
Table 2.8: Assessment of weight loss in older persons over time	100
Table 2.9: Classification of the body mass index	103
Table 2.10: Classification and management of blood pressure for adults ages 18 years or older	108
Table 4.1: Accommodation and family composition	122
Table 4.2: Work and income status	127
Table 4.3: Household assets and appliances	129
Table 4.4: Top 20 food items ranked by total consumption (portion size x number of respondents) as measured by 24hr- recall (n=267)	130
Table 4.5: Analysis of three 24hr- recalls: mean macronutrient intakes of a sample of elderly subjects (n= 267)	133
Table 4.6: Comparison of intakes of macronutrients with the WHO (2003) nutrient intake goals and the elderly in Umlazi nutrient intakes	133
Table 4.7: Analysis of three 24hr- recalls: mean vitamin intake in the elderly respondents	135
Table 4.8: Analysis of three 24hr- recalls: mean micro mineral intakes of a sample of elderly	136
Table 4.9: Household food access as measured by food variety within the food groups consumed over a period of seven days (n= 270)	138
Table 4.10: Mean, standard deviations and the range of scores for the nine food groups	139

LIST OF TABLES-continued	PAGE
Table 4.11: Summary of food group diversity (n = 270)	140
Table 4.12: Means and standard deviations for age, weight and BMI (n= 270)	142
Table 4.13: BMI classification table for men and women	143
Table 4.14: Problematic health conditions	146
Table 4.15: Health facility results	149

LIST OF ANNEXURES	PAGE
ANNEXURE A: Permission letter from eThekweni Municipality to conduct the study in Umlazi	198
ANNEXURE B: Training manual for field workers	199
ANNEXURE C: Health, anthropometric and medical questionnaire	214
ANNEXURE D: Socio- demographic questionnaire	220
ANNEXURE E: 24hr recall questionnaire	228
ANNEXURE F: Food frequency questionnaire	233
ANNEXURE G: Letter from language editor	240

LIST OF ABBREVIATIONS

AA-	Ascorbic Acid
ACC-	Administrative Committee on Coordination
ADLS-	Activities of Daily Living Standards
AHRQ -	Agency for Healthcare Research and Quality
AICR-	American Institute for Cancer Research
ASN-	American Society for Nutrition
AU-	African Union
BMD-	Bone Mineral Density
BP –	Blood Pressure
BRFSS-	Behavioural Risk Factor Surveillance System
CDC-	Centre for Disease Control and Preventions
CDL-	Chronic Diseases of Lifestyle
CFS-	World Food Security
CHD-	Coronary Heart Disease
CKD-	Chronic Kidney Disease
CVD-	Cardiovascular Disease
DASH-	Dietary Attempt to Stop Hypertension
DBP-	Diastolic Blood pressure
DDS-	Dietary Diversity Score
DHAA-	Dehydroascorbic Acid
DM-	Diabetes Mellitus
LR-	Lifetime Risk
DPAS-	Diet, Physical Activity Strategy
DRI	Dietary Reference Intakes
DRV -	Dietary Reference Values
DUT-	Durban University of Technology
EAR -	Estimated Average Requirement
EFA-	Essential Fatty Acid
EFCOSUM-	European Food Consumption Survey Methods
ENHA-	European Nutrition for Health Alliance
ENT-	Ear, Nose, Throat
EPC's	Endothelial Progenitor Cells

ERN-	Extended Release Niacin
ESRD-	End Stage Renal Disease
EU-	European Union
FAO-	Food and Agriculture Organisation of the United Nations
FDA-	Food and Drug Administration
FBDG-	Food Based Dietary Guideline (FBDG)
FPG-	Fasting Plasma Glucose
GDP-	Gross Domestic Product
GHS-R -	Growth Hormone Secretagogue Receptor
GI-	Glycaemic Index
HDL-	High Density Lipoprotein
HEI-	Healthy Eating Index scores
HSRC-	Human Sciences Research Council
ID-	Iron Deficiency
IDID-	Iron Deficiency and Iodine Deficiency
IDF-	International Diabetes Federation
IFPRI-	International Food Policy Research Institute
IFSNP-	Integrated Food Security and Nutrition Programme
IR-	Insulin Resistance
KZN-	KwaZulu Natal
LDL-	Low Density Lipoprotein
L-DOPA-	Levodopa
LOAEL-	Lowest Observed Adverse Effect Level
LR-	Lifetime Risk
LTCF-	Long-Term-Care- Facilities
MDG-	Millennium Development Goals
MEPS -	Medical Expenditure Panel
MetS-	Metabolic Syndrome
MUAC-	Mid-Upper Arm Muscle Circumference
MUFA-	Monounsaturated Fatty Acids
NAASO-	North American Association for Study of Obesity
NAR-	Nutrient Adequacy Ratio
NCD'S –	NonCommunicable diseases
NCHS-	National Centre of Health Statistics

NFA-	National Fortification Alliance
NFCS-	National Food Consumption Survey
NHANES-	National Health and Nutrition Examination Survey
NICUS-	Nutrition Information Centre University of Stellenbosch
NIDDM-	Non-Insulin Dependent Diabetes Mellitus
OSA-	Obstructive Sleep Apnea
PAL-	Physical Activity Level
PEM-	Protein Energy-Malnutrition
PLP-	Pyridoxal 5'-Phosphate-
PMP-	Per Million Population
PUFA -	Polyunsaturated Fatty Acids
RAP-	Rapid Assessment Procedures
SADC -	Southern African Development Community
SADoA-	The South African Department of Agriculture
SALDRU-	Southern African Labour and Development Research Unit
SAMRC-	South African Medical Research Council
SASSA-	South African Social Security Agency
SBP-	Systolic Blood pressure
SCN-	Sub Committee on Nutrition
SENECA-	Survey in Europe on Nutrition and the Elderly, a Concerted Action
SFT-	Skin Fold Thickness
SPSS-	Statistical Package for Social Sciences
SSA-	Sub Saharan Africa
STATSSA-	Statistics South Africa
TC-	Total Cholesterol
UNPD-	United Nations Populations Divisions
UNICEF-	United Nations Children's Fund
VAC-	Vulnerability Assessment Committees
VAD-	Vitamin A Deficiency
WHO-	World Health Organization
WCRF-	World Cancer Research Fund
Wd-	Ward
WHR-	Waist- to -Height Ratio

SYMBOLS

*- Estimated Energy Requirements (EER) low activity individuals 51-70 and >70 old

\$- Recommended Dietary Allowances (RDA)

&- Estimated Average Requirements (EAR)

μg- Microgram

- Adequate Intake (AI)

♂ - men

♀ - women

TABLE OF CONTENTS

INDEX	PAGE
ABSTRACT	v
LIST OF FIGURES	ix
LIST OF TABLES	xi
LIST OF ANNEXURES	xiii
LIST OF ABBREVIATIONS AND SYMBOLS	xiv

CHAPTER 1: THE PROBLEM AND ITS SETTING

1.	INTRODUCTION	1
1.1	DEFINITIONS OF NORMATIVE DIMENSIONS IN FOOD SECURITY	3
	a. Food security	3
	b. Food insecurity	3
	c. Right to food	4
	d. Food sovereignty	4
	e. Nutrition security	5
1.2	THE IMPACT OF MALNUTRITION GLOBALLY	5
	1.2.1 Basic concepts and principles of human rights	7
	1.2.2 Food policies and changing food systems	8
	1.2.3 Food supplies and undernourishment	10
	1.2.4 Food security and insecurity: a global crisis	11
1.3	MALNUTRITION IN THE AFRICAN CONTINENT	13
	1.3.1 Contributing factors to malnutrition in sub Saharan Africa	14
	a. Declining agricultural output	14
	b. Disasters	14
	c. HIV/AIDS	14
1.4	THE IMPACT OF POVERTY ON MALNUTRITION	15
	1.4.1 Measuring poverty	15
	1.4.2 Where are the poor?	17
	1.4.3 Access to services	17

1.4.4	Income earning activity	17
1.4.5	Gender	19
1.4.6	Occupation	19
1.4.7	Social assistance in South Africa	21
1.5	MALNUTRITION AND AGING	21
1.5.1	An overview of undernutrition in South African elderly	22
1.5.2	Impact of urbanisation and over nutrition	23
1.5.3	Overweight and socio-economic status	25
1.6	HEALTH AND MORTALITY RELATIONS	27
1.7	RATIONALE AND MOTIVATION	28
1.8	STUDY OBJECTIVES	34
1.9	THE CONCEPTUAL FRAMEWORK OF THE STUDY	36
1.10	STRUCTURE OF DISSERTATION	37
1.11	CONCLUSION	37

CHAPTER 2: CONCEPTUALISING AGING

2	INTRODUCTION	38
2.1	WEIGHT LOSS CAUSES RELATED TO PHYSIOLOGICAL CHANGES DURING AGING	38
2.1.1	Anorexia associated with aging	38
2.1.2	Central feeding drive mediators	39
2.1.3	Central satiety system	40
2.1.4	Factors relating to hedonic impact	40
2.2	CHANGES RELATED TO DIGESTIVE FUNCTIONS:	40
a)	Gastric distension	40
b)	Gastric emptying	40
c)	Small intestinal gastric intestinal hormone	40
d)	Fat stores	41
e)	Cytokines	41
2.2.1	Muscle changes	41
i.	Anabolic hormones	42
ii.	Physical activity	42
2.3	AGING EFFECTS ON MUSCLE MASS REDUCTION & ROLE OF PROTIEEN	42
2.4	NON-PHYSIOLOGICAL CAUSES OF WEIGHT LOSS	43

2.4.1	Social isolation	43
2.4.2	Depression and other psychological factors	44
2.5	DISEASES PREVELANT IN ELDERLY LIFE	44
2.5.1	Renal failure	45
2.5.2	Rheumatoid arthritis	46
2.5.3	Osteoarthritis	46
2.5.4	Osteoporosis	46
2.5.5	The role of vitamin D	47
2.5.6	The role of disability in elderly life	47
2.5.7	Dental status and oral health	49
2.5.8	Cataract -nutrition and age related lens opacities	50
2.5.9	Obstructive sleep apnea	51
2.5.10	Alzheimer's disease/ dementia	51
2.6	NONCOMMUNICABLE DISEASES IN DISADVANTAGED COMMUNITIES	52
a)	Pre-hypertension	53
b)	Hypertension	53
c)	Importance of systolic pressure	54
d)	Prevalence of hypertension in South Africa	54
e)	African South Africans, older adults/ risk group for hypertension	55
f)	Salt sensitivity	55
g)	Prevention of hypertension: public health challenges	56
2.6.1	Cardiovascular disease	56
2.6.2	Stroke	56
2.6.3	Diabetes	57
2.6.4	Cancer	59
2.7	THE ECONOMIC IMPACT OF OVERWEIGHT AND OBESITY	61
a)	Economic costs and benefits of obesity treatment in developing countries	63
2.7.1	Metabolic syndrome	64
2.8	DIETARY REQUIMENTS FOR THE ELDERLY-MACRONUTRIENTS	65
2.8.1	The role of DRI's and dietary requirements	65
i.	Categories of DRIs	66
2.8.2	Dietary intake and food consumption patterns in South African elderly	69
2.8.3	Dietary needs in the elderly	70
a)	Energy intake	70

b) Carbohydrates and dietary fibre	70
c) Glycaemic carbohydrates	70
d) Protein intake and needs for the elderly	72
e) Dietary fat intake	73
f) Fruit and vegetable consumption	75
2.9 THE ROLE OF MICRONUTRIENTS IN A DIET	75
2.9.1 Micronutrient deficiency in the African continent	75
2.9.2 Micronutrient requirements for the elderly	75
a) Vitamin A	77
b) Vitamin E	77
c) Vitamin C	78
d) Vitamin K	79
e) Folate	79
f) Vitamin B12	80
g) Vitamin B6	80
h) Thiamine	81
i) Zinc	81
j) Riboflavin	82
k) Biotin	82
l) Panthothetic acid	83
m) Niacin	83
n) Magnesium	84
o) Calcium	84
2.10 FLUID CONSUMPTION	85
2.11 MEAL PATTERNS AND FOOD CHOICES OF ELDERLY PEOPLE	86
a) Cooking methods adopted	87
b) Problems related to cooking	87
c) The role of indigenous foods	88
2.12 AGE ASSOCAITED CHANGES IN TASTE, ODOUR SENSATION AND PERCEPTION	88
a) Taste	89
b) Olfaction	89

c) Flavour preference	89
d) Relation between sensory perception and nutritional status	89
2.13 STRATEGIES TO ADDRESS MALNUTRITION	89
a) Dietary supplements and functional foods	90
b) Protein oral supplementation and benefits	93
c) Food fortification	93
d) Community based nutrition programmes	94
2.14 METHODS OF COLLECTING DATA	94
2.14.1 Socio-demographic survey	95
2.14.2 Dietary assessment methods	95
a) Assessment of dietary intake in the elderly	96
b) Uses and limitations of dietary intake methodologies	96
c) Combining different types of dietary assessment methods	98
2.14.3 Anthropometric data collection methods	99
a) Anthropometric evaluation of nutritional status	99
b) Assessing the nutritional status of adults	99
c) Body composition	100
i. Height and length	101
ii. Weight	101
iii. Body mass index calculation	102
iv. Waist to height ratio calculation	103
2.14.4 Circumference measurements	105
a) Subcutaneous fat- skin fold thickness	105
b) Waist circumference	106
c) Calf circumference	106
d) Mid-arm circumference	105
2.14.5 Health assessment methods	106
a) Clinical blood pressure measurement	107
b) Self measurement	107
c) Biochemical indices	108
2.15 CONCLUSION	108

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION	109
3.2 ETHICAL CONSIDERATIONS	109
3.3 EMPIRICAL STUDY DESIGN	110
3.3.1 Developmental stages of the study	110
3.4 STUDY TYPE	111
3.5 STUDY VARIABLES	112
3.6 SAMPLING STRATEGY	113
3.7 RESPONSIBILITY OF FIELDWORKERS	115
3.8 ADMINISTRATION OF MEASURING INSTRUMENTS	116
3.8.1 Socio-demographic survey	116
3.8.2 Dietary intake	116
a) 24 hr- recall questionnaire	116
b) Food frequency list questionnaire	117
3.8.3 Anthropometric, medical and health survey	117
a) Salt administration questionnaire	117
3.9 PROCEDURES FOR CONDUCTING ANTHROPOMETRIC MEASUREMENTS	118
3.9.1 Weight	118
3.9.2 Height	118
3.9.3 Waist circumference	118
3.9.4 Blood pressure	119
3.10 STATISTICAL ANALYSIS OF DATA	120
3.10.1 Socio-demographic and health questionnaires	120
3.10.2 Dietary assessment questionnaires	120
3.10.3 Anthropometric measurements	120
3.11 CONCLUSION	121

CHAPTER 4: RESULTS AND FINDINGS

4 INTRODUCTION	122
4.1 SOCIO- DEMOGRAPHIC RESULTS	122
4.2 INCOME AND EXPENDITURE RESULTS	125
4.3 DIETARY INTAKE AND FOOD CONSUMPTION PATTERN INDICATORS	130
4. 3.1 Food variety score, dietary diversity and nutrient adequacy	137

4.4 ANTHROPOMETRIC AND HEALTH INDICATORS	142
4.4.1 Anthropometry findings	142
4.4.2 Health survey indicators of the sample	146
4.4.3 Salt intake results	149
4.5 CORRELATIONS	150
4.5.1 BMI and weight-to-height ratio correlations	151
4.5.2 BMI and systolic BP correlations in women	151
4.5.3 BMI and systolic BP correlations in men	152
4.6 DISCUSSION OF RESULTS	152
4.7 CONCLUSION	155
 CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS	
5. INTRODUCTION	156
5.1 LIMITATION OF THE STUDY	156
5.2 MAIN FINDINGS OF THE STUDY	157
5.3 CONCLUSION	159
5.4 RECOMMENDATIONS	159
5.4.1 Recommendations for the community	159
5.4.2 Recommendations for policy makers	160
5.4.3 Recommendations for future research	160
 REFERENCE LIST	161
ANNEXURES	200

CHAPTER 1: THE PROBLEM AND ITS SETTING

1. INTRODUCTION

The World Health Organisation (WHO) (2008b) defines “elderly” as all persons over the age of 60. According to a report published in 1980, the elderly made up 8.5% of the world population. During 1990 this figure had risen to 9.4% and it was up to 11% in 2000. By 2020, it is projected that of the total global population of 7.5 billion people, 13.5% will be elderly. In South Africa the elderly made up 7.7% of the population in 2006 and this figure is expected to reach 19% by the middle of the century (United Nations Population Division (UNPDP), 2006). Elderly women constitute 61.7% of the population aged 60 years and over, a figure that rises to 68.1% in the population aged 80 years and over (Statistics South Africa (STATSSA), 2005).

Developing societies are facing this demographic shift of an increasing number of persons over the age of 60 years. Singapore has the fifth fastest growing ageing population in the world and it has placed elderly people as priority (Wong, 2003).

Wong (2003) discovered that quality of life for the elderly in Singapore was influenced by three demographic variables: personal health condition, family ties and public safety. Variables that tended to contribute less satisfaction were arts and culture as well as leisure and recreation facilities that are available in Singapore. The tool used to measure variables of this particular study included a five- point Likert scale to measure the perceptions of older persons.

Research shows that in the periods between 2000 and 2025, the elderly population (≥ 60 yrs) will be on the increase and is projected to be the most rapidly increasing age group globally. This increase is expected to peak at 149% (41- 102 million). However, a fourfold increase which is an equivalent of 36.6 million to 141 million (5-10%) is projected in sub-Saharan Africa which will occur during the 2005-2050 period (United Nations (UN), 2007). According to Meydani, Ahmed and Meydani (2005), this projected increase will be prevalent also in other developing countries. However, this will be more prevalent in rural areas and more amongst women than men.

In Africa the older population is rapidly growing, one of the reasons for this is because about 5% of the young adult population is HIV positive. In the South African region AIDS related mortality results have projected declines in life expectancies from 65 to 56 years. Due to the spread of HIV/AIDS, elderly people have to look after their children who are suffering as well as grandchildren who are becoming orphans. This demanding role has led to the term “grandmother curse” which is often used in relation to the spreading rate of the AIDS epidemic, particularly in sub-Saharan African countries. Orphans of AIDS related deaths as well as children with AIDS are generally taken care of by their grandmothers. This puts more pressure on this segment of society due largely to the generational gap and grandmothers who are overburdened with the continued responsibility of care giving. The health status and nutritional status in older Africans will be negatively affected by the socioeconomic and demographic impact of the AIDS epidemic. AIDS has detrimental outcomes in society and even more so in elderly headed households (Charlton and Rose, 2001a).

In a South African study that sought to identify malnutrition in older adults, certain tools were developed to further investigate the study. The Mini Nutritional Assessment (MNA) which was originally validated for use in Europe, is an 18-item questionnaire which comprises of four aspects of assessment: general, health and nutritional status, dietary and anthropometric in the African context amongst elderly in South African. Using this test showed significant results ($P < 0.05$) with anthropometric measures, cognitive function, and activities of daily living; in women there was an also association with handgrip strength (Charlton, Kolbe-Alexander and Nel, 2007).

Research has shown that old age for most Africans is a culmination of disadvantaged experiences of a lifetime of poverty and deprivation, poor access to health care and a diet that is usually not balanced in terms of quantity and quality. All of these contribute to their risk of susceptibility to malnutrition and ultimately, disease prevalence. In African countries there are poor interventional strategies that focus on older people which is largely due to the cost implications associated with addressing these needs. Rather, strategies are directed primarily at infants and young children, as well as pregnant and lactating women (Help Age International, 2004).

Based on the limited evidence available, the prevalence of under nutrition is higher in older African men (9.5 – 36.1%) than in women (13.1 – 27%), although nutrition transition

is becoming a reality in some urban areas, Looking at the socio-economic status in older Africans, there is a high prevalence of poverty (43-95%). The results also indicated that elderly depended on their children for some form of resources (32% in urban areas and 24% in rural areas) and had a limited food budget to live on. The majority of elderly Africans lived with family (this includes living with children or grandchildren whom the elderly provided support for) (Help Age International, 2004). Results indicated that in the countries most affected by HIV/AIDS, there were between 50% and 60% of orphans living with their grandparents. These countries were Botswana, Malawi, Namibia, South Africa, Tanzania and Zimbabwe (Aboderin, 2007).

The demographic transition has been accompanied by an epidemiological transition which has meant a shift from infectious diseases and under nutrition to chronic and degenerative diseases as major causes of mortality (Gavazzi, Herrman and Krause, 2004).

1.1 DEFINITIONS OF NORMATIVE DIMENSIONS IN FOOD SECURITY

a) Food security

During 2002, the South African Department of Agriculture (SA-DOA) defined food security as a “situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”. For more than 20 years South Africa has been classified as a food secure country that produces adequate amounts of staple food for its population, and also has enough foreign currency to import other foods to meet its needs (Department of Agriculture (DOA), 2002). However, current statistics suggest that 42% of South Africans are food insecure (De Klerk, Drimie and Aliber, 2004; Charlton and Rose, 2002).

b) Food insecurity

Food insecurity, poor conditions of health and sanitation, and inappropriate care and feeding practices are the major causes of poor nutritional status. Food insecurity may be chronic, seasonal or transitory (United Nations (UN), 1975). In South Africa most people buy the food that they eat, but livestock and crop production still occurs in rural areas in the form of subsistence farming (Maunder and Meaker, 2007).

A European study by Quine and Morrell (2005), was conducted among elderly people to measure how the level of food security was linked to inadequate financial resources. Results showed that food insecure respondents were more likely to be linked to financial struggles. In addition, poor self rated health and lifestyle was associated with food insecurity. In females being a home-renter was a significant predictor of food insecurity but not in males. Results in this European study correlate with other studies that indicated that women are less likely to have adequate resources in their old age. Other studies have looked at other attributable factors which cause food insecurity and found that there was a greater need to consider all factors when measuring food insecurity in this age group. Alleviating food insecurity in elderly is largely dependent on funds. This is a feasible goal and is critical to reducing inequalities within health sector. Although this study (which will be illustrated in Chapter 4) has shown significant levels of food insecurity with the majority of respondents living with other members of the family in the community of Umlazi, food insecurity also exists amongst elderly people living alone. According to Help Age International (2006), a study conducted in Cyclone Nargis where purchasing power was lost and there were limited food supplies, the elderly people had coping strategies which included skipping meals, reducing the portion size of food consumed, not eating for the whole day and visiting relatives' homes.

c) The right to food

The Right to Food was declared by the Universal Declaration of Human Rights in 1948 and the International Covenant on Economic, Social and Cultural Rights set it out as a legally-binding right in 1967 (United Nations, 1999). In 2004, governments at the FAO adopted a set of “Voluntary guidelines to support the progressive realisation of the right to adequate food in the context of national food security”. These guidelines aim “to provide practical guidance to states in their implementation of the progressive realisation of the right to adequate food in the context of national food security, in order to achieve the goals of the Plan of Action of the World Food Summit.”

d) Food sovereignty

Food sovereignty is “based on the human right to food, to self-determination, on indigenous rights to territory, and on the rights of rural peoples to produce food for local and national markets. Food sovereignty defends agriculture with farmers, fisheries with artisanal fishing families, forestry with forest communities and steppes with nomadic pastoralists” (FAO, 1998). A meeting of women across various countries gathered in Mali during 2007 to discuss

the right food sovereignty. The key definers for food sovereignty identified and discussed in the Nyeleni Declaration were as follows; it must focus on the people on the ground, it must value food providers, food systems must be localised, bring knowledge and skill of the people and work hand in hand nature retention (Food Sovereignty for Africa, 2008).

e) Nutrition security

According to FAO (1997) “The condition of nutrition security combines: accesses to a variety of good quality and safe foods necessary for child growth and development and to ensure an active and healthy life. Sufficient knowledge and skills must be acquired to prepare and consume a nutritionally adequate and safe diet, including those to meet the special needs of young children, and other vulnerable groups. Access to health services and a healthy environment to ensure effective utilization of foods consumed”. According to Heidhues, Atsain, Nyangito, Padilla and Le Vallée, nutrition security in Africa can be achieved through good governance, strong leadership and making a judicial system an independent entity. Developing strategies that will focus on empowering communities are also key in addressing this challenge. Research that will focus on productivity, increasing technologies, the development of drought, as well as be directed at natural resource conservation will be more effective.

1.2 THE IMPACT OF MALNUTRITION GLOBALLY

Over the past years there has been a limited definition of the term “malnutrition” and it has only been linked to undernutrition. The interpretation of this term also needs to find relevant meaning within the developing world. In order to address disease prevention and predisposition, malnutrition needs to be redefined and find relevance within various contexts of society (United Nations Systems, 2004).

Over 10% of people aged 65 years and over are faced with the reality of malnutrition and this is a significant public health problem. It is estimated that diseases related to malnutrition costs are more than £7.3 billion a year in Europe, a fact often overshadowed by the cost of obesity. Individuals who are >65 years are the main beneficiaries of over half of these funds. The level of risk related to nutritional deficiencies varies greatly within individuals as the causes of malnutrition are social, physical, and psychological. They include underlying diseases, decreased mobility, limited transport to local shops, social isolation and poverty (European Nutrition for Health Alliance (ENHA), 2006).

Hospitals generally have major problems with individuals who are both ageing and sick and many of these cases are due to malnutrition. A series of changes associated with the process of ageing can increase the risk of malnutrition, however, malnutrition is not an inevitable side effect of ageing.

During an individual's lifetime various factors, such as environment (includes both macro and micro), genetics and lifestyle, have an effect on people. These effects gradually contribute to the ageing process. Inadequate nutrient intake and overeating during ageing affect the nutritional status of the aged. Nutritional disorders in the aged may rise because of chronic diseases, decayed teeth, anorexia, obesity, decline in cellular metabolism, hormonal alteration, osteoporosis and dementia accompanied by social, economic, and psychological factors (Jalili, Rashidi and Mogohadam, 2005). Factors such as physiological, social and economic changes are associated with the ageing process. As one ages, the drastic loss of lean body mass is generally often under recognised. However, it may contribute to adverse health outcomes and pose an increasing risk to the quality of life. The major contributing factors to such conditions are increased incidence of diabetes and impaired immunity (Dawson, Taylor and Favaloro, 2008).

A low level of energy intake has been shown to be prevalent among older people in South Africa. In Cape Town where residents were living in informal settlements in peri-urban areas, over a quarter (27%) of men and over a third (36%) of women had energy intakes <67% of the RDA (Charlton and Rose, 2001a).

Research conducted by Clausen (2005), on the Nutritional Predictors of Decline and Short Survival in Prospective Survey of Older Persons Community –Dwellers in Botswana found that 6.7% had reduced ability to perform one or more of four Activities of Daily Living Standards (ADLS) like the use of toilet/ latrine, dress/ undress themselves, wash/clean themselves and transfer in/out of bed. It was concluded that there is a high nutritional risk, and anaemia predicted reduced ability to be self-sufficient and shorter survival times in this population of older Africans. This indicated the need to screen for poor nutritional status and to introduce culturally appropriate interventions to improve the nutritional status of the disadvantaged to preserve ability to self-maintenance and reduced mortality in older persons

According to Maruapula and Chapman-Novakofski (2005), the elderly in Botswana consumed a diet of poor quality. Dietary recommendations were achieved for only one food

group (breads and cereals), and good component Healthy Eating Index (HEI) scores were obtained for five components (fat, cholesterol, dietary fat, sodium).

In West Africa (Nigeria) research conducted on the dietary assessment of elderly who were between 60-102 years (Olayiwola, Ketiku and Olusanya, 2005), found that the diets were 90% of plant origin. Comparing this with the Recommended Dietary Allowances (RDA), it was found that men consumed energy of up to 79% of the RDA while women consumed 78%. The protein intake achieved 77% of RDA for the men and 69% of the RDA for women. The mean vitamin A intakes were 45% of the RDA for men and 40% for women. Energy, protein and vitamin A intake were inadequate in both groups.

The important challenge for any health care system is the treatment and prevention of malnutrition since this challenge continues to affect a large a number older adults (Vellas, Guigoz and Garry, 1999).

According to Hawkes, Eckhardt and Ruel (2005), there has been a decline in individuals who are underweight by 32% to 28% in the last decade. In Sub- Saharan Africa there is still a high prevalence of malnutrition, hence the intervention strategy by the Millennium Development Goal to cut hunger in half by 2015. Developing countries on the other hand are continuing to rise in the proportion of their populations which are showing trends of overweight.

Doak, Adair, Monterio and Popkin (2000), found that underweight and overweight individuals can co-exist in the same households, a phenomenon that was first identified in China, Brazil and Russia. These two types of malnutrition continue to co-exist in society. The developing world continues to face the phenomenon of increasing levels of overweight or obesity.

1.2.1 Basic concepts and principles of human rights

Many different declarations have been made over the years with the aim of reducing food insecurity:

- i. “Everyone has a right to a standard of living adequate for the health and wellbeing of himself and his family, including food” (FAO, 1996).
- ii. “States parties ... recognize the fundamental right of everyone to be free from hunger” “Every man, woman and child has the inalienable right to be free

from hunger and malnutrition in order to develop fully and maintain their physical and mental faculties. Society today already possesses sufficient resources, organizational ability and technology and hence the competence to achieve this objective. Accordingly, the eradication of hunger is a common objective of all the countries of the international community, especially of the developed countries and others in a position to help” (FAO, 1996).

- iii. “We pledge to act in solidarity to ensure that freedom from hunger becomes a reality” (FAO, 1996).
- iv. Food should not be used as an instrument for political and economic pressure. “We reaffirm the importance of international cooperation and solidarity as well as the necessity of refraining from unilateral measures not in accordance with the international law and the Charter of the United Nations and that endangers food security” (FAO, 1996).
- v. The 2009 World Food Summit devoted three days of discussion between several stakeholders to address key issues for the realisation of the right to food. During this summit leaders indicated the importance of reinforcing all efforts in order to meet targets for 2015 Millennium Development Goal One (which is poverty reduction) as well as World Food Summits targets, since this continues to be a global concern. Due to poor investment in areas such as food security, agriculture and rural development negative outcomes have been identified, which have been further negatively influenced by other factors. Global Partnership for Agriculture, Food Security and Nutrition, of which the Committee on World Food Security (CFS) is a central component, were mechanisms identified in building strong international relations and governance in addressing food security (FAO, 2009).

1.2.2 Food policy and changing food systems

According to Charlton, Ferreira and du Plessis (2008a), policies aimed at the elderly have been humanitarian and welfarist. The elderly were viewed as weak, non- productive individuals and squanderers of resource. The voice of elderly people was heard through the United Nations Second World Assembly held in Madrid in 2002. This meeting allowed them to be prioritised when it comes to food policy. The African Union (AU) policy framework

also advocated a plan ensuring that older people's rights to food and nutrition are legally constructed, ensured and guaranteed.

The core formulation of any food policy should aim at ensuring a sustainable, secure, safe, sufficient, nutritious equitable and culturally appropriate diet for all. Food policy is about what influences the set of relationships and activities that interact to determine what, how much, by what method and for whom food is produced and distributed, and by whom it is consumed. It deals with the food economy, which is a subset of the wider economy (FAO, 2000).

Policies constitute statements of formal intent regarding the alleviation of food and nutrition security, thus ensuring a cascade of policy formulation and actions at various levels of government. Policies should however be prioritised, especially if they are formulated with public participation and with close attention to strategic actions (Benson, 2004).

The versatility of human beings around the world contributes to a wide variety of diets and the variety of cuisines that originate from various cultures. Due to changes associated with time, diets have also evolved over time and there have been developments that have been based on those changes. The rich are in search of new food trends and delicacies while the poor are still seeking to afford basic food items. Historically consumed foods have a rich history and some significance and that history is not simply a history of food but a history of culture and society (FAO, 1996). In this study it would be interesting to see what main foods are eaten by this population group and also if indigenous food still plays a major role in people's diets.

Although food continues to be a basic necessity for life, various foods contribute to fulfil a wide variety of roles in our lives, not simply in terms of sustenance but physiological, social and cultural. Food is used for reward, for pleasure, to express status, culture and religious preference. In spite of the overall adequacy of food availability in the world, there continues to be huge differences in the amount and quality of food that is available to people in various countries (FAO, 2000). Although policies used in South Africa have achieved some improvements for an example provision of social support through pension grants, these have not sufficiently alleviated poverty. In some instances in various countries, the policies have

increased inequalities with an adverse impact on food and nutrition security (South African Presidency, 2007; Misselhorn, Drimie and Schwabe, 2007).

The impact of global economic and social change has enormously transformed food at an unprecedented rate. Financial driving forces in developing countries include issues such as urbanisation, markets for direct foreign investment and increasing incomes. The demographic shift which translates to women increasingly entering the workforce as well as women moving from rural to urban areas, are key social drivers. It is important to note that social inequalities are increasing, particularly in urban areas. Other changes include food production based on intensive agriculture, new food processing and storage technologies, longer product shelf-life, the emergence of food retailers such as fast food outlets and supermarkets and the intensification of advertising and marketing of certain products. Based on the changes mentioned above, the shelf life of food is now extended and is no longer seasonally bound, although there are some cost implications involved in this development. Emerging food trends such as the use of convenience foods which can range from home-based meals to pre-prepared or ready-to-eat meals have also played a role. The ever changing food system and lifestyle changes have had certain adverse effects on the health and nutritional status of people in developing countries. Although some of the changes mentioned have had a positive outcome globally, there are also certain poor outcomes such as overweight and obesity, particularly among adults and the increasing prevalence of diet-related non-communicable diseases (FAO, 2005a).

1.2.3 Food supplies and under nourishment

Stability of food supplies is another important dimension of food security and refers to the ability of households or individuals to procure adequate food supplies on a continuing basis through income, production and/or transfers, even when the household is faced with situations of unpredictable stress, shocks or crises. Further problematic associations include crop failure resulting from drought, flooding, or civil conflict, market fluctuations such as sudden price rises, the decline or loss of employment and loss of productive capacities of households members because of sudden illness, as well as cyclical events such as seasonal food insecurity (FAO, 2007a).

The FAO provides annual estimates of the number of undernourished people in the world. The current global figure of undernourished people stands at approximately 862 million.

These FAO estimates of undernourished people are essentially a measure of food deprivation i.e. insufficient energy intake based on calculation of three key parameters for each country (International Food Policy Research Institute (IFPRI) and FAO, 2008). It is important to note that the FAO's measure of undernourishment measures only food deprivation (FAO, 2007a).

A study conducted on homebound older adults to identify relationships between medical, functional, economic, oral health, social, religious, and psychological factors and under-eating showed that seventy percent of respondents were under-eating. Men who were receiving either infrequent care or very frequent care by a caregiver, those who had been hospitalised prior to receipt of home health services, and those with a higher body mass index were more associated with under-eating. This population is vulnerable and there must be more evidence-based interventions that address this concern in this growing population of elderly people (Locher, Ritchie, Robinson and Roth, Smith West, and Burgio, 2008).

1.2.4 Food security and insecurity: a global crisis

According to Tansey (2002), globally food security depends on a range of things, including:

- The ability to minimise/manage/react to climatic change and disruptions to food production by holding suitable stock levels and having emergency distribution arrangements in place; and
- Developing technologies that will not be a hindrance the supply of food through ecological viability but will increase performance and capacity.

Regionally and nationally it includes:

- Effective production and distribution within the borders so that people within those borders acquire the food they need (by production, purchase or special schemes);
- Managing effective research and development (R&D) systems which allow for continued improvements to all aspects of production. This means that farmers within a country must cope with variability (agro-ecological and economic) and climatic changes.
- Ensuring better livelihoods of both rural and urban dwellers to have access to the food they need, either from direct production, purchase or barter.

At the community and household levels it requires:

- Continued ability to maintain livelihoods that allow production/procurement of food needs in an appropriate manner;
- Impoverishment prevention can be addressed through strategies that can eliminate risk for local needs and customs. This also involves disputes that lead to food becoming a weapon.
- Support for those in marginal areas/environments to increase productivity, or if they are forced out of these areas, for there to be alternative livelihood possibilities available; and
- Equitable gender and inter- and intra-household distribution (Tansey 2002).

Natural disasters only play a minor role (10%) in hunger related incidences across the world. These include famine and there is still a need for further attention towards this type of contributor. Most of the hungry, approximately 90% are chronically undernourished (FAO, 2005b).

Food insecurity is a “situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active, healthy life”. It may be caused by the unavailability of food, insufficient purchasing power, or the inappropriate distribution or inadequate use of food at the household level (United Nations (UN), 1975). Food insecurity occurs when people do not have access at all times to enough food for an active and healthy life which is essential for all humans. Deprivation of regular and reliable access to food could lead to detrimental effects in communities. Since the 1990s the Southern African Development Community (SADC Region) has experienced severe food shortages due to a number of problems such as poor climatic conditions, poor access to basic services, economic problems and poor governance (Southern African Development Community (SADC), 2006). Food insecurity has been further exacerbated by the current rise in food prices related to climate change, greater demand for food products in emerging economies, agricultural production used for bio fuels, rapid population growth and urbanisation (FAO, 2008).

The 2009 World Food Summit in Food Security in Rome highlighted the following challenges:

- To eradicate hunger from the earth. Not only to ensure sufficient food production to feed a world population that will grow by 50% and reach 9 billion by 2050, but also

find ways to guarantee that everyone has access to the food they need for an active and healthy life.

- To put in place a more coherent and effective system of governance of food security at both national and international levels.
- To make sure developing countries have a fair chance of competing in world commodity markets and that agricultural support policies do not unfairly distort international trade.
- To find ways to ensure those farmers in both developed and developing countries can earn incomes comparable to those of secondary and tertiary sector workers in their respective countries.
- To mobilise substantial additional public and private sector investments in agriculture and rural infrastructure and ensure farmers' access to modern inputs to boost food production and productivity in the developing world, particularly in low-income and food-deficit countries.
- Considering that 30 or more countries are currently experiencing food emergencies, to agree to more effective mechanisms for early reaction to food crises.
- To ensure that countries are prepared to adapt to climate change and mitigate negative effects (FAO, 2009).

1.3 MALNUTRITION IN THE AFRICAN CONTEXT

According to FAO data, in 2003 about 862 million people worldwide were undernourished. The results show that 820 million of the undernourished are in developing countries whilst 9 million in were in developed countries, 25 million in countries in transition. This is an additional burden that needs to be fast tracked in developing countries (FAO, 2006).

The conceptual framework of the United Nations Children's Fund (UNICEF) (1990), identified three underlying causes of malnutrition including: inadequate household food insecurity, inadequate care for children and women and insufficient health services and healthy environment. With particular reference to sub-Saharan Africa, inadequate household food insecurity appears to be the most important underlying cause of malnutrition (Smith & Haddard, 2000). Recent estimates are that 184 million people or 36% of the population of sub-Saharan Africa are chronically hungry or food insecure (FAO, 2000b). The various regions of Africa show that being underweight was most prevalent in East Africa at 30% followed by 25.3% in Central, 26% in Western, 13.6% in Southern and 8.6% in Northern

Africa. The relationship between the underlying causes of malnutrition and food insecurity in South Africa needs urgent attention from researchers since limited empirical data is available for other groups such as elderly women and men (Oldewage-Theron, Zotor, Matiwane and Venter, 2005a).

1.3.1 Contributing factors to malnutrition in sub-Saharan Africa:

a) Declining agricultural output

Food security is intrinsically linked to agriculture. Agriculture plays a vital role in the lives of the people in sub-Saharan Africa in terms of food production, employment generation and export earnings. Agriculture accounts for approximately 21% of the gross domestic product (GDP) of sub-Saharan Africa (FAO, 1994).

b) Disasters

Natural and manmade disasters which strike countries in sub-Saharan Africa are a major cause of food insecurity and worsening malnutrition. Drought affects most countries in the Horn of Africa because of the limited rainfall in that part of Africa (Messer, Cohen and Costa, 1998). During the recent earthquake in Haiti, Help Age International estimated that at least 200,000 elderly were affected by the earthquake and about 300,000 were injured while approximately 1.2 million needed emergency shelter. This crisis has escalated the levels of food insecurity among the elderly in this population (Help Age International, 2010).

c) HIV/AIDS

According to FAO (2000b), projections of the impact of HIV/AIDS are to increase by more 11 million deaths in the next 20 years. However, HIV/AIDS has a direct and profound negative impact on food insecurity and nutrition in sub-Saharan Africa. The 25 worst affected countries are in sub-Saharan Africa with AIDS related deaths numbering 7 million agricultural workers. In Southern Africa the widespread HIV pandemic is a major determinant of food and nutrition security, as the region has the highest prevalence rate of HIV in the world (DOH, 2007b). AIDS deaths peaked during 2005 at 2.2 million, but have now declined to 2 million since 2007, the main reason for this is accessibility of antiretroviral drugs. In Southern Africa during 2007 over one third of new HIV infections and 38 % of AIDS deaths occurred. Women account for half the people living with HIV worldwide and nearly 60% of those infected in sub-Saharan Africa (UN, 2009). In a study conducted by

Kruger, Watson and Wentzel-Viljoen (2009), amongst older persons infected with and/ or affected by HIV/AIDS, indicated that the HIV/ AIDS epidemic is a new health risk challenge that will be faced by older persons as they age, which indirectly worsens their nutrition status putting them in need of urgent support.

The growing levels of extreme poverty, the pandemic of HIV/AIDS and poor leadership within the region which has affected the entire continent, have all been identified as causes of food insecurity within the region. According to the United Nations Aids (UNAIDS) Epidemic Update (2007), the estimated number of people living with HIV/AIDS worldwide in 2007 was 33.2 million. South Africa is the country with the largest number of HIV infections in the world.

1.4 IMPACT OF POVERTY ON MALNUTRITION

Since poverty involves deprivation at many levels, measures/ indicators of poverty are many and varied. They include aspects such as hunger, unemployment, social exclusion, unhappiness, and access to basic services. “Poverty is not just a state of affair; it is an unacceptable state of affairs” (Noble, Ratcliffe and Wright, 2004).

According to Statistics South Africa (STATSSA) (2006a), there were 13 million households in the country, 7.8 million of which had children in them. In 84% of these households no child ever went hungry which is a considerable improvement from 68.8% in 2002.

During the period of 2002 to 2006, adults who went hungry showed a steady decline from 6.9% in 2002 to 2.5% in 2006. However, looking at the gender dynamics, male headed households in 2002 showed less hunger, as well as in 2005 (5.4%) and in 2006 (2.1%). However, female headed households showed a higher prevalence of hunger at 9.7% during 2005 as well as 3.3% in 2006.

The Millennium Development Goals (MDG) on poverty aim to halve the proportion of people living on less than 1USD a day between 1990 and 2015 (African Development Bank, 2007b). There is reasonable consensus that poverty levels in South Africa increased in the years immediately post-democracy until around the year 2000 since which time it has slowly decreased (African Development Bank, 2007a).

1.4.1 Measuring poverty

Income is not the only measure of poverty. In apartheid South Africa, in particular, black families might have been prevented from living in an area in which they had access to basic services such as pure water, electricity, refuse removal and so on. This denial of access would have had a major impact on their well-being and opportunities. Today these formal restrictions no longer apply, but their legacy often remains. Two distinctions can be made even in a non-apartheid situation when it comes to assessing poverty levels (income alone is not an adequate measure of poverty):

- Objective measures such as: income, life expectancy, housing standards, and subjective measures which look at attitudes, needs and perceptions.
- Measures of the constituents of well being, such as indicators of health, welfare and human rights, and measures of accesses to the determination of well being, such as availability of housing, health care, education facilities and income.

A basic measure of poverty is per capita household income, in which one calculates the total monthly income of each household. In addition to salaries and wages, this total includes net profit from business, professional practice, farming or letting property, royalties, interest and dividends, state grants, payments from family members outside the household, lump sum payments and a number of other categories. The total is divided by the number of household members to present the average income per household member or per capita (Budlender, 2000). Wiggins (2005) divided the poor into three categories, namely working poor, non-working poor and young children living in poverty, the consequences of these types of poverty are illustrated in Table 1.1

Table 1.1: The dimensions of food insecurity and malnutrition in Southern Africa: looking at chronic poverty (Wiggins, 2005).

Who is affected by chronic poverty?	Consequences
1. Working poor: who are without assets, skills or opportunities to escape poverty [Not known: total extreme poor: 24.6 M]	Poor access to nutritious food because of financial constraints. Hungry seasons occurring during harvest when poor farming households run out of their own food supplies. Food prices are highest and credit access is limited which increases the severity of this problem.
2. Non-working poor: unable to work due to age, illness, disability [Not known: total extreme poor:24.6 M]	Reliant on support from family / social grants and friends resulting in limited buying power and food choice.
3. Young children: living in poverty [3.9 M in extreme poverty]	Poor health conditions contribute to malnutrition with consequences such as poor growth and low survival rates.

1.4.2 Where are the poor?

In all South Africa-statistical surveys, the enumeration areas are classified according to the settlement type. Areas such as metropolitan areas, cities and towns which are formally proclaimed as urban are classified as urban. Areas which are not part of these legally proclaimed areas, but adjoin them, are classified as semi urban. This classification covers a small proportion of households and would, for example, include some informal settlements. All other areas are classified as non- urban or rural. This last category includes commercial farms, small settlements, rural villages and other areas with dispersed settlement (Budlender, 1999; Anon, 2009).

According to Charlton, Ferreira and du Plessis (2008a), in South Africa the influence of rural to urban migration has caused family members to reduce farming activities which elevated food insecurity. Research has shown that African South African elderly who headed households had a higher risk of poverty and the bigger the household, the more it was associated with food poverty.

1.4.3 Access to services

The primary responsibility of local government involves affording access by means of satisfying certain basic needs to the people. Those services, including water on site or nearby,

electricity, sanitation and refuse removal, all contribute to the overall physical and psychological well-being of household members (Budlender, 1999).

1.4.4 Income- earning activity

The extents to which households benefit from earned income are the rate of economic activity and unemployment:

- The rate of economic activity is calculated as the total number of adults who are either employed or unemployed, divided by the total number of adults in the relevant age group. An unemployed person is understood broadly as someone who is without work but willing to engage in it.
- For both men and women the rate of economic activity increases with increasing household wealth while the rate of unemployment decreases. The results of all the economic activity patterns show that households in the lower income decile tend to have fewer income earners than those into the top income deciles (Budlender, 1999).

Table 1.2: Measures of poverty in South Africa (Anon, Towards Anti- Poverty Strategy for SA, 2009)

Type of poverty measure	Threshold in R2000	% of individuals below the poverty line
Poverty line set at per capita expenditure of the 40th percentile of households	R346 per capita	54.9%
Stats SA (as reported by Hoogeveen and Özler) - lower bound	R322 per capita	52.6%
Stats SA (as reported by Hoogeveen and Özler) - upper bound	R593 per capita	70.4%
'Dollar a day' - International poverty line of US\$370 (1985 prices) per capita per annum	R81 per capita	8.1%
Two dollars a day' - International	R162 per capita	27.0%

poverty line of US\$370 (1985 prices) per capita per annum		
'Poverty line' implied by the Old Age Pension means test for married persons, assuming a household of 5 persons and no non-elderly income earners	R454 per capita	63.4%
'Indigence' line of R800 per household per month (in 2006 prices)	R573 per household	11.7%
'Indigence' line of R2400 per household per month (in 2006 prices)	R1720 per household	55.1%

Table 1.2 shows some of the measures of poverty used by these researchers. A reported household expenditure of R800 a month as an initial poverty line is used as a measurement strategy. The data understate actual consumption of government services by the majority of households. Old pension earners were below the poverty line by 63.4%.

1.4.5 Gender

The rate of economic activity for women is generally around 70% of the rate for men across all deciles. Secondly, fewer of those who are in the market are successful in finding work. In a household where there is a lack of access of services such as water and fuel, the women will be involved in accessing alternative sources and utilising less efficient means of satisfying the basic needs of household members. This could be a result of the smaller range of jobs traditionally available for women (Budlender, 2000). In the areas of agriculture and food security in Africa, women are not easily afforded those services. Cultural restrictions, domestic responsibilities as well as lack of confidence in speaking the national language of business and not enough female extension agents to help women access land, all contribute to their stagnant position (Oniong'o, 2005).

1.4.6 Occupation

A large proportion of working South Africans are employed in what are termed elementary occupations, sometimes referred to as unskilled or routine work. In general, elementary workers will have low earnings. As household income increases, there is a decrease in the

percentage of women and men employed in elementary jobs. There is also an increase in the percentage of managers, professionals, technicians and clerks for both women and men as household income increases. These patterns would all, at least partly, be accounted for by differences in educational levels. Education is, however not the only explanation. For example, the income related pattern differs between women and men even as far as crafts workers are concerned (Budlender, 1999).

Elderly people who have poor education and training are at more of a disadvantage due the high levels of competition within the job labour market. Economic support and other resources are vital since older persons often live in large extended households and this provides stability to many lives. Fundamental variables such as household structure, marital status, public and private pensions, education, and residential location drive the economic activity of older persons. The changing demographic trends of younger Africans having more access to education, suggests that as they age, more job opportunities could be available for them in future (Lam, Leibbrandt and Ranchhod, 2004).

The USAID initiative in South Africa found that by helping a local group explore ways to make communally-owned tribal land more productive, this land provided a platform for the elderly to support and feed themselves. Due to their advanced age, frailty and the level of responsibility associated property management, the elderly in this community decided to rent out the land. Widows and the elderly had land use rights, but the financial constraints or the ability to farm it were limiting factors for them. Renting out their land allowed the income of this impoverished group to be enhanced and the food available to the community to be increased (USAID, 2003).

According to Pagan (2009), there are various strategies that policy makers can introduce in order to increase employment opportunities and reduce the prevailing conditions which result in poverty for older workers with disabilities. These strategies include supporting gradual retirement opportunities with flexible and reduced working hours. Older people should be given opportunities for increased labour participation and reduced risks of poverty and marginalisation. These efforts will change attitudes towards older people with disabilities in society.

1.4.7 Social assistance in South Africa

In South Africa social grants are one of the social mechanisms of alleviating poverty that have been introduced by the government. Results indicated that 62% of the total grants went to the poorest (40%) of households. During 1999 there were 2.5 million beneficiaries and 12 million beneficiaries during 2007. This has been the largest form of government support for the poor. Child support grants reached 7.8 million beneficiaries in 2007 compared to 34 000 in 1999 (Appeal, 2008).

In South Africa there is the Social Assistance Act 59 that provides social support to deserving individuals. The number of African- South Africans and Coloured eligible individuals who receive pension grants is almost 100% of (Follentine, 2006). In African households in which a pension beneficiary resides, it is common for beneficiaries, especially women to share their income with family members or to pool it with other household income (Barrientos, Ferreira, Gorman, Heslop, Legido- Quigley and Lloyd-Scherlock, 2003; Moller and Ferreira, 2003).

The current state pension in South Africa is R1030.00 which is equivalent to \pm \$137 and this amount generally feeds the entire household. This is an increase of 7.5% from the previous financial year 2009 (Financial Mail, 2010).

1.5 MALNUTRITION AND AGEING

Ageing is associated with many physiological, social and economic changes. The drastic loss of lean body mass, prevalence of lifestyle related diseases and impaired immunity, all have adverse health outcomes which compromise the individual's quality of life.

The development of protein energy malnutrition occurs during the ageing process due to physiological changes. Although there is decreased food intake during elderly life, malnutrition is a secondary factor that tends to be less noticeable in older people. Research shows that similar strategies used to address child malnutrition should also be used to combat under nutrition in elderly. The effects of protein energy malnutrition has major financial implications to families, communities, health care system as well as the elderly person who has developed protein energy malnutrition. Education and training within communities is important in ensuring that this condition is detected and managed properly (Dawson, Taylor and Favaloro, 2008).

Globally the ageing population is on the increase. However, this increase coincides with the rate of undernutrition amongst the older persons. In developing countries the risk of malnutrition is prevalent in 44% of healthy, community dwelling older persons. Demographic shifts which involve urbanisation, women entering the workforce and children migrating to towns and living away from their elderly parents, have caused less care giving to be given to older people in society. Developing nations need to build systems of addressing this concern. Malnutrition is not an inevitable side effect of ageing, however, malnutrition can escalate due to changes associated with the ageing process. The health care system faces an enormous challenge to prevent malnutrition in older adults (Hickson, 2006).

1.5.1 An overview of malnutrition in South African elderly

The presence of continuous infectious diseases as well as the evidence of insufficient dietary intake can be defined as undernutrition. Under nutrition can be further defined as being underweight for one's age, too short for one's age, dangerously thin for one's height and deficient in vitamins and minerals. The consequences of under nutrition can affect an individual's health status, productivity, social status and even economic advance of the affected person (WHO, 2000).

In South Africa there is no nationally published data on the nutritional status of older people, and only limited studies have been conducted. South African studies also show a vast difference in macro and micronutrient intakes across all ethnic groups. The results show that African South Africans have a lower prevalence of underweight than other African populations within the region (Charlton, Ferreira and du Plessis, 2008a).

In South Africa, research has shown that wheat and maize based foods are the constituents of a diet that is rich in starchy foods which the main food item that is consumed by the majority of South Africans. This reflects previously reported trends where carbohydrate intake was found to contribute between 44% and 64% of total energy intake in urban dwellers. However, amongst African South African rural dwellers it contributed between 62% and 71% (Steyn, 2006a). In the past, the majority of older African South Africans were disadvantaged and had poor access to health care and a diet which was inadequate in quantity and quality. Although nutrition problems in the elderly are primarily due to dietary inadequacies, problems of over nutrition associated with the nutrition transition are increasingly evident. In community

dwelling, because of the degree of dependency on others for help and care, the elderly are at risk for malnutrition (Charlton, Ferreira and du Plessis, 2008a).

In a study that looked at free-living elderly in Sharpeville in the Vaal Triangle, it was found that the mean age was 71.7 years of which the majority of the respondents were female (87.1%). Education level was low with only 23% having attended high school or college. The majority of the respondents were widowed (70%) and 19.4% were married. A small percentage (4.7%) lived alone, whilst the majority shared the house with other family members. The major health problems experienced by the respondents were ear, nose and throat (ENT) infections (72.4%), painful joints (70.6%) and chronic headaches (48.2%). The use of chronic medication was 55.9% of which 40.6% was for the treatment of high blood pressure. Blood pressure measurements indicated that 68% of respondents suffered from hypertension ($\geq 140/90$ mm Hg). The mean systolic blood pressure was 168.6 mm Hg and the diastolic blood pressure 101.0 mm Hg (Oldewage-Theron et al. 2005a).

In communities the increasing socio-economic burdens of the caregivers are affecting the quality of life in this group therefore interventions, in nutritional health and socio-economic status are vital (Oldewage-Theron et al. 2005a). Results have shown that African elderly - headed households have the highest food poverty rates of all ethnic groups. By examining studies that had been conducted in various other communities within South Africa, the objective of this study was to determine if the community of Umlazi is experiencing the same difficulties.

1.5.2 Impact of urbanisation and over nutrition

Over nutrition resulting in overweight and obesity, is the outcome of eating too much, eating too many of the wrong things and/or not getting enough physical activity. The risk of becoming overweight or obese is increased by a diet high in fat, sugar and salt. This state may lead to diabetes, coronary heart disease and cancer (WHO, 2000).

Globalisation has influenced lifestyle, food and eating habits. Access to fast food has been linked with health problems that result in high fat, high energy diet consumption. The modern diets of South Africans reflect a lack of knowledge of the traditional culture and practices, but have been inspired by the fusion of different cultures. These include the Malay, European, Chinese, American and food types from neighbouring states. The coexistence of cultures with

different origins in the same area could influence behavioural patterns, including food habits and eating patterns (Mbhenyane, Makuse, Ntuli and Mbhatsani, 2008). Urban Africans have tended to adopt the Western diet (Bourne, 2000).

According to Lahohla (2006), this is due to the fact that typical rural foods are frequently not available in urban areas. Urbanisation, globalisation and economic development have influenced how eating patterns and types of foods consumed. This includes high-value foods, processed foods and eating patterns which include a frequent consumption of food outside home and also dining for social pleasure. These trends have contributed to dietary and lifestyle changes that encourage poor eating habits together with reduced energy expenditure are the leading causes of the growing problems associated with being overweight in developing and particularly middle-income countries.

As mentioned previously, food supply chains have been associated with globalisation and urbanisation. The increasing presence of supermarkets in developing countries may add significantly to the food supply chain but further investigations need to be conducted to explore the relationship. Food offerings are changing and supermarkets now offer more time-saving convenience products and lower priced packaged grocery items relative to fruit, vegetables and traditional staples could contribute to a higher energy density food consumed.

In developed countries, such policies generally try to respect individual freedom to make unhealthy as well as healthy choices (except possibly in the case of children), but also recognise that reducing health inequalities and influencing social norms are legitimate activities of government. Labelling and packaging legislation plays a vital role in providing relevant information to the customers, and consumers need to be informed how to use this resource to make informed choices. Even in developed countries, health care interventions to improve diets and health are lacking, but this is even more so in developing countries. Therefore substantial research and careful monitoring are essential (Oniong'o, 2001).

The ways in which globalisation affects being overweight include the following:

- Global mass media gives exposure to global food brands in the form of TV advertising (increasing TV ownership and viewing) and through newspapers and magazines. "Western" convenience and fast foods are higher in sodium, sugar and fat

(and generally more kilojoule-dense) and are more highly refined than traditional foods.

- Urbanisation has influenced the physical intensity of jobs which can lead to reduced energy requirements.
- Urbanisation has resulted in more women participating in the workplace. This has caused a shift in cost of time which has resulted in a greater demand for convenience foods, convenient shopping and eating out.
- The cost of vegetable oils, meat and dairy products is now lower due to technical changes and openness to the global economy and so this has created relative growth of these products at the expense of traditional staples.
- Processed food is cheaper than in the past due to the dynamics associated with technical change and economies of scale in global food manufacturing.
- High income earnings, particularly in urbanised areas, promote affordability which can lead to overconsumption.
- The increased population density associated with urbanisation makes it possible to supply cheap foods for eating outside the home (Uustialo, Pietinen and Puska, 2002).

1.5.3 Overweight and socio-economic status

There are various perceptions about what constitutes pleasure: whether it is food, physical appearance and fitness/healthiness. Achieving an "ideal" body weight (defined as a weight that is preferable for reasons of health and/or appearance) is very difficult. If there were no constraints such as money spent on food purchases, commitment to consistency of healthy food and drink choice even in social environments, engagement in effective physical exercises, there would be a greater percentage of people responding to the call of weight management. Underweight people sometimes spend a little extra cash to consume more foods or drink. The drive to achieve ideal body weight through eating extra for these individuals is a pleasurable experience. There are also continued associations between overweight individuals and income. The changing environment means that as spending/buying power increases, individuals who want to lose weight will continue to spend money by buying more expensive healthy foods, joining gyms, paying for membership of weight-loss groups, and so on. These initiatives can assist in reducing one's weight (Mendez and Popkin, 2004).

In a South African study of adult women conducted in Khayelisha in Cape Town, it was found that gender and marital status were associated with being overweight, obesity as well as abdominal obesity. The level of physical activity was not associated with either outcome. Marital status may alter the food consumption habits of individuals and this aspect needs to be explored (Malhotra, Hoyo, Ostby, Hughes, Schwartz, Tsolekile, Zulu and Puaane, 2008).

Educational background contributes to more informed choices leading an ideal body weight, whereas less educated counterparts are generally not aware of the health risks of being overweight. Nutritional concepts of healthier eating are also better understood by a population that has certain levels of education. In developed countries, it is accepted that the incidence of overweight is greatest among disadvantaged groups, and this also the case in middle-income countries. Women of low socio-economic status are more likely to be overweight than those of high socio-economic status in urbanised countries. However, the reverse is true in countries with low urbanisation. There are correlations between urbanisation and income and socio-economic status (Mendez, Monteiro and Popkin, 2005).

According to Vio, Alba and Uay (2002), low socio-economic societies in Chile experience increasing rates of overweight and obese individuals. Research conducted in South Africa's Western Cape Province found that 70% of the women were overweight. Interestingly though, only 20% perceived themselves as being overweight. Another prevalent perception is that being overweight is seen as a sign of wealth and status, and most of these women associate underweight with illness, particularly HIV/AIDS. The younger generation of educated women have a different perception of body weight. They aspire to and see the benefits of a slim body. In Brazil, there are two distinct associations between rich and poor communities and obesity prevalence. The northeast citizens of the country who are obese have related this condition to poor economic status. However, in the southeast, citizens have a high economic status that they link to obesity (Sawaya, Martins, Grillo and Florencio, 2004).

Policy making should always consider the vital knowledge of the relationships between income, overweight and consumption of specific foods. Certain demographic groups and the country from which these demographic groups exist in, are risk factors associated with weight gain. It is therefore important, to monitor both anthropometric and food intake data by income and demographic within risk groups. More sophisticated multivariate analysis should include other demographic variables such as education and age (Ezzati, Lopez

Rodgers and Murray, 2005). According to Townsend, Aaron, Monsivias and Keim (2009), poverty which may lead to weight gain may be due the consumption of foods that have less nutritional value and can be termed “high energy dense foods”. In women, food insecurity is positively related to being overweight (Townsend, Pearson, Love and Achterberg, 2001).

1.6 HEALTH AND MORTALITY RELATIONS

The mortality profile in South Africa partly reflects the sequential trend of diseases that are poverty-related, as well as chronic diseases related to an industrialised lifestyle and burdens of morbidity and mortality from trauma and violence (Bradshaw, Groenewald and Laubscher, 2000). It is the poor who are suffering from numerous causes of mortality at once. During 1996 South African death registration showed that infectious diseases, together with maternal mortality and malnutrition-related conditions accounted for 30.6% of deaths while chronic diseases accounted for 31.9%. Although HIV/AIDS is spreading at a rapid rate and affecting the number of deaths associated with it, premature adult mortality was still high in South Africa (Bradshaw, Groenewald and Laubscher, 2000).

Other factors that contributed to the high death rate were associated with the triple burden of poverty-related diseases such as tuberculosis and diarrhoea, injuries and emerging non-communicable diseases (NCDs) such as hypertension and diabetes. Even in the poorest quintile, NCDs are responsible for the same proportion of deaths as infectious diseases. AIDS is currently affecting the pattern of death in South Africa. The life expectancy for men is estimated to be 59 and for women 65. Premature adult mortality (measured as the probability of a 15-year-old dying before the age of 60) has been estimated to have started increasing and will reach levels close to an estimated 80% rate within the next ten years (Dorrington, Bradshaw, Johnson and Bundler, 2004).

Globalisation and urbanisation do seem to be changing the exposure to risk factors especially among the urban poor. For example, a study conducted in the early 1990s found that it was predominantly middle-income men who smoked (Steyn, 1994). However, by the end of the decade it was poor men in urban settings who were the most likely to smoke (Bradshaw Groenewald and Laubscher, 2000). The 1998 Demographic and Health Survey found that 56% of women in South Africa are either overweight or obese (Puoane, Steyn, Bradshaw, Laubscher, Fourie, Lambert and Mbangane, 2002). Women living in rural areas had a 25%

less chance of being obese and 37% less chance of having hypertension (Bradshaw and Laubscher, 2002).

1.7 RATIONALE AND MOTIVATION

According to the WHO (2002), the world's population aged 60 and over will more than triple from 600 million to 2 billion between 2000 and 2050. Most of this increase will occur in the developing countries, where the number of older people is expected to rise from 400 million in 2000 to 1,7 billion by 2050. It is also estimated that by the year 2025, the global population of people over 50 will have exceeded the numbers of persons younger than 15 years. Today, about two thirds of all older people are living in the developing world and this is set to increase by 75% in 2025 (DOH, 2007). South Africa has the most advancing ageing population in the Southern African region (UNPD, 2006).

During a study conducted in 2002, longstanding illness was reported in 63% of 65-74 year olds and 72% of people aged over 75. Almost two thirds of general and acute hospital beds were used by people aged over 65 and people over 75 years stayed in hospital longer. This literature continues to emphasise the burden of disease and the impact it has on the nutritional status of this population group (Hickson, 2006).

Medical problems are widespread amongst African elders. Cardiovascular disease was present in 44% of Kenyan and 37% of Tanzania elderly in 2001. Type 2 diabetes mellitus rates varied from 25% in South Africa to up to 94% in Sudan (Help Age International, 2004). Like other sub Saharan countries today, South Africa faces an increasing burden of non-communicable diseases (Unwin, Setel and Rashid, 2001).

Poor public infrastructure, incompetent health workers as well as limited financial resources contribute to the worsening health conditions of the elderly. Patients, who delay in seeking treatment, contribute to higher prevalence of health problems in rural areas (Help Age International, 2004).

In Africa various factors which affect people's poor health status have been discussed. However, household food insecurity also continues to have an effect on dietary intake and is an underlying cause of under nutrition in many households across the continent. In South Africa a food expenditure data reported that 43% of households experienced food poverty in

1995. A household food spending less than the cost of a nutritionally adequate subsistence diet was defined as a being in a state of food poverty (Charlton and Rose, 2001a). Another subsequent analyses reported that for the first time, 50% of elderly households (age of > 60y) were experiencing food poverty, compared with 40% of younger households and this continues to raise concern within this population group. Variables such as ethnicity and age of the household head were major contributions to poverty levels. African elderly-headed households had the highest food poverty rates of all groups. African older adults should now be considered as a priority for targeting when planning nutrition interventions (Charlton and Rose, 2001a).

The results of the Income and Expenditure survey 2005/2006 show that the total annual household consumption expenditure during the survey year is estimated to be approximately R700 billion. On average, the estimated total household consumption expenditure per household in South Africa was R56 152 per annum. Housing, water, electricity, gas, and other fuels, transport, food and non-alcoholic beverages were the main drivers for household consumption expenditure. Food and non alcoholic beverages were the third largest expenditure group in the country during 2005/2006 contributing 14.4% to the total household consumption expenditure, on average R8105 was spent by each South African household (STATSSA, 2005).

KwaZulu Natal has the highest death rate with the lowest life expectancy of 44.6 years in men and 48.4 years in women. The Western Cape has the highest life expectancy of 60.7 years in men and 67.5 years in women as can be seen in Table 1.3. These results prove that the younger generation is in the majority and care should be given to this generation since many of them are going to be orphaned. Extended families play a huge role in raising children and this role is most often filled by grandmothers.

Table 1.3: Estimated life expectancy at birth for the period, 2001-2006 (STATSSA, 2008)

PROVINCE	MALE (yrs)	FEMALE (yrs)
Western Cape	60.7	67.5
Eastern Cape	50.8	56.3
North Cape	57.4	63.5
Free state	48.7	53.5
KwaZulu- Natal	44.6	48,4
North West	51,0	55,4
Gauteng	54,1	58,4
Mpumalanga	48,0	52,8
Limpopo	51,2	55,8
SOUTH AFRICA	51,2	55,7

Umlazi is situated south of Durban, less than 5km from Durban International Airport. Historically it was a farm mission in the early 19th century and it was developed into a formal township in the 1950's.

According to STATSSA in terms of the population percentage distribution by age, elderly contribute 7% of the South African population (Figure 1.1). Looking at studies conducted it has been estimated that 2.9 million people in South Africa are 60 years and older and this constitutes 6.2% of the total population (Charlton and Rose, 2001a). Umlazi is the second largest township in the country in terms of population and the largest in KZN with 388 696 people.

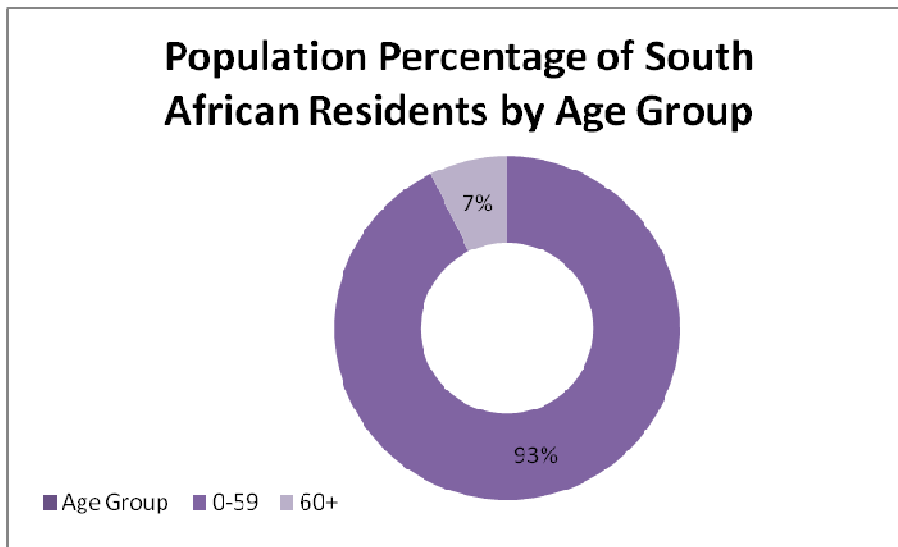


Figure 1.1: Population percentage of South African residents by age group (STATSSA, 2008)

Figure 1.1 shows that the elderly population contribute 7% of the population and as discussed in the literature on the elderly as caregivers within this community, clearly indicates an overwhelming burden of care giving for a high number of children and grandchildren since that is the main social responsibility of the elderly.

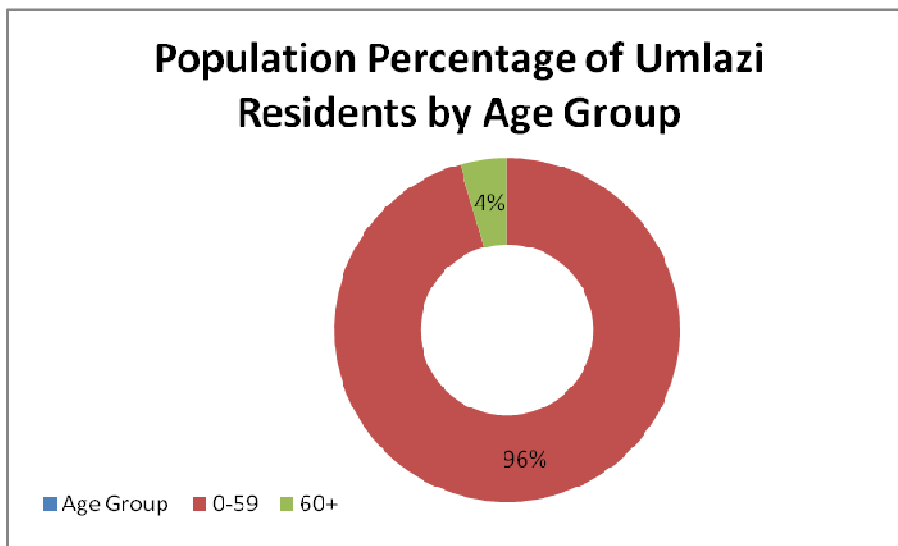


Figure 1.2: Population percentage of Umlazi residents by age group (STATSSA, 2008)

Figure 1.2 indicates that the elderly population contributes by 4% of the overall population in Umlazi township.

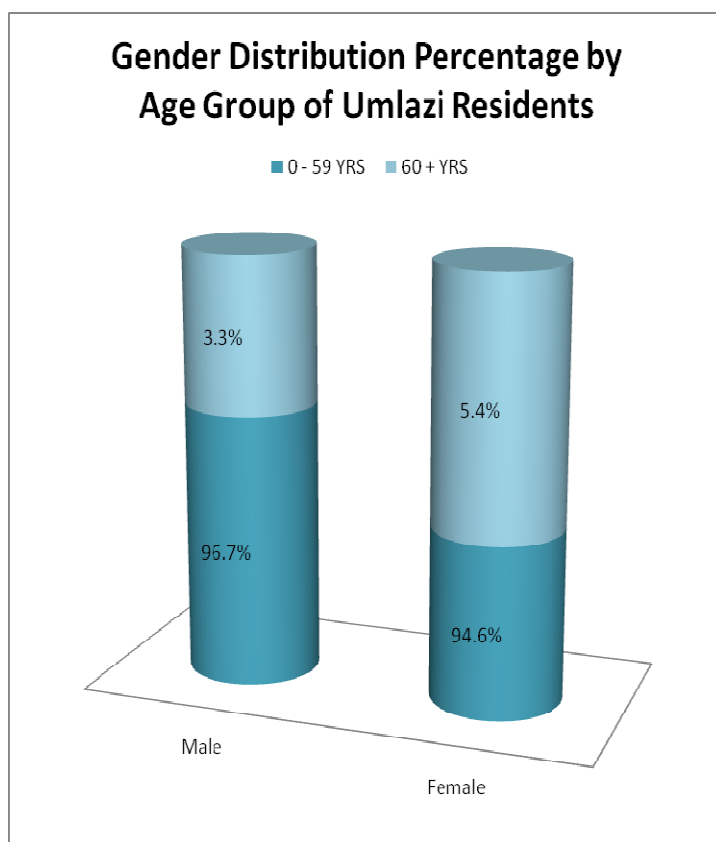


Figure 1.3: Percentage population for both elderly women and men in Umlazi

Women have a longer life expectancy than men. Figure: 1.3 shows that 5.4 % of women in Umlazi and 3.3% of men are > 60 years of age therefore, grandmothers have a longer life span.

Different cultural backgrounds which are generally associated with varied food habits could be used as good strategies for optimising health in older persons and more literature is showing evidence of that. Food variety as a measure of dietary adequacy appears to be associated with survival (Wahlqvist, Darmadi- Blackberry and Savage, 2001).

The risk for chronic disease such as diabetes and heart disease in the elderly continues to increase tremendously. It is shaped and modified by factors, such as economic status and experiences across the whole life span. Tobacco use, lack of physical activity and inadequate diet put individuals at relatively greater risk of developing non-communicable diseases during old age. It is therefore important to address risks from these diseases from early life to later life (WHO, 2008b). In South Africa very few older South Africans live in a residential

care facility (UNPD, 2006; Makiwane, Scheider and Gopane, 2004). Most elderly South Africans are free living which is why this study aimed at investigating the current situation on free-living elderly in the community of Umlazi.

Rice, wheat, soybean cake and maize are the top staple foods that are in demand (FAO, 2007b) in South Africa. South Africans have a high demand for carbohydrates (wheat, maize and rice) and chicken meat: the results of this study correlate with Figure 1.4 reports on the foods mostly imported in South Africa (refer to Chapter 4 for results).

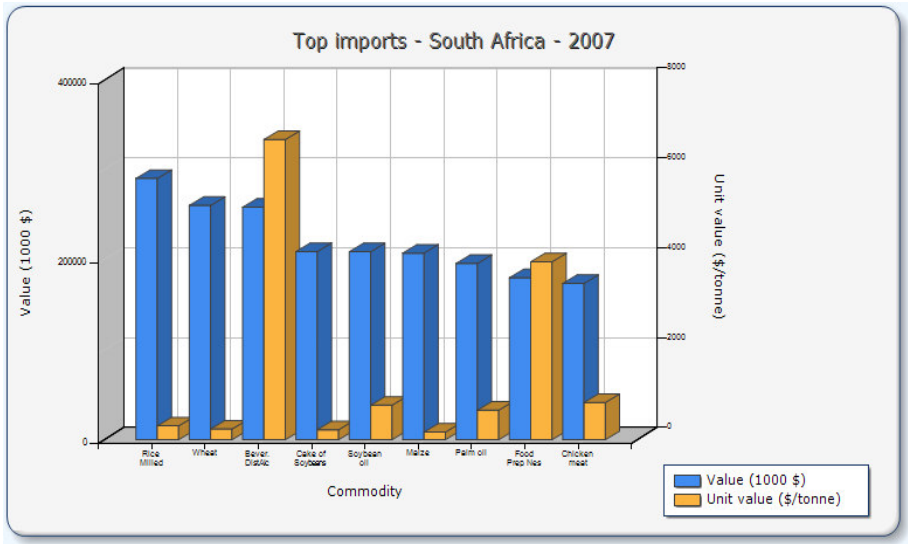


Figure 1.4: The top food imports in South Africa in 2007

In Figure 1.5: reflects that foods frequently exported from South Africa in 2007 were mainly fruit and vegetables. Further analysis can be observed to evaluate to what extent this community has access to fruit since it is ready available in this country (refer to Chapter 4 for results).

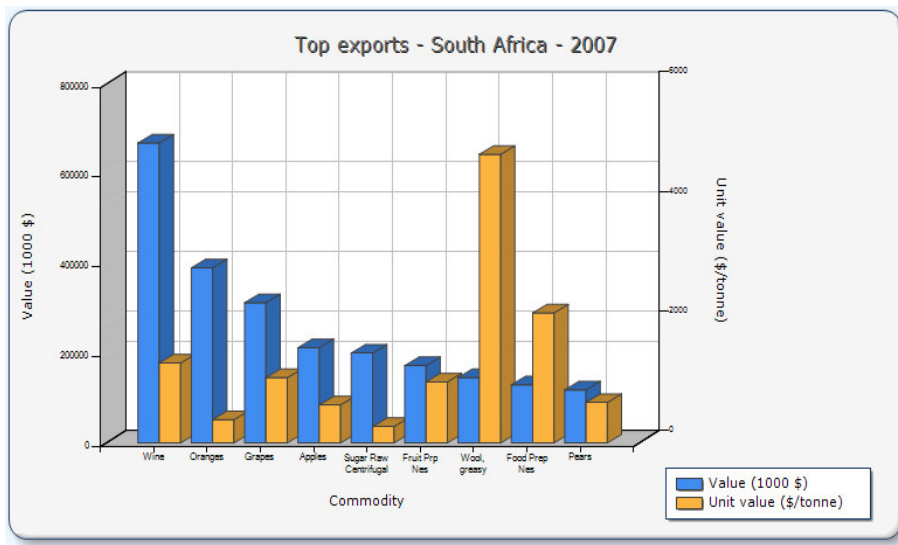


Figure 1.5: Top exports of commodities in South Africa in 2007

1.8 STUDY AIM AND OBJECTIVES

The main objective of this study was to conduct a situational analysis of free-living elderly people (aged 60 and above) living in Umlazi Township.



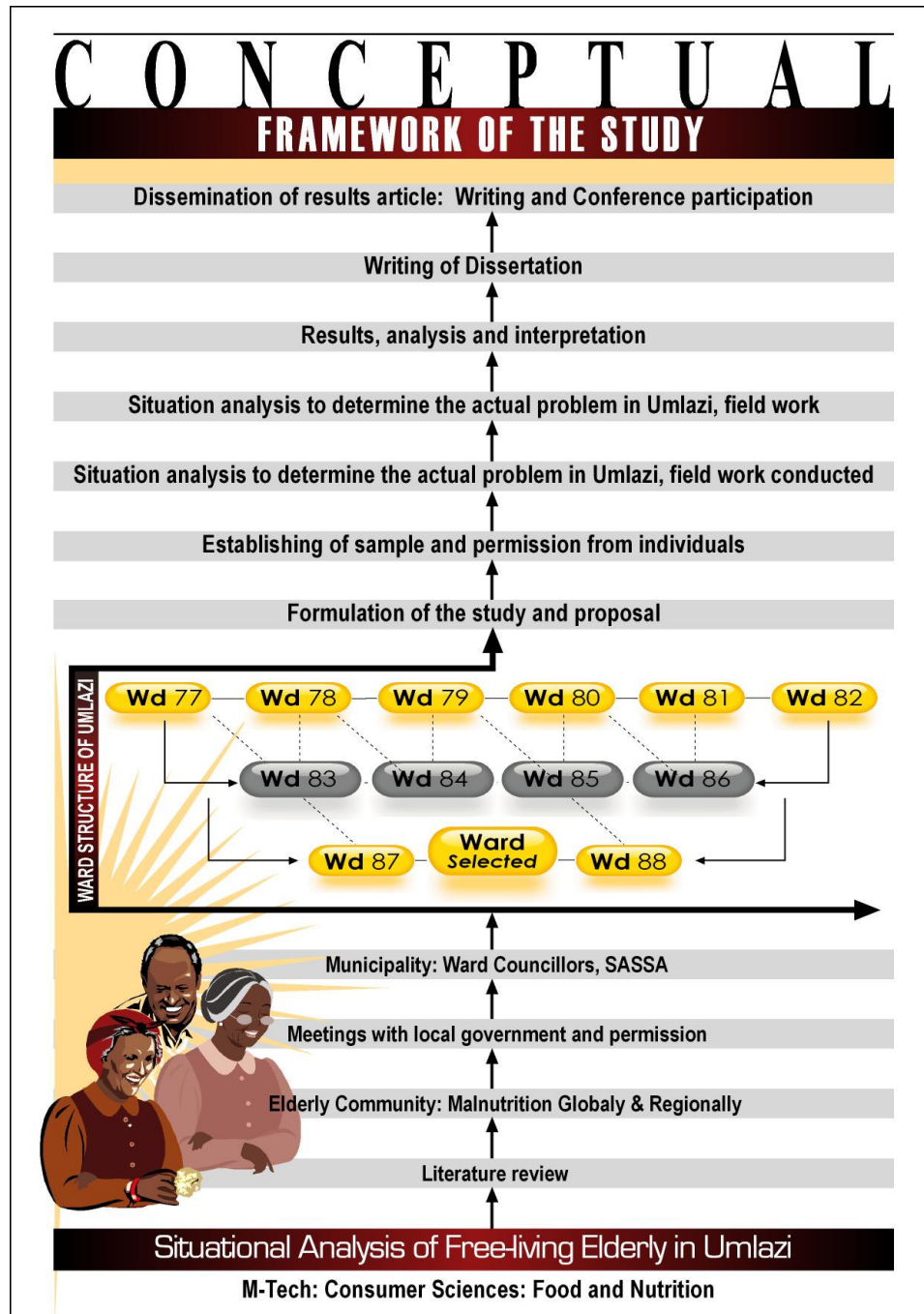
Figure 1.6: Elderly of Umlazi's largest ward waiting at a payout point on pension day

The specific objectives for this project were formulated as follows:

- To determine the dietary intake of the elderly by means of a 24-hour recall questionnaire.
- To determine the socio-demographic profile of the elderly in the sample by means of a socio-demographic questionnaire.
- To determine the nutritional status of the elderly by using anthropometric measurements.
- To determine the health status of the group of elderly by means of a health questionnaire and conducting blood pressure tests.
- To determine the dietary diversity of the sample by administering food frequency questionnaires.

1.9 CONCEPTUAL FRAMEWORK OF THE STUDY

The framework below details the various stages involved from the beginning until the end of the study.



Wd= ward

Figure: 1.7: The conceptual framework of the study

1.10 STRUCTURE OF THE DISSERTATION

Chapter 1: Problem and its setting. General discussion of the nutrition problems experienced by the elderly, aims and objectives and conceptual framework.

Chapter 2: Literature synthesis

Chapter 3: Methodology

Chapter 4: Results

Chapter 5: Discussion, conclusion and recommendations

1.11 CONCLUSION

Food security is difficult and complex to achieve whilst food insecurity is easy to see. The dimensions range from personal, household, and community levels to regional, national and international levels as illustrated. Social security in South Africa has played an important role in eradicating poverty and reducing inequality. Social grants are effectively targeted, and are the most pro-poor item of government expenditure which continues to be a major source of income in elderly headed households. The consequences of under nutrition in free living older adults may be especially severe, as inadequate energy intake may affect the course of illness or, in some instances, be made worse by illness or treatment. The literature in this chapter highlights the various drivers of malnutrition as a global crisis.

CHAPTER 2: CONCEPTUALISING AGEING

2. INTRODUCTION

Older people have many factors which increase nutritional risk. These range from social, physical/medical factors to psychological ones. Since the previous chapter has reported on role of malnutrition, this chapter will seek to further explore the role of risk factors contributing to malnutrition and the overall well-being of elderly people. The role of elderly people in society is essential and therefore the constitution of the quality of life which includes health aspects, the role of diseases, and dietary behaviour must be investigated.

2.1 WEIGHT LOSS CAUSES RELATED TO PHYSIOLOGICAL CHANGES DURING AGEING

2.1.1 Anorexia associated with ageing

Anorexia nervosa is a disorder involving a psychological denial of appetite and self-starvation. It is common particularly among the youth. However, there are slightly different contributing factors to the anorexia of ageing. Figure 2.1 shows an elderly woman with severe weight loss. She had no teeth, which also contributes to problems with chewing and digestibility of the food intake.



Figure 2.1: 110 year-old woman with severe weight loss who was excluded from the study

de Groot, van Staveren and de Graaf (2000); Visvanathan (2003) describe this anorexia as commonly occurring in the elderly as the decrease in the usual food intake and poor appetite leads to unanticipated loss of body weight. A follow-up survey conducted over a four year period by Europe on nutrition and the elderly, showed that men had a decline of 0.6 megajoules in a day, whereas women who only declined by 0.4 megajoules in a day of the energy intake. According to de Groot and van Staveren (2002), similar studies that looked at body weight loss over a ten year period showed that women lost more weight (5kg) were at 27% as opposed to their male counterparts at 23% of normal body weight. A follow up was then conducted to further illustrate that 5kg loss of body weight limited survival.

This research suggests that poor energy levels and nutrient intake affected the decline of body weight of older persons. According to Muller (2003), age-related changes in body composition have been related to age-related manifestations of disease, thus increased fat mass (especially increased visceral fat) is associated with metabolic risk. On the contrary, reduced fat-free mass is associated with loss of muscle function, increased fragility and chronic diseases linked to wasting and immobility and also associated with loss of physiological functions.

Wilson and Morley (2003) found that weight loss in the aged is due to physiological anorexia which is referred to as sarcopenia. The main causes related to this condition include: changes in taste, smell and a decrease in adaptive relaxation of the stomach fundus. This, however, leads to more rapid antral filling and early satiation. Research also suggests that there is an increase in basal and stimulated levels of the satiating hormone, cholecystokinin. However, in men the decline of testosterone leads to a high presence of leptin as well as deterioration of lean body mass. Since ageing is associated with a decrease of antioxidant functioning for enzymatic activities, it is essential that this population group increases consumption of antioxidants in their diet. This contributes to a lower risk of disease such as cardiovascular disease, cancers, diabetes and other cognitive disorders associated with oxidative damage (Elmadafa and Meyer, 2008).

2.1.2 Central feeding drive mediators

Research suggests that the relationship between the process of stimulation, leading to feeding and gender, also hormone deficiency such as oestrogen is a contributing factor to the relationship of the stimulation of feeding in later life (MacIntosh, Morley and Chapman, 2000).

2.1.3 Central satiety system

Ghrelin plays a vital role in maintaining the metabolism of glucose and also facilitating insulin that can be secreted through vagal mediation (Muccioli, Tschop and Papotti, 2002; Visvanathan, 2003).

Other studies done by Sturm, MacIntosh and Parker (2003), suggest that ghrelin levels are higher in undernourished older people, which then raises concerns as to whether this hormone is a vital contributing factor to anorexia in the aged.

2.1.4 Factors relating to hedonic impact

The aged will experience taste that is less sharp, and a diminished sense of smell. Moreover, they could experience a reduced enjoyment of food due to increased sensory specific satiety. Poor variety and rigid diet leads to deficiencies caused by a lack of micronutrients. If these are not sufficient, they could decrease an ageing person's nutritional status as well as compromise their immune status (Tuorilla, Niskanen and Maunuksela, 2001).

2.2 CHANGES RELATED TO DIGESTIVE FUNCTIONS:

a) Gastric distension

An increased sensation of fullness is more likely to affect the stomach/ gastric distension. There is a strong relationship between the impairment of the fundus present in the gastric cavity and the level of how receptive relaxation occurs in gastric distension and earlier satiety (Kupfer, Heppell and Haggith, 1985; Rayner, MacIntosh and Chapman, 2000).

b) Gastric emptying

MacIntosh, Morley and Chapman (2000) found that distension due to antral delaying as well as certain signals linked to feeling fuller controlled by the small intestine reduce appetite. In addition food intake is linked to slow gastric emptying.

c) Small intestinal gastric hormone

According to Visvanathan (2003), cholecystokinin (CCK) is responsible for the release of bile into the duodenum. Pancreatic enzyme secretion is triggered by fat and protein in the stomach.

Animal studies have shown that soy protein suppresses appetite in part, by stimulating the release of CCK which regulates satiety and gastric emptying (Nishi, Hara and Tomita, 2003). According to Foltz, Ansems, Schwartz, Tasker, Loubakos and Gerhardt (2008), some researchers have suggested that peptides derived from soy may have the potential to act directly with CCK receptors, however, there is not compelling data to substantiate this mechanism.

Research shows that there seems to be poor understanding of the mechanisms that are responsible for older persons who suffer from reduced appetite as well as delayed gastric emptying. Potential contributors to the anorexia of ageing are also due to an enhanced satiating effect of small intestinal carbohydrates (MacIntosh *et al.* 2001).

According to Verdu, Bercik and Collins (2009), ensuring an effective gastrointestinal function and a co-ordinated central nervous system are influenced by various factors. Certain probiotics can slow down postinfective risk which is known to promote infection.

d) Fat stores

Adipose tissue is regarded as an endocrine organ that produces secretions such as leptin and other peptides. There is an important link between adipose tissue secretions and nutritional status (Wolf, 2009).

e) Cytokines

In older people, there is a correlation between cytokines and anorexia, as well as muscle decline and a lowering of albumin levels. In addition, many middle-aged and older persons have a chronic increase in cytokines that can lead to anorexia, muscle wasting and hypoalbuminaemia and loss of muscle (Visvanathan, 2003 and Morley, 2003). A study showed that women have several risk factors such as reduced mobility, which also contribute to the loss of muscle mass due high levels of IL-6 (Ferricci, Penninx and Volpato, 2002).

2.2.1 Muscle changes

Ivey, Tracy, Lemmer and NessAiver, Metter and Fozard (2000) found that the physiological regulation of muscle protein synthesis is often altered in disease states. Alterations may interact to change the rates of protein synthesis and degradation in various ways. Severe stress conditions related to declining body mass are due to an increased rate of protein

breakdown in skeletal muscle. Chronic disease states are characterised by more subtle alterations in protein metabolism that may lead to severe protein wasting within few months or years (Biolo, 2003).

a) Anabolic hormones

Evidence shows that increasing age in men contributes to the development of sarcopenia and also the decrease in functional status (Volpi, Sheffield-Moore and Rasmussen, 2001; Visvanathan, 2003). Serum testosterone level is related to the appendicular skeletal mass in older women (Kenny, Dawson and Kleppinger, 2003).

b) Physical activity

South African adults do not seem to comply with minimum physical activity requirements. Research has shown that only 63% men and 48% women have been seen to comply with these minimum requirements of the World Health Survey of 2003. This is the third highest level of inactivity reported in the world. Rural and urban groups are similar in terms of work, leisure or transport-related activity, with the occupational activity contribution to total physical activity being 29%, leisure time activity 53% and transport 18% (WHO, 2005b).

2.3 AGEING EFFECTS OF MUSCLE MASS REDUCTION AND ROLE OF PROTEIN

Reduced body mass in the aged can weaken their bodies physically. Amino acids are essential to protein synthesis, helping other components of the body function, and also ensuring immunity and wound healing.

Muscle mass plays a fundamental role when there are insufficient amino acids in the body due to poor intake or absorption. Protein loss is due to several reasons; some of which are often exacerbated by various illnesses or when the elderly have extended stays in hospitals. Research has shown that adults gain 500g body fat annually; however, at the same time, muscle can also be lost at a rate of 250g simultaneously. This generally occurs around age 30-60, but as age increases to 70 years skeletal muscle loss occurs at the rate of 27% of overall body weight. The values mentioned here have a potential of remaining as they are or can increase but if increase is prevalent, it highlights that there is increasing body fat (Dawson, Taylor and Favaloro, 2008).

Research suggests that wasting, sarcopenia and cachexia are the major contributing factors of declining muscle in the life of the elderly. Sarcopenia has been shown to have an increasing percentage of between 13-24% in people below 70 years, but for people who are over 80 years old, the percentage increase rises up to above 50%. Diseases occurring in later life (e.g. pressure ulcers, cancer, etc) are associated with cachexia. Cytokines release is associated with increased resting energy expenditure and muscle breakdown. Wasting or cachexia has also been associated with body weight loss. However, sarcopenia has been closely linked to obesity, poor mobility and increased frailty which causes increased dependency. A higher prevalence of inadequate nutrient intake can be associated with insufficient consumption of protein rich sources. This frailty causes increased medical costs; a problem likely to continue in the future since the elderly population is growing. Lack of physical activity and a sedentary lifestyle are major causes of the development of sarcopenia. Muscle loss has far greater consequence for an old person. Some risk factors associated with this loss are dehydration, and a declining metabolism (Brownie, 2006).

2.4 NON-PHYSIOLOGICAL CAUSES OF WEIGHT LOSS

The need for prescription medications increases as medical illness rises, which contributes to a greater risk of poor nutritional status since medication is generally expensive. Purchasing chronic medication for a poor individual reduces his capacity to buy nutritious food (Guarnieri, Antonione and Biolo, 2003).

2.4.1 Social isolation

In the US a growing percentage of people live alone, thus experiencing feelings of isolation. Morbidity has negative consequences for the elderly (Cacioppo and Hawkley, 2003). Greaves (2006) found that social isolation is linked to levels of negativity and unpleasantness of thought, both mentally and physically. However, social isolation can have positive spinoffs too, both physically and emotionally behaviour.

A Brazilian study that used ballroom dancing as therapy for the elderly discovered that dancing has various positive effects. The first one was that the respondents had fun while dancing. Secondly they experienced certain health benefits, thirdly it rekindled pleasant memories, and lastly it enhanced cultural dynamics of connectivity for a broader Brazilian community (Lima and Vieira, 2007).

According to Pennix, Guralnik, Lerucci, Simonsick, Lerucci, Deeg and Wallace (2003), studies have shown that when delivery persons deliver meals to elderly, they can help improve food consumption while delivering meals.

Another study compared older persons living in a community with those who lived in nursing homes. Both shared a frail status. The results showed that individuals who lived alone experienced a worse psychological state e.g. depression, a sense of helplessness and some actually showed hopelessness (Ron, 2004).

2.4.2 Depression and other psychological factors

The elderly in Rwanda (>70years) showed higher levels of depression when compared to other elderly in African countries (Pieterse and Ismail, 2003).

In a study conducted in the United Kingdom, which focussed on depression in elderly sentenced prisoners, a Geriatric Depression Scale was used during interviews to measure the relationship between certain dynamics that are major components of prison as well as those that are not in prison. The finding scores showed the threshold for mild depression was in over half of the prisoners. Variables related to prison life and duration of sentence served showed no relationship to scores for depression. However, there is a strong correlation between depression scores and imported chronic physical ill health (Murdoch, Morris and Holmes, 2008).

Patients with early-onset depression have far less chance of increasing the continuity of the illness. This leads to cases of dementia, which at a later stage develops into depression (Ballmaier, Kumar, Elderkin-Thompson and Narr, 2008).

2.5 DISEASES PREVALENT IN ELDERLY LIFE

The prevalence of death amongst the elderly is highest in KwaZulu Natal and Gauteng. The lowest rates of deaths reported were in Northern Cape (results are provincially represented over a total population). Between 2002 and 2006 this pattern remained constant; however, deaths at the age of 0-4 years as well as 30-34 years were prevalent particularly in males as opposed to females. Younger females were reported to have higher levels of death at particularly in stages of reproduction but during the age 70 the lifespan of men is lower than

that of women. Significant levels of narrowing were observed over a period of time for the preceding gap between women and men (STATSSA, 2006b).

Table 2.1: Top leading causes of death in KwaZulu Natal for both genders age 60-84 (STATSSA, 2006b)

Disease Type	% (percentage contribution)
Tuberculosis	14.6%
Diabetes Mellitus	7.9%
Cerebrovascular diseases	7.4%
Other forms of heart diseases	5.3%
Influenza and pneumonia	4.9%
Intestinal Infection	4.2%
Ischaemic heart disease	4.2%
Chronic lower respiratory diseases	3.2%
Hypertensive diseases	2.5%
Malignant neoplasm's of digestive organs	2.4%

According to Table 2.1 the leading causes of death in Kwa-Zulu Natal are as follows: diseases (56.6%), natural causes (38%) and non-natural causes (5.3%).

Although cerebrovascular disease was the first contributing factor leading to death-related illness, the second leading cause was Diabetes Mellitus (11.1%) amongst females, whereas cerebrovascular disease was the second leading cause amongst males (6.6%). Therefore the prevalence of diabetes is more common among females than males between 60-84yrs.

2.5.1 Renal failure

The activation of anorectic and catabolic cytokines leads to malnutrition which is mainly caused by renal failure (Guarnieri, Antonione and Biolo, 2003). Renal failure is on the increase globally and research shows that more than one million people are currently on dialysis. The projected figure for 2010 is two million. South Africa still needs to provide

more statistics, as well as reporting on conditions of chronic kidney disease (CKD) sufferers. Research has shown that that diabetes nephropathy leads to CKD as well as end stage renal disease (ESRD). Further exacerbating conditions of this condition include obesity and diabetes type 2 (Lysaght, 2002).

In Southern Africa, diabetes mellitus is approaching epidemic proportions of 500 per million populations (PMP). The prevalence of this disease is currently reported in Indians at the rate of 14%, followed by Africans at a rate of 7%. The implications of this involve this country's capacity to provide medical care. The major cause of hospitalisation is linked to renal failure, a chronic condition. Haemodialysis is received by only 42% of South Africans who are on renal therapy, followed by 40% patients receiving peritoneal dialysis and those who received kidney transplants are only 18% (Medscape, 2002).

Chronic renal failure in the elderly is associated with a number of co-morbid conditions, which contribute significantly to morbidity and mortality. The major cause of hospitalisation is also linked to chronic renal failure particularly with severe uremic complications. Elderly ESRD patients have a major financial constraint that affects disease management (Prakash Hota, Singh and Sharma, 2006).

2.5.2 Rheumatoid arthritis

The damaging of bone connecting tissue that is affected by inflammation is known as rheumatoid arthritis. This is prevalent in around 1.6% -1.9% of people within the 60-69 year age group. At 70 years and over, the percentage of sufferers increased from 2.5% to 2.8% (Kesley and Lamster, 2008).

2.5.3 Osteoarthritis

This condition is sometimes called degenerative joint disease. What generally occurs in this condition is the weakening of cartilage situated around the bone, which eventually changes the structure of that bone.

The areas most affected are the places where joint formations occur e.g. spine, knees, hands etc. Pain within those areas is symptomatic of osteoarthritis, as well as stiffening, which leads to impaired functioning. For instance, one may no longer be able to use one's hands to chop, or hold things properly.

This disease is rife in Western countries, where it has led to many elderly people becoming disabled. The WHO predictions indicate that by 2020 this condition will be the fourth contributing factor towards disability globally (Arden and Nevitt, 2006).

2.5.4 Osteoporosis

Osteoporosis is a systematic skeletal disease characterised by a decrease in bone strength, mainly due to age related bone loss, which leads to an increased risk of fracture. But the increased risk of fracture with ageing also depends on a greater propensity to fall and a lower ability to reduce the impact of the falls (Riggs, 2000).

Intervention studies indicate that calcium supplementation assists in gaining bone mass; although results show that these effects did not persist after withdrawal of supplements. Therefore further investigation still needs to be done to see if calcium supplementation over a longer period has any positive effects. Research has also shown that women who have had some degree of bone fracture during their postmenopausal stage, as well as institutionalised elderly women who have increased calcium intake have shown improved bone mass. However, physical exercise and other life-style factors, as well as factors influencing the risk and consequences of falls are also very important (Amorim Cruz, 2001).

Most elderly women and about a fourth of postmenopausal women have osteoporosis, and so cannot be regarded as healthy. However, if people with osteoporosis can be accepted as “apparently healthy,” different subsets of RDA’s should be established for elderly women based for instance on physical activity level. Most postmenopausal and elderly women need an individual approach regarding bone health and health in general, and so the concept of RDA covering the calcium needs of around 98% of the targeted population may not be appropriate for women of these age groups (Wever, 2000).

2.5.5 The role of vitamin D

According to Amorim Cruz (2001) vitamin D deficiency is common in Europe, mainly in elderly people (40%), who are at high risk due to inadequate sunlight exposure. A positive association between the level of vitamin D in the body and bone mineral density has been reported in post menopausal and elderly women. The effects of vitamin D supplementation on fracture rates are not consistent. Research shows that combining calcium and vitamin D supplementation significantly reduces the incidence of non-vertebral fractures in 32% of

elderly women living in institutions. The relative contribution of calcium and vitamin D is unknown in this study. A positive association between vitamin D status and bone mineral density (BMD) has been reported in post-menopausal women and in elderly people. Vitamin D supplementation alone decreased the incidence of fractures in elderly. Supplementation that specifically focuses on combining calcium and vitamin D supplementation significantly reduced the incidence of non-vertebral fractures (32%) in a French study of more than 3000 elderly women living in institutions (Amorim Cruz, 2001).

The effectiveness of Vitamin D supplementation in fracture reduction has been demonstrated. But a consensus has not yet been reached on whether the supplementation can reduce falls (Avenell and Handoll, 2007).

A trial conducted in a developing country (Chile) demonstrates that resistance training over nine months resulted in improved muscle strength and timed up-and-go tests in vitamin D deficient elderly, while simultaneous supplementation with vitamin D (400µg) and calcium (800mg/day) provided greater benefits. These include increased bone mass and better performance in physical function tests, including gait, speed and body sway, which are important determinants of balance and may thereby reduce risk of falls (Bonout, Barrera, Leiva, Gattas and Pia de la Maza, Avendano and Hirsch, 2006).

2.5.6 The role of disability in elderly life

Disability is a critical issue in the life of the elderly since it affects daily activities. During pension day the elderly usually rely on family, arranged transport and wheel chair drivers to assist in collecting pensions at pay points. This means that they have to be responsible for reimbursing their helpers for that service which can be an economic burden. Reference can be seen in Figure 2.2 which was captured during pension day.



Figure 2.2: Disabled elderly captured on pension day

In the USA, findings suggest that 75% of people aged 65 and over suffer from at least one chronic illness, while about 50 % of the elderly population suffer from at least two illnesses. This is problematic as it can cause disabilities (Agency for Healthcare Research and Quality (AHRQ), 2004).

In a study conducted by Nusselder, Looma and Mackenbach (2006), major trajectories associated with disability prior to death were identified. These were found to be various and unique in problems that exist among the population of the disabled. The study recommended that further investigations be done to assess more measurements.

2.5.7 Dental status and oral health

The importance of good dentition and the maintenance of excellent oral health are key in later life, and should always be advocated since they play a key role in food intake. In the 3rd National Health and Nutrition Examination Survey (NHANES 111), respondents with impaired dentition showed a lower Healthy Eating Index (HEI) score and less fruit consumption. Moreover a reduced consumption of serum values found in ascorbic acid was discovered (Sahyou, Lin and Kralle, 2003).

According to Naidoo and Myburgh (2007), there is a strong relationship between nutritional status and oral health with dual effect. Mortality rate increases when dentures are absent in those who have no teeth. Food choice then becomes limited due to specific foods that cannot

be consumed. Food that require more chewing e.g. meat and poultry, certain fruits and vegetables are not consumed in required amounts, which then results in nutrient deficiency. According to Lamster, Lalla, Borangnekke and Tylor (2008), oral cavities in the United States are very common among older people. Root cavities often surface in one or more teeth. Individuals over 75 years often experience a 4mm loss of attachment (65%).

Oral health among older adults has improved in recent decades, but widespread problems remain especially among those with low socioeconomic status, or among institutionalised individuals of poor health and functional status. Housebound and institutionalised elderly people have many dental needs that are not currently being met (Dolan, Atchison and Huynh, 2005).

In a study conducted of 367 elderly (more than 65 years old) people who died during the 1999-2006 period, those who had unsatisfactory chewing ability were at higher risk of mortality than those with satisfactory chewing ability. It was concluded that chewing ability is a predictor of mortality in elderly Taiwanese people, and increases the risk for metabolic syndrome (Meei-Shyuaan, Yichen and Walhqvist, 2009).

In a personal interview, the researcher asked Hlangwane (2009), a dentist in eMshiyeni Hospital at Umlazi, about local dental health. She reported that dentures or false teeth are not accessible to public patients in South African Government hospitals, only to members on a medical scheme. This is a major problem for elderly people as there is no other means of getting aid for improving the state of their teeth. Poor access to oral health affects food choice by restricting the elderly to foods that are softer and easier to chew, which could be a contributing factor to malnutrition.

2.5.8 Cataract (nutrition and age related lens opacities)

A study on eye health conducted in Beijing in 2006 performed a multivariate analysis on respondents aged 65 years and over. Results showed that the amount of sub capsular cataracts was linked to a higher risk of mortality in older persons (Xu, Cui and Wang, 2008).

A South African study conducted by Cook (2007), found that a total of 1 000 people (681 women and 319 men), were pensioners who suffered from cataracts that were still operable. Some of the pensioners had blindness linked to cataracts. Eighty percent of the people

seemed pleased with cataract surgery, although the World Health Organisation seemed dissatisfied with the results.

A lack of education around surgical possibilities was the main barrier preventing people from undergoing surgery. Therefore more education is the first step towards reducing the increase of cataracts among older people. Post management of monitoring is also essential to ensuring improved visuality.

In a study conducted amongst Zulu-speaking women in KwaZulu Natal, results showed that possible causes of failure to attend surgery were associated with the fear of the operation causing blindness. Surgical options were not a first preference by majority of respondents with poor vision. This suggests that there are limitations associated with surgical opportunities. One such limitation is that of financial constraints, while another is that of easy accesses. Also there is no guarantee that improved access to cataract surgery will be made use of by compromised members within the community (Rotchford, Rotchford, Mthethwa and Johnson, 2002). Poor sight affects portion control, food purchases, and ingredient reading a contributing factor that limits safer food choices.

2.5.9 Obstructive sleep apnea

The condition obstructive sleep apnea (OSA) is prevalent in individuals who are obese. Individuals with BMI that is above 27kg/m² and are hypertensive are likely to a high index suspicion for OSA. Further investigation though is essential for these individuals in determining various symptoms such as witnessing of apnea by close individuals, restlessness during sleeping and snoring which are evidence of this condition (Dart, Gregorie and Gutterman, 2003).

2.5.10 Alzheimer's disease/ dementia

Alzheimer's disease (AD) is a commonly associated cause of dementia. This condition affects behaviour as well as cognitive functioning, so compromising daily living activities (Plassman, Langa and Fisher, 2007).

To date the presence of AD has not yet been conclusively established in African-African populations. In numerous African settings, elders demonstrating symptoms of dementia may not be present at health care clinics, due to the condition being stigmatised, or lack of access

to health care. Africans aged 60 years have an estimated 1.6% scores, compared to 5.4% in Western and 6.4% in North America (Ferri, Prince, Brayne, Brodaty, Fratiglioni, Ganguli, Hall, Hasegawa, Hendrie, Huang, Jorm, Mathers, Menezes, Rimmer and Scazufca 2005).

Various studies have suggested that men are less likely to experience Alzheimer's disease. It is more prevalent in women, due to oestrogen loss after menopause. A study on ageing that specifically looked at Alzheimer's and dementia, found that there are pathological associations with this condition. This includes dementia; particularly in elderly people below 95 years old. This conclusion was drawn from a study of 456 elderly brains examined for age categories between 63 to 103 years. The study was done by the Medical Research Council of Cognitive Function and Ageing (Savva, Wharton, Ince, Forster, Matthews and Brayne, 2009).

A cohort study also conducted by Eskelinen, Marjo, Ngandu, Tuomilehto, Soininen and Kipvipelto (2009), suggests that there were some positive benefits associated with drinking coffee in middle aged individuals, as this helped reduce the risk of dementia and AD during later phase in life.

2.6 NON COMMUNICABLE DISEASES IN DISADVANTAGED COMMUNITIES

The year 2005 saw non-communicable diseases (NCD's) cause 60% deaths worldwide. In SA this condition is referred to as chronic diseases of lifestyle (CDL). It has contributed to a total of 35 million deaths. In terms of infectious diseases, these were dominated by maternal deaths, followed by prenatal deaths and a combination of nutritional deficiencies also contributed to these deaths. These results were obtained locally in 2005 (WHO, 2005a). CDL deaths occurred predominantly in disadvantaged countries, due to poor economic conditions. When the diseases were ranked, heart disease was found to be the main cause of death, followed by strokes, cancer, chronic respiratory disease, and lastly diabetes (WHO, 2008a). Increased fruit and vegetable intake can save about 2.7 million people from experiencing further compromised nutritional status. The global diabetes mellitus (DM) epidemic is spreading rapidly. Today, type 2 diabetes extends to the affluent populations of developing countries. Tanzania has lower levels of DM worldwide, but the rate is expected to double by 2025. This rise is due to changes in lifestyle, eating habits and an increase in life expectancy (Solomons, 2005).

Skeletal, cardiovascular, metabolic and neoplastic disease is on the rise in industrialised countries. There is a link between risk of a number of chronic illnesses and a lifelong pattern of dietary consumption. Food habits in later life contribute to the advancement of chronic diseases as well as to their prevention. Various strategies have been initiated by the WHO, including a Global Strategy called Diet, Physical Activity Strategy (DPAS). This initiative involved various sectors, both public and private, which made several contributions welcomed by the 57th World Health Assembly during 2004 (WHO, 2005b).

a) Pre-hypertension

Pre-hypertension is not used to measure disease category, but to indicate the level of risk associated with the potential development of hypertension. This classification brings about an awareness of possible risk, while encouraging intervention, and preventing or delaying the development of the disease. Drug therapy is not a priority at this stage. Advice to help modify further development is more important. Appropriate drug therapy trials should be considered after lifestyle modification has failed to reduce patients' blood pressure (BP) to 130/80mm Hg or less. This only applies to patients who have pre-hypertension and are also diabetic, or have kidney disease (Hypertension, 2003).

b) Hypertension

According to the report by WHO, increased levels of BP have been associated with approximately 7.1 million deaths globally, which amounts to a percentage of 13%. Suboptimal BP (systolic >115mm Hg) rate is influenced by various diseases in this order: firstly, cerebrovascular disease (62%), followed by ischaemic heart disease 49% (WHO, 2002).

Hypertension among African elderly people is on the increase. When comparing populations in Botswana and Uganda, results show that the Ugandans hypertension impacted at 51% while in Botswana it had an effect on between 22-24% of the population, affecting 39-74% of older adults (Kimoti and Hammer, 2008).

Another study shows that the relationship between men at risk is 90% for male counterparts who showed non-hypertensive symptoms during the ages of 55-65 years. This study by the Framingham Heart in 2002 continued to illustrate that risk was more prominent in women by 86-90% than men at between 81-83% (Vasan, Bieser, Seshadri, Larson, Kannel and D'

Agostino, 2002). High blood pressure exists in undernourished populations at the early stages of the epidemiological transition (Tesfayne, Nawi and Minh, 2007).

A study analysing the rate of high blood pressure among South African women in comparison with Caucasian women investigated whether obesity contributed to cardiovascular risk. It found that South African women had peripheral vascular resistance that increased with rising BP. However, it was surprising to discover there was no connection between the two groups in terms of cardiovascular risk and obesity. Insulin resistance as a variable must also be considered when looking at these two groups (Schutte, Hisman, Van Rooyen, Schutte, Malan, Reimann, De Ridder, van der Merwe, Schartz and Malan, 2008).

c) Importance of systolic pressure

The importance of SBP cannot be over-emphasised. Findings show that it is becoming more and more of a risk factor in cardiovascular diseases (CVD's). Age increase contributes to the changing patterns of BP. The difference between SBP and DBP is the fact that SBP does not remain constant but increases as age reaches a plateau from the age of 50 years, and during later life. DBP is more relevant for people under the age of 50 years, operating alone or concurrently with SBP. However, hypertension at a later age is mostly associated with SBP (Hypertension, 2003).

d) Prevalence of hypertension in South Africa

Over half of South Africans age 65 years and older are hypertensive (BP > 140/90 mm Hg) (DOH, 2002). Good blood pressure control is difficult to achieve in this age group, due to a failure to attend clinics. Some might be far, and follow up visits are sometimes missed. Other constraints include a financial burden as well as poor information around the impact of this disease. This shows that sometimes the public health system does not benefit individuals (Hypertension, 2003).

Although South Africa has a high population of women at risk for hypertension, certain measures are essential for controlling and managing the spread of this particular disease. It has other detrimental health effects for the elderly, such as strokes and cardiovascular disease (Charlton and Jooste, 2001b).

A promotion of the Dietary Attempt to Stop Hypertension (DASH) eating plan may be unrealistic in South Africa, due to poor consumption of fruit and vegetables. The major reason for this challenge is related to high food insecurity among the disadvantaged as well as poor dairy products consumption. Reducing the salt content of commonly consumed food products, such as bread, together with increasing potassium, magnesium and calcium content, has resulted in a clinically significant reduction in blood pressure in older hypertensive South Africans (Charlton, 2006).

- e) African-South Africans, older adults and those with a family history are seen as the risk group for hypertension.

Research suggests that African-South Africans are most susceptible to the risk of hypertension. Hypertension in this group can be detected at an earlier stage than other ethnic groups living in South Africa. Salt sensitivity is a common denominator among this group, as well as the effect of low rennin activity on the plasma. These conditions increase cardiovascular risk and also contribute to complications in renal functioning. Other factors that worsen this condition in this ethnic group include genetic dynamics, socio-economic status and environmental considerations (Kola, Sumaili and Krzesinski, 2009).

The prevalence of hypertension in South Africa is 59% for African-Africans, 52% for Indians, 58% for Coloured and 50% for White adults (Steyn, 2006a).

Charlton and Jooste (2001b) produced a study of 47 elderly people between 60-78 years. Their research methodology included testing respondents in random and controlled trials. Results showed that significant salt reduction alone can positively influence both SBP and DBP over a period of about four weeks. Salt sensitivity is observed with increasing age.

- f) Salt sensitivity

Salt sensitivity can occur during salt administration showing the level at which blood pressure rises and also when salt is taken away the level at which blood pressure falls. Research shows that salt sensitivity can be altered through weight loss. Salt sensitivity includes scores of 3-5mmHg decrease in mean arterial pressure (Charlton and Jooste, 2001b). Increasing potassium, magnesium and calcium content and reducing the salt content of commonly consumed food products, has resulted in a clinically significant drop in blood pressure in older hypertensive South Africans. Food industries still need to buy in for effectively rolling out such a public health strategy (Charlton, 2006). As methods to assess the salt-sensitivity status of individuals are lacking, the prudent approach is a reduction of salt

intake of no more than 5g per day for the prevalence of hypertension (National High Blood Pressure Education Programme, 2003).

According to Centre of Disease Control (CDC) (2011), dietary salt intake of 3,400mg if reduced to 2,300mg can reduce hypertension cases up to 11 million. However, if salt intake is further reduced to 1,500 mg hypertension cases could drop as far as 16.4 million.

g) Prevention of hypertension: public health challenges

Preventing the rise of BP as one age should be a key priority, as this lowers the risk of disease. Secondary factors critical to prevention include engagement in physical activity, following a diet rich in fruit and vegetables, reducing alcohol intake, and using potassium as a preventative measure. Limitations include cultural barriers, poor infrastructure to roll out educational plans, a lack of competent human resource to educate, and social environments that have limited healthier choices (American Public Health Association, 2002).

2.6.1 Cardiovascular disease

The INTERHEART case-control study in 52 countries observed nine risk factors associated with cardiovascular disease; abnormal lipids (which are associated with risk for metabolic syndrome), smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, consumption of fruits and vegetables, consumption of alcohol and physical activity. The factors mentioned account for 90% of the risk of heart attack worldwide. The nine modifiable risk factors were relevant for both women and men in all ages in every geographical region (Yusuf, 2004). In the United States the projected cost for cardiovascular disease were \$475.3 billion, and \$ 165.4 billion for coronary heart disease (American Heart Association, 2009).

According to Daneman (2006), approximately 80% of atherosclerosis accounts for total mortality in diabetes. Coronary artery disease is the first major link, followed by other vascular related diseases leading to these deaths.

It is estimated that more than 5.5 million South Africans, 30 years and older, are at risk of developing cardiovascular disease (CVD) as a result of their total cholesterol (TC) levels (Maritz, 2006). In South Africa many people suffer from high blood cholesterol levels. For them dietary treatment forms an integral part of the management of dyslipidemia, even when drug treatment is required. Dyslipidemia is associated with abnormal lipids circulating in the

body which causes health complications (Berger and Marias, 2000). Cognitive impairment and depression are the two most common manifestations in older people associated with cardiovascular risk factors. Other factors were seen as having effective links to hypertension. The relationship between cardiovascular risk and cognitive functioning still needs further investigation, as this can assist in improved functioning of the brain (Flicker, 2010).

According to Puska (2009), public health systems can adopt population-orientated programmes, since they have fewer financial constraints. Nutritional education is also essential in analysing the quality of fats consumed by communities at large.

2.6.2 Stroke

Over 134000 individuals participated in four studies which indicate that dietary fibre intake and whole grains assist in stroke reduction. A comparison was done between high consumers of these foods and low consumers. The outcome showed that increased consumption of whole grains can reduce the occurrence of ischemic strokes by 26% (Steffen, Jacobs, Stevens and Shahar, Carithers and Folsom 2003). Similar observations have been made arguing that improved fruit and vegetable intake lowers the risk of ischaemic stroke (Johnsen, Overvad and Stripp, 2003).

2.6.3 Diabetes

According to Wild, Roglin, Green, Sicree and King (2004), diabetes is predicted to rise by 39% (366 million people) globally between 2000-2030.

In South Africa the prevalence of diabetes mellitus has increased from 5-12% (Africans), 17% (Indians) and 21% (coloureds) (DOH, 2002). According to Reddy, Shah, Varghese and Ramadoss (2005), China and India are experiencing similar trends.

According to Steyn, Blaauw, Lombard and Wolmarans (2008), recent data on self-reported DM in South Africa ranges between 0.9% in Limpopo and North West, to 3.2% in the Western Cape amongst males, and between 1.1% in the North West and 5.9% in Kwa-Zulu Natal amongst females. It is highest amongst Asian females (11.5%) and Asian males (8.5%). Dietary management of diabetes has undergone major changes since the early 1980's. The earlier diet guidelines focused on carbohydrate intake. In particular they restricted sucrose consumption, but did not limit fat or protein intake. While this approach was considered to be

essential for good blood glucose control, it was eventually seen as the major cause of cardiovascular complications. The study recognised the beneficial effects of a high carbohydrate and high fibre intake in rural African communities, where diseases such as diabetes and heart diseases were still uncommon (Niedel, 2000).

The International Diabetes Federation (IDF) recommends an effective programme that focuses on improving diet intake, while with prioritising physical activity (stipulating a 30 minutes of exercise daily). This programme can assist in reducing weight gain as an effective intervention strategy (Alberti, Zimmet and Shaw, 2007).

Intervention can be limited by genetic dynamics as well as body composition. Individuals who are at a high risk of becoming diabetic, as well as those who have compromised socio-economic status can benefit by engaging in lifestyle-orientated interventions. These interventions are expensive therefore, public health should look into developmental programmes that address this challenge (Roumen, Blaak and Corpeleijn, 2009).

Although diabetes is increasing globally, the prevalence of metabolic syndrome contributes to the development of this disease in almost half of the American population suffering from full-blown diabetes or at diabetes at a predevelopment state. Some associations indicate that even individuals with other environmental risk factors are also included (American Dietetic Association, 2008).

The US population during 2008 was estimated to have the following prevalence scores; diabetes, 8% or 23.6 million; pre diabetes 23% or 70.3 million; and the metabolic syndrome 20.3% or 62 million. Type 2 diabetes was prevalent at approximately 90% of those diagnosed with diabetes and 80% of them were obese. An increase in dietary fibre was associated with reduction and glycaemic control when oral medication and insulin doses were used for individuals with Type 1 or Type 2 diabetes (Anderson and Pasupuleti, 2008).

The Finnish Diabetes Study compared low fibre intake and high fibre consumers. The survey reported the significant role played by fibre in eliminating disease progression particularly for pre-diabetic individuals moving over to a diabetic stage. This was monitored over a four year period. High fibre consumers had a reduced risk of 62% when compared to low fibre consumers (Anderson, Baird, Davis, Ferreri, Knudston, Koraym, Waters and Withers, 2009).

2.6.4 Cancer

According to Key, Spencer and Reeves (2010), studies show that obesity increases the risk of oesophageal cancer, colon cancer, pancreatic cancer, breast cancer, kidney cancer and cancers associated with the gallbladder. However, there is no certainty about how far the risk of pancreatic cancer can increase due to obesity. In the United Kingdom, 5% of all cancers are linked to obesity and weight gain.

Cancer is preventable through maintaining a healthy diet and a physically active lifestyle. This helps maintain a moderate body mass, which can reduce up to 30% to 40% of all cases. The implication an appropriate diet could lead to an annual reduction of 3-4 million possible cancer cases. Following a diet rich in fruit and vegetables could also lower the risk of getting cancer by 20% (Rosenberg, 2003).

Findings have also identified the benefits of certain foods, such as carotenoids which protect against oral and lung related cancers (DOH, 2002). Foods rich in lycopene protect against prostate cancer. Lastly β -carotene protects against oesophageal cancer (World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR), 2007).

Table 2.2: Top ten histologically diagnosed cancers in South Africa, by gender (Love and Sayed, 2001)

Site	Males (lifetime risk)	Females(lifetime risk)
Skin- basal cells	1 in 24.37	1 in 44.17
Skin- squamous cells	1 in 53.41	1 in 99.51
Cervix	NA	1 in 31.66
Breast	NA	1 in 31.95
Uterus	NA	1 in 109.20
Ovary	NA	1 in 185.69
Prostate	1 in 43.79	NA
Non- Hodgkin's lymphoma	1 in 143.36	1 in 208.83

Oesophagus	1 in 44.75	1 in 110.39
Colon	1 in 147.56	1 in 147.56
Lung	1 in 44.55	1 in 139.39
Bladder	1 in 114.14	-
Stomach	1 in 114.14	-
Liver	1 in 127.08	-
NA- not applicable		

Table 2.2 indicates that in South African males, the approximate Lifetime Risk- LR (0-74 years) of developing cancer, excluding skin cancer, is 1 in 7 people for blacks, 1 in 5 for coloureds, and 1 in 4 for whites and Indians. In South African females, the approximate LR of developing cancer, excluding skin cancer, is 1 in 8 people for blacks, 1 in 7 for coloureds, 1 in 5 for Indians, and 1 in 4 for whites. Overall, South African males and females have an LR of developing cancer of 1 in 5 and in 1 in 6, respectively (Love and Sayed, 2001).

According to Mqoqi, Kellet, Sitas and Jula (2004), female breast cancer is amongst the most prevalent amongst Asian, Coloured and white females, while cervical cancer is most prevalent among African- African females.

A National Health and Nutrition Examination Survey-NHANES 111 (1988-2000) hypothesised that individuals with insulin resistance (IR) were more likely to die of cancer. The study investigated 16 000 participants. The results showed that insulin resistance was associated with a 41% increased risk of overall cancer mortality. Therefore IR appears to be a high risk condition in cancer mortality. There were fewer deaths due to lung cancer (Niyati, Yong and Grace, 2009).

2.7 THE ECONOMIC IMPACT OF OVERWEIGHT AND OBESITY

Continued reductions in average energy expenditure contribute to increasing problems associated with weight gain. This is more prevalent in developing countries since they are still in transition between economies based on rural agriculture and heavy industry towards ones based on urban, light industry and service sectors. The National Health Service Scheme, or state-paid compulsory health insurance for the poor, has been one of the safety nets suggested across middle and high-income countries to assist individuals who become unwell, and should be subsidised for the full cost of medical treatment (Traill, 2008).



Figure 2.3: Obese and blind woman captured on pension day.

Research has shown that energy expenditure must exceed energy intake, otherwise weight gain will occur. A change in lifestyle has been linked to obesity, but also other elements i.e. physical, social, behavioural factors also contribute. Although over- consumption does lead to obesity, so does a lack of self control around foods with sensory appeal (these foods are generally tasty rich in fat or sugar) (Kopelman, 2000).

Easy access to highly palatable foods contributes towards induced excess consumption, as well as a lack of food avoidance from affected subjects. Obesity is a global and public health problem. Research has shown that in the United States of America (USA), the percentage of

adults (20 years of age) with BMI of 25kg/m², or higher, increased from 64.5% to 66.3% according to NHANES data obtained in 1999-2000 and 2003-2004 (Ford and Mokdad, 2008). In Portugal cardiovascular disease has been linked to 40% of deaths. This figure correlates with findings that show that Portugal is the leading country for stroke prevalence in Western Europe. A study of elderly people in Porto, Portugal, looked at the health and nutritional status of 1519 respondents. The variables set were those for less educated elderly people and also those who were non-smokers. Findings showed a high prevalence of obesity in people between 60-69 years and the variables having associations with obesity (Santos and Barros, 2003).

Implications of obesity include serious medical complications and an impaired quality of life. Frail physical functioning due to an age-related decline in older people can easily be exacerbated by obesity. However, controversy remains as how to administer appropriate treatment for obesity (which includes weight loss). This can have detrimental effects leading to major health risks. The American Society for Nutrition (ASN) and North American Association for Study of Obesity (NAASO) have identified positive associations with weight loss therapy, particularly for older people; these include an improvement of quality of life, and fewer medical complications. However, weight loss therapy has to minimise muscle and bone loss as generation in both these body areas that are affected (Villarreal, Apovian and Kushner, 2005).

According to Ray, Lipton, Katz, Zimmerman, Katz and Derby (2011), chronic pain in elderly is associated with central obesity. Overweight and obesity (Body Mass Index- BMI \geq 30kg/m²) levels in older Africans are high in Botswana, Cameroon, Kenya, Senegal, South Africa and Uganda (Help Age International, 2004).

In South Africa, the ethnic group mostly at risk for overweight and obesity compared to other ethnic groups are African-South Africans, particularly women (Puoane et al., 2002). A Cape Town study of people in an urban township showed a high prevalence of obesity, measured by both BMI (46.6%) and waist circumference -WC (63.4%). These results demonstrate that excess weight gain is linked to abdominal obesity in women (Malhotra, Hoyo, Ostby, Hughes, Schwartz, Tsolekile, Zulu and Puoane, 2008).

Similar findings from other countries have been reported. In South Africa a study by Senekal, Steyn and Nel (2003), and also African studies by Fezeu, Minkoulou and Balkau (2006) and Amoah (2003), show that the prevalence of obesity is significantly higher amongst females as compared to males. Results also showed a strong association between gender, obesity and abdominal obesity, while in a multivariable analysis, men showed a relatively low risk whilst females showed a much higher risk.

The economic costs of obesity are serious. Data from the Centre for Disease Control and Preventions and Behavioural Risk Factor Surveillance System (BRFSS) suggests that escalating levels of obesity increase medical spending. In the USA obesity prevalence accounted for 10% of overall medical spending in 2006 (CDC, 2009).

The role of public and private health workers as well as key policy makers is essential in dealing with the spread of obesity. Figures reported in some developed countries indicate that it causes within the range of 2-7% of total health care costs (CDC, 2009).

There have not been that many studies done focussing on the link between obesity and economic hardship in developing countries. However, more studies have been done on the NCD's have been recognised by a number of international agencies including WHO and the World Bank. Developing countries have far more medical costs than developed countries. This is due to the use of limiting foreign exchange to pay for imports of expensive equipment and medication, and special training of staff. Obesity prevention is critical. It is also the only sensible approach to planning public health policies in developing countries (Davey and Leeder, 1993).

a) Economic costs and benefits of obesity treatment in developing countries

Preventative measures should be adopted to manage obesity, as this is a more cost-effective method. Low income developing countries continue to face challenges of poor access to medical care, as they only have public health and essential clinical services as major platforms for treatment (World Bank, 1993).

In certain countries research has shown that some children who are under five years have high levels of obesity originating from birth, and even from gestation in the womb. Obesity has been traced back to developmental stages of growth. However, interventions are essential

in all stages of life. Nutritional policies that are well developed and highly resourced are very scarce worldwide. Various sectoral policies ranging from gender, health and social welfare have had a haphazard and sometimes negative effect on nutrition. Indirectly, this affects the effective roll-out of nutrition policies. It is important to evaluate the positive and negative effects of nutrition developmental policies further. These policies have some negative effects, particularly economically, as well causing poor health. This mainly occurs in developing countries and is mostly influenced by the level of supply and demand (World Bank, 2009).

Developing countries have contributed >90% to global disease. However, global spending has only been at 12% for these developing countries. The Millennium Development Goals (MDG) have shown that between US\$25 billion and US\$70 billion is necessary to meet the cost of addressing disease in these countries (World Bank, 2007).

Research has found three reasons why development partners and governments do not prioritise nutritional programmes. Firstly, malnutrition has an invisible effect on families and communities. Lack of knowledge of its role in causing and perpetuating disease is a major risk factor which can lead to death. Poor uneducated families are most affected. They are marginalised, and therefore do not have a strong social voice. Thus community nutrition services become less popular. Secondly, government and development partners have been slow to recognise the escalating economic cost of malnutrition (World Bank, 2009).

Malnutrition is delaying progression in meeting MDGs. Research has shown that there are cost-effective ways of including nutritional programmes that can be rolled out within the larger community. Preventing malnutrition is a governmental responsibility; however, it often falls through the cracks that exist between the public and private sector (World Bank, 2009).

2.7.1 Metabolic syndrome (Met S)

Metabolic syndrome (MetS) is a cluster of abnormalities including insulin resistance, dyslipidemia, visceral adiposity and hypertension. A high intake of dietary fibre or whole grain can ameliorate and even reverse this condition (Anderson *et al.* 2008).

Reaven (2003), discovered that the group abnormalities that relate to Met S can actually be categorised into “syndrome x” because they represent a single syndrome. Reaven identified impaired glucose intolerance as part of the abnormality. Considering the increasing global impact of this condition, it is vital that these developments are taken into account.

- a) Fasting plasma glucose (FPG) of between 5.6mmol/l and 7.0mmol/l will occur in individuals who are insulin resistant (ADA, 2007). According to Songming (2009), ghrelin, leptin, adiponectin and insulin are associated with metabolic syndrome and metabolic abnormalities. Leptin may be a novel link between obesity and other metabolic abnormalities.
- b) Research has shown that as age increases, so does the prevalence of metabolic syndrome risk. In an American study results showed that adults who were between 20-29 years had 7% prevalence whilst as age increased to over 60 years, prevalence also increased to >40% (Ford, Giles and Dietz, 2002).

Recent studies have suggested that short-term nutritional counselling improved some factors of metabolic syndrome. Other contributing factors to minimised risk were associated with increased calcium and reduced vitamin D consumption (Pimentel, Arimura, Moura Silva, de Sousa, 2010).

Ogebera (2010) found MetS present in 86% of the respondents' results. It was more common among women (86%) than men (83%). Respondents between 20 to 29 years experienced a prevalence of 11%, however, those between 70 to 79 years had a higher prevalence of 89%. This clearly indicates the link between age and the progression of the disease. The main defining variables for MetS include central obesity and elevated triglyceride levels. The HDL-C in both genders differed significantly.

2.8 DIETARY REQUIREMENTS FOR THE ELDERLY: MACRONUTRIENTS

2.8.1 The role of dietary reference intakes (DRIs) and dietary requirements

The estimated energy requirements (EER) for moderately active men and women aged 70 years and older are 10.68 and 8.55 MJ/day (2 557 and 2046kcal/day), respectively. A lowered basal metabolic rate and reduced physical activity influence the lower energy requirements for older persons. Protein requirements (DRI) are the same as for younger adults at 0.80g/kg/day. Due to complications associated with ageing research has suggested that increased amounts of protein are required, up to 1g/kg (Young, 1989).

According to the Nutrition Information Centre University of Stellenbosch (NICUS) (2003), the approach of the Food and Nutrition Board of the Institute of Medicine of the United States to formulate the DRIs represents a paradigm shift that is essential in limiting deficiencies that occur. The importance of DRIs is to promote health which contributes to quality of life. DRIs contain essential guidelines for social groups and individuals which improve risk factors for chronically related illnesses.

The DRI framework includes the following considerations:

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

DRIs have been developed using various materials ranging from clinical to controlled case studies. Journal publications used had to be peer reviewed in developing this resource (NICUS, 2003).

i. Categories of DRIs

Institute of Medicine, 2004; NICUS (2003), defines the following DRI categories as follows “firstly the term DRI is a collective term and refers to a set of at least four nutrient-based reference values. Each type of DRI refers to the average daily nutrient intake and it is to be understood that some deviation around this average value over a number of days would be expected. It is, therefore, the average mean intake over time that is the nutritionally important reference value. Other four reference values which form part of DRIs are as follows:

EAR (Estimated Average Requirement) is defined as the intake that meets the estimated needs of a nutrient of 50% of individuals in a specified gender group, at the given life-stage. 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.

RDA (Recommended Dietary Allowance) is defined as the intake that meets the nutrient needs of almost all (97-98%) individuals in that gender group, at the given life-stage. It is

important to recognize that the RDA applies to individuals and not to groups and is the goal for dietary intake by the individual.

AI (Adequate Intake) is used in a case where the scientific evidence is inadequate to set an EAR. In such cases, the AI reference is used instead of the RDA. The AI is based on experimentally derived 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 established and to have an RDA calculated.

UL (Tolerable Upper Intake Level) is defined as the maximum nutrient intake by an individual, who is unlikely to pose risks of adverse health effects in almost all (97-98%) individuals in a specified group.”

The categories for various physical activity levels and categories will be illustrated in the table below

Table 2.3: Categories for physical activity levels (NICUS, 2003)

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

The physical activity level used for this population group was sedentary. This was also the basis for the calculation of energy requirements for male and female respondents.

Table 2.4: Energy requirements for sedentary individuals (51-70 yrs) (NICUS, 2003)

GENDER	AGE	Active PAL ^a EER
♂	51-70YRS	3 067 ^b (12 881)
♀	51-70YRS	2 403 ^c (10 093)

Table 2.5: Dietary reference intakes for macro and micronutrients in age 51-70 years
(Institute of Medicine, 2004; NICUS, 2003)

Nutrients	Females	Males
MACRO NUTRIENTS		
Energy (KJ)	10093KJ	12881KJ
Carbohydrates (g)	100	100
Fibre (g)	>25	>25
Protein (g)	46	56
Fat (g)	25-30	25-30
MINERALS:		
Calcium (mg)	1200	1200
Fe (mg)	5	6
Magnesium (mg)	265	350
Potassium (mg)	580	580
Cl (mg)	425*	550*
Zinc (mg)	6.8	9.4
Cr (mg)	20	30
Selenium (mg)	45	45
Iodine (mg)	90	90
VITAMINS:		
Vitamin C (mg)	60	75
Thiamine (mg)	0.9	1
Riboflavin (mg)	0.9	1.1
Niacin (mg)	11	12
Vitamin B6 (mg)	1.3	1.4
Folate (mg)	320	320
Vitamin B12(mg)	2	2
Panthonate (mg)	50*	50*
Biotin (mg)	30*	30*
Vitamin A (mg)	500	625
Vitamin D(mg)	10*	10*
Vitamin E (mg)	12	12
Vitamin K (mg)	90*	120*

* The asterisk represents the (AI's) intake (Institute of Medicine, 2004; NICUS, 2003) and Nitrogen equilibrium

Table 4.5 will be further discussed in Chapter 4 and results will be compared to the requirements highlighted in this table.

2.8.2 Dietary intake and food consumption patterns in South African elderly

The traditional African diet comprised harvested agricultural based foods, plants, hunted animals and other indigenous foods. This diet was generally low in fat, rich in fibre, high in carbohydrates, and moderate in protein intake. Geographical location, depending on ethnic group, influenced food variety across the country. According to Steyn (2006a), rural dwellers in South Africa have a high carbohydrate intake and very low fat intake prevalence. According to Vilakazi (2005), the traditional African diet over the years, has been disrupted due to domestic food production trends with heavy dependence on commercial and food imports. In general older white South Africans have shown a high consumption of fat (>35% energy – E), whilst African South Africans have shown lower consumption of (<25%-E) and older Coloured South African having moderate consumption (32%-E). Research has also shown that older South Africans generally have a low fibre intake (Charlton, Ferreira and du Plessis, 2008a).

Oldewage-Theron et al. (2005a), found that in Sharpeville the following foods were consumed in the following order from a scale of 1-10 items, including their mean daily intake average. Firstly tea (299g), followed by stiff maize porridge (273g), brown bread (93g), full cream, fresh milk (67g), chicken, cooked (103g), beef, cooked (125g), fermented maize drink (mageu) (212g), eggs (123g), apple (160g) and orange (189g). This list was derived from an evaluated 24 hour recall tool. Higher nutrient deficiency scores were detected amongst women as opposed to their male counterparts. The mostly commonly deficient nutrients for individuals were calcium, magnesium, copper, selenium, iodine, vitamins A, B2, B6, C, D, E, pantothenate, folate, and biotin. All three daily meals were consumed by the majority of respondents, however, nutrient deficiency remains prevalent in this community (Oldewage-Theron et al., 2005a).

According to Help Age International (2004), elderly Africans consumed less than the current recommendations of more than three meals a day. The majority of respondents consumed

only two to three meals per day. This correlates with results indicating restricted dietary diversity in foods consumed as well as low energy scores. Low intakes of fruit and vegetable were also evident, except in Kenya. African and Coloured South Africans on the other hand showed poor fibre consumption which relates to low fruit and vegetable intake.

In South Africa race contributed significantly to fat consumption scores indicating that it was highest (>35%) among white elderly people, moderate (32%) in coloured elderly people, and low (24-26%) in black elderly people (Charlton and Rose, 2001a).

Micronutrient intake in African South African elderly people was found to be low. The majority of older adults had intakes low of: vitamin A, B6, C, D, E, K, folate, and biotin, and the following minerals: calcium, magnesium, copper, and selenium were less than 67% of DRI (Charlton, Kolbe-Alexander and Nel, 2007).

Research conducted by Oldewage-Theron et al. (2005a), suggests that month-end earnings allows for increased food expenditure particularly at the beginning of the next month. This suggests that when financially accessible, highly palatable and rich foods can be over consumed during this period, especially by individuals who are generally living in a state of food insecurity. One of the factors influencing older peoples' nutritional status is inappropriate and unnecessary dietary restriction and unappetising food. The quality of life of older people is also impacted by their enjoyment of food.

2.8.3 Dietary needs in the elderly

a) Energy intake

“According to the first law of thermodynamics, energy can be neither created nor destroyed; thus, for any system, the following equation applies: Energy intake = energy out + change in energy stores – work performed” (Odgen, Fryar, Carrol and Flegal, 2004).

According to Schoeller (2009), the role of energy is essential and interventions should not only address its relevance, but must also take the dynamics of energy expenditure or energy intake into account. Interventions should consider the balance between energy intake and expenditure.

b) Carbohydrates and dietary fibre needs

The United States Food and Drug Administration (FDA) defines whole grains “as consisting of the intact, ground, cracked, or flaked fruit of the grains whose principal components, germ and bran are present in the same relative proportions as they exist in the intact grain”. Whole grain can reduce the risk for CVD. Studies have shown that the intake of fibre-rich bran and wheat germ, as well as whole grain which is using a broader concept of wholegrain, can also reduce this risk (De Moura, Lewis and Falk, 2009).

A South African study showed that urban dwellers (this included all ethnic groups) consumed carbohydrates as their main contributor to total energy intake which was between 44%-64%. However findings have also shown that carbohydrate based foods remain the major food item contributing to diet. However rural African dwellers consumed a varied amount of 62% to 71%. This clearly indicates that rural dwellers consume more than those living in urban areas (Steyn, 2006b; Vorster, Venter, Wissing and Margetts, 2005).

The development risk of the following disease trends: coronary heart disease, hypertension, stroke, diabetes, obesity and certain gastrointestinal diseases can be significantly lowered if high intakes of dietary fibre are consumed by individuals. Other benefits associated with increased fibre intake include lowering high blood pressure and serum cholesterol levels and reducing glycaemia and insulin sensitivity in non-diabetic and diabetic individuals. Fibre also significantly enhances weight loss for obese individuals. Increased fibre intake addresses a number of gastrointestinal disorders including: gastroesophageal reflux disease, duodenal ulcer, diverticulitis, constipation and haemorrhoids. Fibres that have a probiotic effect help to enhance immune function (Anderson et al. 2009).

c) Glycaemic carbohydrates

The Glycaemic index values rate food items and dishes according to the effect of these items on blood glucose levels (Steenkamp and Delport, 2005). Frequent misconceptions regarding the GI include the use of high fat low GI food items, a general disregard for portion sizes and exclusion of certain high GI food items which might lead to an overall exclusion of important nutrients. This leaves the GI open for misinterpretation and should be carefully explained to diabetics who use the GI as a guide for healthy eating (Pieters and Jerling, 2005).

It is imperative that the GI be used as a tool in combination with a healthy balanced diet and not merely to compare two different items (Slabbert, 2005). Food containing carbohydrates has been a widely investigated and prioritised effect in diabetic management. The digestion as well as the absorption of these foods can be “slow or rapid’ depending on the consumption of the carbohydrate, and the way it is cooked. “The GI is measured by comparing the area under the curve of blood glucose elevation in healthy subjects after a test meal, compared with the same amount of digestible carbohydrate for a standard meal or glucose” (Goerg Asp, 2000).

d) Protein needs and intake for the elderly

According to Dawson et al. (2008), Recommended Daily Intake (RDI) criteria are used to determine protein requirements. In Australia research has shown that RDI in the elderly above 70 years is above 1, comparing men (0.7/kg) and women (0.94/kg). The majority of research concerning RDI is mainly based on healthy younger people. Recent findings have identified the importance of amino acid in metabolic functions. The recommendation is for plasma and intracellular levels to be far above needs recommended.

Determining accurate protein requirements, particularly for the elderly in various living arrangements e.g. within the community, hospitals and other institutions is what further studies should focus on.

According to the Food Based Dietary Guideline (FDBG) “meat, fish, chicken, milk and eggs can be eaten everyday” is motivated by reviewing the evidence that these foods contribute valuable nutrients to the diet preventing under nutrition of especially calcium, iron, zinc, and the essential omega 3 fatty acids. The evidence of overconsumption of these foods increases the risk of chronic diseases is evaluated, with particular emphasis on the role of saturated fats, omega-3 fatty acids and cholesterol in relation to the risk of coronary heart disease and cancer. The FDBG guideline indicates that foods from animal origin include milk, other dairy products such as yoghurt and cheese, fish, both fresh and tinned, fresh water and marine fish, eggs, and meat both red meat and chicken. Animal originated foods are relatively expensive and therefore financial constraints could lead to reduced consumption when compared with foods from plant origin”.

African-South Africans are increasing their intake of animal derived foods which is leading to more adequate diets. Urbanisation has had a major affect on this. Other population groups

generally have high intakes of meat, which increases the risk of chronic diseases. However, there is a low intake of other animal sources, such as milk (across the majority of population group), and fish (in some populations) (Scholtz, Vorster and Matshego, 2001). According to DOH (DOH, 2004; DOH, 2007b) 51% of n=8115 males and females older than 15 choose fatty red meat cuts, 75% eat chicken with skin, and 37% eat processed meat either daily or weekly.

In 47 studies, 71 clinical arms evaluated soy protein and its effect on lowering levels of total cholesterol of 4% and low density lipoprotein LDL by 5.4%, when compared to control interventions. Forty eight or sixty eight percent of all soy protein arms (34 studies) showed statistically significant decreases in TC (total cholesterol) and/ or LDL either in the entire study population or in subsets of respondents when compared to control treatments (Allen, 2007; Azadbakht, 2008; Liao, 2007). The current soy protein health claim recommends an intake of 25g of soy protein a day. Several studies continue to support soy protein intake at this level to achieve blood cholesterol reduction (Hartland and Haffner, 2008).

According to Scholtz, Vorster and Matshego (2001), good eating habits and a balanced diet can be achieved by excluding foods from animal sources. This is difficult but not impossible if sufficient substitutions are incorporated within a diet. “Consuming 400-500ml of milk or its equivalent per day, two to three servings of fish per week, four eggs per week and alternatively not more than 560g of meat per week, improves nutritional status without increasing risk of chronic diseases”.

According to DOH (DOH, 2004; DOH, 2007b) results showed that 74% of people (n=8115 males and females older than 15) use full cream milk.

e) Dietary fat intake

Fat provides energy generally since it serves as an essential dietary nutrient. It also adds palatability to dry foods and can be used for cooking purposes. There are certain foods that are rich in fat, but which also have a low fat quality and poor nutritive value. This can be observed by analysing their composition. Foods containing a better fat quality in terms of nutritive value will generally have more of unsaturated form of fat than saturated fat types. Further examples to illustrate poor fat quality would be dairy products that are rich in fats, as well as meats. Vegetable oils (palm and coconut oil excluded) are products with a generally

high, but poor, fat quality. Although the importance of fats and oils cannot be underestimated, it is important to note that their effects on the body vary. Further publications are essential in spreading knowledge about the positive roles of fats, since this information is still scarce globally. Research has shown that fats that are generally consumed across the world are rich in SFA and low in essential fats (omega-3 and -6, polyunsaturated fatty acids (PUFA)). It is better to switch from eating animal fats to using modern soft margarines or oils (Zevenbergen, Brea, Zeeleberg, Laitinen, Duijin and Flotter, 2009).

According to Elmadfa and Kornsteiner (2009), in a global perspective study on fat intake conducted in 28 countries “the mean daily intake of total fat expressed as percentage of energy ranged from 11.1 to 50.7% E. The highest variation in total fat intake was observed in Africa (13.1 – 50.7% E). However, America (25.7-37.2% E), Asia (11.1-35.6% E) and Europe (28.5-46.2%) also demonstrated great differences in regional fat intake”.

According to FAO (2005a), “with the world population of 6.5 billion people in 2005, the average intake of oils and fats would be almost 20kg per person per year. There is a wide variability: intake in the Western World is estimated at around 50kg/person/year whilst in sub-Saharan Africa this is no more than 10kg”.

According to the WHO (2003), recommendations on the quality of fat in the diet, that need to be taken into account are as follows:

- “Fat may provide up to 30-35% of the daily energy intake
- Saturated fat should provide no more than 10% of the daily energy intake
- Essential PUFA (n-6 and n-3) should contribute 6-10% of the daily energy intake
- Transfats should be less than 1% of the daily energy intake
- The remaining of the energy from fat can be provided by mono-unsaturated fats”

According to Foster and Lunn (2007), “over the past 30 years new changes have adapted to the availability of the fat poultry meat (which used to be regarded as a luxury and is relatively lean), and reduced fat-milks and dairy products. As a result, lower-fat meats, such as poultry, have overtaken beef, pork and lamb as the most popular meats, and semi-skimmed milk now dominates the milk category”. According to Lunn and Buttriss (2008), “the consumption trends for fats and oils show the rise of reduced-fat spreads and the decline in margarine, butter, and lard intake over the past 20 years. The changing dietary patterns have also led to a

substantial change in the fatty acid profile of the diet. As oils have replaced hard fats, there has been a favourable shift in the balance of unsaturates and saturates in the diet”.

In a study conducted by the International Food Information Council Foundation, results showed that respondents had negative perceptions towards all consumable fats. However, only 72% of the respondents found saturated fats to be mostly associated with health risks. The negative perception identified in these results influences food choice when shopping, as well as when applied to portion size. Respondents preferred butter to margarine, because it was seen as being the healthier option (Diekmann and Malcom, 2009).

f) Fruit and vegetable consumption

Studies show the importance of increasing daily fruit and vegetable intake as a protective mechanism against cancers, and also against cardiovascular disease. Findings have shown that fruit and vegetables are a useful source of flavonoids, as well as of potassium, folate and many other vitamins, minerals and fibre (Love and Sayed, 2001). A low fruit and vegetable intake accounted for 3.2% of all deaths in South Africa in 2000 and 60% IHD in males and 52% in females, 17.8% ischaemic stroke in males and 32.7% in females, 9.8% oesophageal cancer in males and 7% in females, 7.8% lung cancer in males and 4.7% in females. This emphasises the importance of public health importance initiatives to increase the fruit and vegetable intake of all sectors of the population (Schneider, Norman, Steyn and Bradshaw, 2007).

2.9 THE ROLE OF MICRONUTRIENTS IN A DIET

2.9.1 Micronutrient deficiency in the African continent

Micronutrient deficiencies have been a concern in Africa. Scarcity of knowledge on the extent of the problem has delayed interventions and most likely contributed to prevailing high mortality, morbidity and low productivity. It is also well known that micronutrient deficiencies coexist with protein malnutrition, the most common nutrient deficiency in Africa (Smith and Haddad, 2000). According to the Academy of Science of South Africa (ASSAF) (2007), “micronutrient deficiencies are common and more pronounced in individuals with disease progression and in those with inadequate diets. Deficiencies may hasten disease progression, increase mortality and facilitate mother-to-child transmission of HIV. Micronutrient supplementation is highly necessary if individuals are below the

recommendations required. Supplements do not function as a cure but help elevate nutrient deficiencies as well as more possible complications. Good nutrition is vital and affords the body better healing platform from disease/infection and move towards recovery” (NICUS, 2005).

2.9.2 Micronutrient requirements for the elderly

Nutrient intakes considered adequate for the elderly are often based on extrapolation from the better defined requirements of younger adults, partly by taking the changed energy needs into consideration. Fortunately, the question of specific needs for vitamins in the elderly can be answered without exact knowledge of the absolute minimum requirement, because according to observations, comparison with the vitamin supply parameters of other age groups is valid.

Specific needs for the elderly can arise from:

- Decreased needs for food and energy
- Disadvantageous food selection
- Disturbed digestion
- Inefficient absorption
- Diminished retention or storage capacity
- Increased elimination
-

This section will discuss the summarised results of these reports, together with the results of a comprehensive nationwide nutritional study conducted on the elderly (Heseker and Kubler, 1992).

A study that assessed the role of vitamin and mineral supplements for older adults, comparing users and non-users, looked at how nutrient intake adequacy and dietary attitudes differed. The following nutrients were found to be below the EAR's: vitamins A, B-6, and C; folate; zinc; and magnesium for a smaller proportion of supplement users than non-users. Folate, vitamin E, and magnesium EAR's were met by less than 50% of both groups. However, findings suggest that less than 50% of both users and nonusers met the EAR from food sources alone. Conclusions drawn from the study show that nutrient improvement can be achieved through supplementation in older adults, as 80% or more of users met the EAR for vitamins A, B-6, B-12, C, and E; folate; iron; and zinc, but not magnesium (Sebastian, Cleveland, Goldman and Moshfegh, 2007).

Tolerable Upper Intake Levels were exceeded by men for iron and zinc by supplement users. Fewer women, however, exceeded the Tolerable Upper Intake Level for vitamin A. Socio-demographic factors such as age group, metropolitan area, and educational status played a significant role regarding supplementation among these older persons. Race, region, smoking status, and vegetarian status were also other significant factors for women (Sebastian et al. 2007).

Consuming food alone has shown continued contributing insufficient nutrient intake in older adults. Supplements are beneficial in supplying nutrients that the body lacks, however only a few people in this population consume them on daily basis. Developing recommendations for older persons means carefully considering a vast spread of deficiencies associated within this group. Poor dietary management within this population group can lead to a higher supplement use in this at-risk population (Sebastian et al. 2007).

a) Vitamin A

Vitamin A intake is essential for the elderly because of the high risk it holds for developing eye related problems. Vitamin A deficiency affects haemoglobin levels due to iron metabolism and red blood cell production involvement, and also contributes to nutritional anaemia, probably by restricting iron use for haemoglobin. The reduction of anaemic populations can be achieved through the use of vitamin A (alone). A combined iron supplementation can elevate the anaemic burden (West, Gernand and Sommer, 2007).

b) Vitamin E

The term vitamin E refers to the group of eight phytochemicals exhibiting the antioxidant activity of alpha-tocopherol, but only alpha-tocopherol meets human vitamin E requirements. In humans, vitamin E absorption is dependent not only on the fat content of the food but also the mechanisms for fat absorption. This leads to vitamin E deficiency (Traber and Kamal-Eldin, 2007).

According to Wolf (2007), the human daily requirement of alpha-tocopherol was estimated by a determination of the turnover kinetics of deuterium-labelled RRR-alpha-tocopherol in two women and three men. Fat eaten with the vitamin, increased by 0.43 mg for each gram of fat consumed in varied proportion to the amount of alpha-tocopherol absorbed. Research

showed that a vitamin was used to vacuum impregnation apples; this method was a fat-free method for administering alpha-tocopherol. There was absorption of 10% of the administered alpha-tocopherol even in the absence of fat. The daily requirement of alpha-tocopherol when consumed with a diet containing 21% fat was estimated to be 15 +/- 2 mg, an amount close to the current Estimated Average Requirement (EAR) of 12 mg/d. The results indicate that individuals who choose to consume a low fat diet can benefit from this initiative of vitamin E supplementation.

c) Vitamin C

According to Sahni, Hannan, Gagnon, Blumberg, Cupples, Kiel and Tucker (2008), vitamin C is essential for collagen formation and normal bone development. Total, supplemental, and dietary vitamin C intake with bone mineral density (BMD) at the hip (femoral neck, trochanter) were observed. Associations were observed between higher dietary vitamin C intake and femoral neck-BMD loss. Although the associations showed similarities, they retained borderline significance after adjusting for potassium intake (a marker of fruit and vegetable intake). It was further suggested that fruit and vegetables have a protective role which cannot be separated from vitamin C effects, particularly in women. Vitamin C plays a particularly significant protective role in older men.

Research has shown that poor dentition or mobility cause some underlying sub-clinical diseases that can reduce plasma ascorbate concentrations in elderly people. Thus they have generally shown lower daily vitamin C intake scores as compared to younger people. Ascorbate is essential for collagen production. Vitamin C deficiency will result in defective connective tissue, including reduction in collagen synthesis and structural stability. The development of degenerative disc disease (DDD) in older people has been linked to vitamin C deficiency. Vitamin C requirements can increase due to the increased tissue inflammation that accompanies DDD in individuals affected by this condition. This condition also involves creating a cascade of positive feedbacks that potentially accelerate and contribute to further disc degeneration and low-back pain. Recommendations for this condition would be to revise and finely calibrate RDAs for the patient's ageing-related degenerative disc disease. The RDAs should be minimised for ascorbate status (Smith, 2010). According to Riviere, Birlouex-Aragon and Nourhashemi (1998), older people who find it difficult to consume adequate amounts of fruit and vegetables are known to have low levels of Vitamin C in the

blood. Indeed, this appears to be the case even in the presence of an apparently adequate intake of vitamin C.

Research has shown that fewer hip and non-vertebral fractures were prevalent in respondents exposed to a higher intake of total or supplemental vitamin C. The Framingham Study has observed the protective role of vitamin C in bone health in elderly life (Sahni, Hannan, Gagnon, Blumberg, Cupples, Kiel and Tucker 2009).

d) Vitamin K

Vitamin K deficiency is associated with low bone mineral density and increased risk of bone fracture. Multiple regression analysis indicated that not only phyloquinone (K1) and menaquinone 4 (MK-4) and 7 (MK-7) K1 and MK-7 were independently correlated with undercarboxylated osteocalcin (ucOC) concentration and the ratio of ucOC to intact osteocalcin (iOC). The plasma K1 or MK-7 concentration was more prevalent in individuals above 70 years. Results also showed that it seemed to decrease progressively with age. Although ucOC has no defined role, if submaximal gamma-carboxylation is related to the prevention of fracture or bone mineral loss, circulating vitamin K concentrations in elderly people should be kept higher than those in young people (Tsugawa, Shiraki, Suhara, Kamao, Tanaka and Okano, 2006).

e) Folate

Research suggests that colorectal cancer and other cancers can be reduced if folate rich foods are consumed. In the United States, 40% of adults aged 60years and older, have been perceived to consume a supplement containing folic acid, most of which contains 400mcg per pill (Maso, 2009).

When folic acid is highly concentrated in the blood it may lead to resistance to antifolate drugs used against malaria, rheumatoid arthritis, psoriasis, and cancer. This is due to a natural killer cell cytotoxicity that decreases when concentrations levels are high. The increased risk of cognitive impairment and anaemia is associated with a combination of high folate levels and low vitamin B-12 status, particularly in the elderly. Folate has a dual effect on cancer, protecting against cancer initiation but facilitating progression and growth of preneoplastic cells and subclinical cancers, which are common in the population. Some people can respond negatively to high folic acid intake. Careful considerations should be made in countries

seeking to use folate in fortification projects. Further research is vital in identifying the effects, both good and bad, caused by a high intake of folic acid from fortified food or dietary supplements (Tsugawa et al. 2006).

f) Vitamin B12

Animal products are the main source of vitamin B12, and are only consumable in foods like meat, milk, milk products and eggs. Vitamin B12 foods are exclusively from animal sources. There are no derivatives from any kind of plant sources. Vitamin B12 concentrations can only be present in foods in a form of bacterial contamination for fermentation. Although most diets have levels of vitamin B12 that exceed the recommended daily allowance (RDA), there is relatively widespread prevalence of vitamin B12 deficiency (Scott, 2007). The suboptimal status of folate and vitamin B12 at the biochemical level has been associated with significant neuropsychiatric damage, including cognitive impairment. This vitamin is important in co-factors in methylation processes essential for brain function. However, lack of improvement in cognitive function in elderly Dutch people with mild vitamin B12 deficiency were seen with a 24-week supplementation of either high dose vitamin B12 given alone, or provided in combination with folic acid (Eussen, de Groot, Joosten, Bloo, Clarke, Ueland, Schneede, Bloom, Hoefnagels and van Staveren, 2006).

g) Vitamin B6

Several randomised trials have investigated the risk of heart disease, checking to see if supplementation can help reduce risk. It was considered premature to establish a B6 intake level and/or a homocysteine concentration for lowest risk for disease. Further research is still needed to validate the role of vitamin B6 in improving cognitive function in older adults (NICUS, 1998). In a study conducted by Roth-Maier, Kettler and Kirchgessner (2002), that looked at precaecal digestibility of vitamin B6, specific foods were chosen in terms of relevance for both animal and human applications. The following foods were selected: eggs, bananas, white cabbage, corn, milk powder, fish, barley, soybeans, brown rice, wheat bran, brewer's yeast, rye and soybean meal. The concentration of vitamin B6 in foods and chyme was determined by high pressure liquid chromatography. Digestibility of vitamin B6 from all tested food sources ranged from 51 to 91% in the following order: cabbage diet > banana diet > fish diet > milk powder diet > brewer's yeast diet > soybeans diet > soybean meal diet > egg diet/corn diet > barley diet > wheat bran diet > rye diet. Results showed brown rice to

have the lowest vitamin B6 availability at 16%. The digestibility of vitamin B6 from plant products (excluding the rice) was on average 10% lower when compared with animal.

h) Thiamine

The human organism has relatively low storage capacity of thiamine, so a regular thiamine intake is necessary. In a study of the elderly in Germany, it was found that, in contrast to RDA, thiamine intake was not reduced. This is a consistent finding that the intake and the measured status of thiamine do differ in the aged. Thiamine status was assessed by measuring the activity of transketolase in erythrocytes (ETK). Thiamine deficiency among healthy adults of all age groups is rare. Chronic consumption of alcohol, which affects the absorption and metabolism of thiamine is accompanied by an insufficient intake of numerous essential nutrients, and is the main reason for a thiamine deficiency in the elderly. Among very old and sick elderly people the prevalence of low values increases significantly. Further evidence is required to justify additional thiamine requirements among older people (Iber, Blass and Brin, 1982). Thiamine-responsive megaloblastic anaemia syndrome is a rare autosomal recessive disorder, defined by the occurrence of megaloblastic anaemia, diabetes mellitus, and neurosensorial deafness, all of which respond in varying degrees to thiamine treatment. The study suggests that thiamine plays a crucial role for many cells and tissues, particularly in respiratory chain activity (Tinsa, BenAmor, Kaabachi, Ben Lasouad, Boussetta and Bousnina, 2009).

i) Zinc

In a study conducted amongst elderly persons (Charlton, 2005), very low zinc status at both dietary and serum levels were detected. The enrichment of maize meal with zinc as one of the micronutrients that will benefit the community at large was legislated in South Africa in April, 2003. The amounts used were 1.89 to 2.66mg per 100g raw maize meal, depending on the degree of requirement (DOH, 2003). A study was conducted to determine whether the provision of zinc, in combination with amino acid supplements, would further improve levels of biochemical markers of bone health in frail elderly people. The research showed that restoring zinc levels through oral zinc supplementation could positively improve older peoples' immune responses. Also healthy ageing becomes achievable when zinc status is balanced. This review summarises current literature looking at zinc supplementation in the elderly, thereby defining the rationale for the immunological part of the ZINCAGE project (Haase, Mocchegiani and Rink, 2006).

According to Rodondi, Ammann, Ghilardi-Beuret and Rizolli (2009), zinc supplementation in conjunction with protein, further improved daily living scores in individuals with low baseline levels.

Iron is required by the human body for essential functions, including the production of haemoglobin for red blood cells, which transfer oxygen from the lungs to tissues, and electron and enzyme transport in all cells, especially muscle cells (Gibson, 2005). Iron rich foods include liver, spinach, red meat, eggs and others. Iron deficiency then leads to anaemia. The most common cause of anaemia in older persons is the type associated with chronic disease. In a study of older African- South Africans, normocytic anaemia was present in over 50%, while only 17% of subjects with anaemia had haemopoietic nutrient-related deficiencies (Charlton, Wolmarans, Marias, and Lombard, 1997; Charlton, 2005).

j) Riboflavin

The functioning of many metabolic pathways is essential and riboflavin is required to facilitate this. It is deficient when dairy product intake and meat intake are low. It may impair erythropoiesis and contribute to anaemia. Milk and milk products, which are the most important source of riboflavin, are consumed less frequently by the elderly. Since no definitive evidence for an age-related alteration of riboflavin metabolism exists, it can be concluded that the riboflavin is not affected by ageing (Zimmermann, 2007).

k) Biotin

As with other B vitamins, biotin is widely distributed in foods. The biotin intake shows a wide variation. Biotin from intestinal bacterial synthesis seems to be available. Biotin deficiency is rare in men (Heseker and Kubler, 1992).

Biotin has a unique role in cell signalling and chromatin structure. Evidence is emerging that biotin participates in processes other than classical carboxylation reactions (Zempleni, 2005). Biotin deficiency is a rare nutritional disorder caused by a deficiency of the water-soluble B vitamin termed biotin. However, biotin deficiency is rare and seldomly occurs in healthy individuals who consume a regular diet, unless they are being treated either with certain anticonvulsants or with broad-spectrum antibiotics. Biotin related-deficiency is probably the result of a combination of factors. The essentially protein bound biotin which is present in

food must be converted to free biotin in the intestine before it can be absorbed (American Heart Association, 2007).

l) Pantothenic acid (PaA)

No specific pantothenic acid deficiency symptoms have been reliably described up to now. Pantothenic acid is widely distributed among foods. There is no agreement on the age-dependency of pantothenic acid concentrations in plasma (Heseker and Kubler, 1992). The releasable pantothenic acid that is common in food is often adequate, which makes dietary deficiency very unlikely. The presence of any deficiency is often related to other nutrient deficits. Some cases of pantothenate deficiency have been observed in patients with acne and other dermatological conditions (McCormick, 1988).

m) Niacin

An assessment of niacin supply is extraordinary difficult, since a reliable calculation of ingested niacin on the basis of the incomplete data that exists at present is impossible. For the assessment of niacin status, only the urinary excretion of niacin metabolites is available. A more reliable index is still to be found. Sources of niacin are tuna, pork, beef, potato, egg and milk (Husker and Kubler, 1992). According to Sorrentino, Besler, Bahlmann, Meyer, Mueller, Horváth, Heinemann, Flemmer, Bahr, Haller, Drexler and Landmesser, (2007), extended-release niacin (ERN) improves endothelium-dependent vasodilatation; restores re-endothelialisation capacity of endothelial progenitor cells (EPCs), and most importantly, improves vasoprotective functions of HDL in patients with metabolic syndrome. This data suggests that extended-release niacin therapy has a beneficial effect on HDL vasoprotective qualities.

n) Magnesium

Relationship of magnesium intake to chronic disease:

- In the case of cardiovascular disease, indicators of magnesium deficiency rather than magnesium deficiency itself, result in the manifestation of the disease.
- Hypertension has been associated with positives if there is evidence of long-term dietary intake of magnesium per se. However, the prevalence of hypertension has not been established because of the possible contribution of other nutrients, particularly that of potassium.

- Skeletal growth and osteoporosis have shown that some link between dietary magnesium and osteoporosis exists. However, further research is required to assess the role of magnesium in determining bone health.

The relationship between diabetes mellitus as a functional indicator of adequacy for magnesium has no significance until magnesium depletion studies further investigate the relationship between normal individuals and specific dietary intake levels with abnormal glucose tolerance testing (NICUS, 2003).

o) Calcium

Calcium is a major component of bones and teeth, and is also required for muscle, nerve activity and blood clotting. The consequences of deficiency include poorly mineralised and weak bones, osteomalacia (rickets in adults), convulsions and muscle spasms (Wellman and Kamp, 2008). In South Africa calcium could not be included as part of the micronutrient multimix prescribed for fortification of bread, bread flour and maize meal because of the interactions between iron and calcium. Promotion of consumption of calcium-rich foods such as dairy products and canned pilchards remains as an important health consideration (NICUS, 2003).

There have been very limited studies highlighting the role of specific vitamin and mineral requirements for the elderly. Since this study looked at elderly people, looking at literature sources that reported on role of micronutrients in elderly was scarce and certain nutrients were strongly reported than others for an example calcium in relation to osteoporosis, vitamin C and dementia. Therefore more research should analyse the role of micronutrients in the elderly.

2.10 FLUID CONSUMPTION

The importance of body water and exchangeable electrolyte volume and distribution are essential when learning and practicing nutritional science. Water and electrolyte disturbances are often seen in malnourished patients and may also appear in patients undergoing refeeding. Clinical assessment and therapeutic protocols that reverse water derangements must be taken into account. Sodium metabolism is also an important nutritional goal. A relatively high carbohydrate intake and specific infections are well-known anti-diuretic and anti-natriuretic

factors, provoking the appearance of dependent oedema, a physical sign associated with absolute or distributional hypoalbuminemia (Sitges-Serra, 2003).

Fluid and electrolyte balance is often poorly understood when health workers prescribe it to patients. A lack of attention to detail can lead to increased post-operative morbidity and mortality. The aim of fluid therapy is to prevent an increase in body weight, which is usually a result of accumulation of extra-cellular water. Fluid balance can easily be monitored by daily weighing, the use of fluid charts, and serum urinary biochemistry which must be interpreted in the light of a clear understanding of intercompartmental shifts and path-physiological changes. The management of fluid and electrolyte balance is a vital part of metabolic care for surgical and critically ill patients, with important consequences for gastro-intestinal function. However, it is also an important component in artificial nutritional prescriptions (Lobo, 2003).

Deep ocean water contains rich ionic minerals and trace elements at similar ratios to human body fluid, which are good for body absorption and utilisation. Research has shown that drinking deep ocean water improves human body fluid at the level of 50% when compared to drinking normal water. At the same time, patients who drank deep water had a lower level of aluminium, mercury, lead in their body fluid (Acta Medica, 2002). Drinking hardness 1000 deep ocean water at 1000ml daily for 5 months consecutively, can reduce both LDL cholesterol and total cholesterol by up to 15% (Japan Society of Ningen, 2005).

The body does not have an ability to produce this essential nutrient although it is required by the body. Although perspiration occurs, the body continues to require a daily turnover of water at approximately 4% of total body weight in adults. A typical 70kg adult requires 2500-3000ml/day which is equivalent to the 4% mentioned above. Water loss from the lungs and skin are responsible for half of the total turnover. A daily intake of up to 2l/day of safe clean water is desirable for optimal hydration. Water consumption can vary from tap water, beverages such as tea and coffee, and other tap water based drinks (Bourne and Seager, 2001).

According to Kikafunda and Lukwago (2005): “in Uganda dehydration was present in a third of the elderly population; the prevalence was 41% in rural areas compared to in urban areas (27%), while results show that women (37%) were more dehydrated than men (29%).”

2.11 MEAL PATTERNS AND FOOD CHOICES OF ELDERLY PEOPLE

According to Locher, Ritchie, Roth, Sen, Vickers and Vailas (2009), the interaction between the social and environmental context of individuals, and food choice is complex. Possible interventions to change eating behaviours, especially community-based ones, involving self-management approaches, must carefully take into account individuals' self-perceived motivations as well as barriers to food selection. Successful interventions that involve caregivers incorporating food that is tasty, easy to prepare and inexpensive is critical.



Figure: 2.4: Cooked meals sold on pension day- 2008.

Seventy six Swedish older persons (75 years and over) living in a community reported consuming three meals per day, 41% consumed one snack and 32% consumed 2-3 snacks (National Board of Health and Welfare, 2000).

Longevity in Thai elderly people in relation to food consumption behaviours was due to:

- simple home-made meals with an emphasis on food safety and use of local resources
- three balanced meals provided per day with balanced nutrition as an important key to their health benefit and
- dining mostly with family members on a daily basis (Anuntatanachai, 2009).

Food-based interventions are essential when addressing dietary behaviour in older people. These include assistance: during feeding time, in creating ambience in dining areas,

reworking menus, providing acceptable portion sizes, plating, providing texture (important for those who have chewing difficulties), and in adding home delivery services which are essential. Others include formulations which will manipulate the energy or nutrient density of recipes, the provision of frequent snacks and beverages between meals, interventions using multivitamins/multimineral, or oral liquid nutrition supplements in addition to meals, as well as providing nutrition education and counselling (Silver, 2009).

a) Cooking methods adopted

In South Africa boiling and stewing is very common in the black culture. Practices such as cooking meat together with vegetables are common in most families. According to Desai, Winter, Young and Greenwood (2007), there are various methods that can improve the dietary intakes of residents in long-term-care-facilities (LTCF). The institutional environment must have a more homely touch. Results showed that where cafeteria style meals over the course of three weeks were provided in a LTCF in Ontario, results showed significantly higher energy intakes as compared to traditional meal delivery service on trays ($P<0.001$).

b) Problems related to cooking

Cooking is troublesome: sometimes there are no shops nearby, and acquiring the desired items is hard. Sometimes there is limited access to food, even if there is the desire to consume it. A lack of teeth to chew certain foods also results in avoidance of food items. For the free-living elderly, cooking and food purchasing is a problem, particularly if living alone. However, living with extended family promotes regular eating. Children and grandchildren are valuable human resource in food preparation. Living in isolation means that usually large amounts of food are prepared and eaten repeatedly. In a study of elderly men conducted in the UK, 27% of men reported that standing for long periods as well as disability affected their ability to shop for food. Men who had better developed cooking skills had increased nutrient intakes of energy, protein, folate, potassium and magnesium, copper and zinc and vitamin B12 (Holmes, Roberts and Nelson, 2008).

c) Role of indigenous and traditional food



Figure 2.5: Traditional food sold on pension day.

During pension day most elderly people purchase various food items sold on the market, which makes them susceptible to food poisoning. Figure 2.5 shows traditional meat offals, which is the most commonly sold meat on the day.

The use of cultural foods has several sociocultural, economic and nutritional benefits. In a study conducted in Ghana where fresh fruit and vegetables were sold at the market, fruits had a high microbial contamination and therefore a need to educate vendors was expressed (Budu, 2009).

2.12 AGE ASSOCIATED CHANGES IN TASTE, ODOUR SENSATION, AND PERCEPTION

When an elderly person observes that food simply doesn't taste the way it used to, he or she is referring to food flavour. The chemical senses (taste, smell, and tri-germinal sensitivity) all contribute to the perception of food flavour. The sense of taste provides the individual with information about sweet, sour, bitter, and salty stimuli. The sense of smell is extremely important for perception of food flavour, since the olfactory system carries information about the many volatile substances in the food that add the nuances that transform, for example, a bittersweet substance into a truffle, and a sweet and sour substance into a tangerine. The trigeminal system provides the sensations of warmth, coolness and pungency important to the perception of, for example, food flavoured with chilli peppers or mint. Thus considering the effects of ageing on taste or flavour and of ageing on olfaction, trigeminal sense, both for their own effects on appetite and dietary selection and for their contribution to the overall constellation of food flavour are essential to consider (Murphy and Withee, 1989). A lack of

food enjoyment due to loss of food palatability as well as sensitivity to taste and smell of foods is associated with ageing. Older adults may have an impaired ability to appreciate the palatability of food (Roberts, 2000).

a) Taste

In a recent study conducted on older Europeans results showed that stress is associated with sensitivity to the taste of salt. This could suggest that a preference for and consumption of salty foods is a consequence of reduced physiological well-being in older people (Stewart-Knox, 2009).

b) Olfaction

Research has shown significant evidence of a strong link between age-related olfactory losses. The areas surrounding the receptor cell which are sometimes related to structural anatomic changes essential in facilitating olfaction are affected by ageing. Specific receptor of proteins, ion channels or signalling molecules are essential elements for olfactory pathways, this allows for signalling and processing odorant information. These specific receptors are altered or disturbed with the presence of age-related diseases and the use of certain medications. Various studies also suggest that chronic diseases, medications and dental and sinus problems are the primary culprits in causing olfactory impairment. The ageing process is a secondary factor leading to this condition (Rawson, 2006).

c) Flavour preference

Changes in flavour preference are connected to changes in smell and taste function in the elderly. Several studies have addressed this issue. Research also shows that younger persons preferred greater sweetness and saltiness than adults; they found no differences among adults up to 64 years old. In a randomised trial in which the flavour of protein-rich food items was enhanced with beef, chicken, turkey, or lemon butter flavour, and kilojoule intake was increased, in long-term-care- facilities (LTCF) residents gained 1.1kg (Mathey, Siebelink, de Graaf and Van Staveren, 2001).

d) Relation between sensory perception and nutritional status

Snacking on items such as yoghurts, drinking shakes, snack bars etc. can easily be incorporated within meals. This helps increase nutrient density in a diet. The reason why this incorporation is an advisable strategy is because elderly people generally consume smaller

meals as age increases (Turic, Gordon, Graig, Ataya and Voss, 1998). A study that further explored this strategy showed that in-between meals contributed to increased total energy intakes of 30% in LTCF (de Jong, Chin, Paw, de Groot, de Graaf, Kok and van Staveren, 1999).

Undesirable weight loss can be reduced through oral liquid nutrition supplementation; this strategy was used in a study of LTCF residents. However, careful considerations must be made to meet taste preferences and receive adequate assistance to promote consumption, this increases the rate of consumption (Young, Greenwood, van Reekum and Bins, 2004).

The evidence reviewed suggests that food-based interventions increase energy and nutrient intakes, and improve nutritional status, as well as clinical and functional outcomes. Very well designed LTCF is essential in evaluating healthcare outcomes and the cost-effectiveness of food-based interventions (Silver, 2009).

2.13 STRATEGIES TO ADDRESS MALNUTRITION

According to World Bank (2009), “malnutrition is one of the most important constraints to achieving the MDGs. Improving nutrition is essential to reduce extreme poverty. Recognition of this requirement is evident in the definition of the first MDG, which aims to eradicate extreme poverty and hunger. The two targets are to be halved between 1990 and 2015:

- The proportion of people whose income is less than \$1 a day.
- The proportion of people who suffer from hunger (as measured by the percentage of children under age five) are underweight”.

The South African Department of Agriculture in 2002, in announcing the Integrated Food Security Strategy as part of the Integrated Food Security and Nutrition Programme (IFSNDP), pointed to food security being part of Section 27 of the Constitutional Bill of Rights in South Africa. This states that “every citizen has the right to have access to sufficient food and water, and that the state must by legislation and other measures, within its available resources, avail to progressive realisation of the right to sufficient food. Eradication of hunger, malnutrition and food insecurity beyond 2015 are fundamental goals that need to be addressed”. The strategic objectives for rolling out these goals encompass: the focus on food production and training, creating employment opportunities and well-generated income, addressing food safety and nutrition, building properly functional systems that facilitate food distribution,

more job creation, creating effective communication systems with relevant stakeholders who will assist in community building and seeking effective management and improvement of resources (Moeng and de Hoop, 2008).

According to a World Bank Report (2009), nutrition should be on the forefront of most countries' development agenda. There is a need to convene around a common strategic agenda in nutrition, focusing on scaled-up and more effective action for under-nutrition and the provision of micronutrients in priority countries. A focus on action research or learning-by-doing for overweight people, low birth weight babies, those suffering from HIV/AIDS is also necessary. This repositioning must involve reviewing and revising current inadequate levels of funding for nutrition (World Bank, 2007).

The initiative that commenced nine years ago where world leaders sought to create a better world for all by setting far-sighted goals to alleviate poverty, hunger and disease was reviewed in 2009. Although progress has been made the global economic crisis has had strong repercussions. According to the UN Millennium Development Report (2009), the number of people living in extreme poverty during 2009 worldwide was expected to be around 55 million to 90 million, which was actually higher than anticipated before the global economic crisis. The crisis worldwide had varied impacts in some countries. Results show that developing countries suffered with a fall associated with poverty rates. In sub-Saharan Africa, both the number of people who are poor and the poverty rate are expected to increase further in some of the more vulnerable and low growth economies. Achieving the MDG's will require that the development agenda be fully integrated into efforts to jumpstart growth and rebuild the global economy. This will also require targeting areas and population groups that have clearly been left behind i.e. rural communities, poor households and ethnic minorities, all of whom will have a hand in shaping our common future. This is further illustrated in the Table 2.6.

Table 2.6: Critical nutritional investment relates to achieving the MDG's (UN, 2009)

GOAL	NUTRITION EFFECT
<p>Goal 1: Eradicate extreme malnutrition</p> <p>Which erodes human capital through poverty and hunger.</p>	<p>Malnutrition erodes human capital through poverty and hunger irreversible and intergenerational effects on cognitive and physical development.</p>
<p>Goal 2: Achieve universal primary education.</p>	<p>Malnutrition affects the chances that a child will go to school, stay in school, and perform well,</p>
<p>Goal 3: Promote gender equality and empower women.</p>	<p>Antifemale biases in access to food, health, and care resources may result in malnutrition, possibly reducing women's access to assets. Addressing malnutrition empowers women more than men.</p>
<p>Goal 4: Reduce child mortality.</p>	<p>Malnutrition is directly or indirectly associated with most child deaths, and it is the main contributor to the burden of disease in the developing world.</p>
<p>Goal 5: Improve maternal health.</p>	<p>Maternal health is compromised by malnutrition, which is associated with most major risk factors for maternal mortality. Maternal stunting and iron and iodine deficiencies particularly pose serious problems.</p>
<p>Goal 6: Combat HIV/AIDS, of HIV malaria, and other diseases.</p>	<p>Malnutrition may increase risk of HIV transmission, compromise antiretroviral therapy, and hasten the onset of full-blown AIDS and premature death. It increases the chances of tuberculosis infection, resulting in disease, and it also reduces malarial survival rates.</p>

a) Dietary supplements and functional foods

Dietary supplements refer to any combination of macronutrients, vitamins, minerals, herbs and phytochemicals available in different forms: pills, capsules, tablets powders, liquids that are used to supplement what is consumed in diet in the form of food and drinks. South Africans may well adopt the American Heart Association's recommendation that all adults should consider the daily use of a multivitamin supplement for chronic dieters, and that all adults should consider the daily use of a multivitamin for chronic disease prevention. The South African DOH has also recommended the routine daily use of multivitamin/mineral supplement supplying approximately at one time the RDA or AI of the micronutrients for people living with HIV/AIDS. Such dietary supplements should never take place of a healthy diet (Steele and Senekal, 2005; Academy of Science of South Africa (ASSAF), 2007).

b) Protein oral supplementation and benefits

The Sarcopenia condition can be rehabilitated by an additional protein source through nutritional supplementation, which improves the nutritional status of older persons. Supplementation offers some significant benefits, which include improved ulcer healing, but it has to be in conjunction with high-intensity resistance exercise. This allows for effective means of counteracting muscle weakness or physical fragility. Different protein forms can be used which have different preferences. These include liquid or powdered commercial protein supplements, with the most common being based on milk or soy protein. Whey protein is an excellent source of amino acids, particularly for older people. Whey proteins have been commonly linked with cheese-making. The nutritional benefits associated with whey protein are closer to that of human milk. Whey protein is more easily digestible than caseinates or soy-based protein. In elderly people, the key factors responsible for positive protein metabolism. The ingestion of an equivalent amount of isolated essential amino acids has a certain duration which affects the magnitude of elevated plasma amino acids. The higher the concentration of whey content utilised by older people, the better the essential amino acid yield (Dawson, 2008). To prevent or remedy under-nutrition in older adult patients there are certain limitations that healthcare professionals and other decision makers need to overcome. Limited human resources, both professionally and non-professionally have an effect, as well as clinical nutrition interventions research, and comprehensive nutrition interventions (Silver, 2009).

c) Food fortification

Food fortification aims at improving the quality of diet by adding nutrients at levels higher than those found in the original food. In developing countries food fortification is a sustainable and cost-effective medium to long-term strategy which can improve the micronutrient status of at-risk populations. The wheat flour and maize meal fortification project in South Africa has been a success, reaching nearly 6 million women of reproductive age (15-49 years) and more than 2.3 million children under the age of six who are consuming fortified bread (Kruger, Hendricks and Puone, 2008). In a food fortification project initiated by the government, results showed that findings from several surveys have demonstrated a strong consumer response and widespread public support for the fortification project. These results create strong political alliances that the National Fortification Alliance (NFA) is able to leverage for the benefit of the Food Fortification Programme (DOH and UNICEF South Africa, 2008).

d) Community-based nutrition programmes

These programmes not only focus on improving access to health services or providing resources to improve nutritional status, but further address underlying factors that are related for example to poor caring practices, as well as initiatives that support behaviour modification. In South Africa, the majority of community health and nutrition programmes (CHNPs) have focused on communicable diseases and the alleviation of poverty, which is the main determinant of nutrition. Due to the rising epidemic of diet-related chronic diseases and obesity, particularly amongst the poor, there is a need for health promotion activities to encourage a healthy lifestyle, as well as to increase the consumption of healthy foods. Improving nutrition, specifically in poor communities, requires a combination of facility-based activities (Puoane, Sanders and Mason, 2008; Steyn, Bradshaw, Norman, Jourbert, Schneider, Steyn, 2006c).

Nutrition services in institutions are also essential when developing guidelines and policy initiatives in addressing malnutrition. This applies mainly to elderly people who are hospitalised, some who are in long-term care facilities as well as those in communities. This initiative was developed in the UK and has been successful, however, in South Africa there has been no implementation so far (National Institute of Clinical Excellence, 2006).

According to Follentine (2006) and Makiwane, Scheider and Gopane (2004), it is vital to provide a comprehensive service in elderly centres, which may include health, spiritual, counselling, training and development services to the elderly, besides meals. Research has shown that lunches and morning tea have a positive effect on the elderly residing in those communities; this strategy was adopted in South Africa.

Non-governmental nutrition services can also benefit the community at large. These are normally facilitated by NGO's and other community based organisations. These include soup kitchens and luncheon clubs who provide this service to the elderly, and grandchildren, peers and other relatives who during meal times can assist the elderly (Stevens-O'Connor, 2006).

2.14 METHODS FOR COLLECTING DATA

2.14.1 Socio-demographic survey

This is a method used to collect data pertaining to the social status of a respondent or group of people. It is essential in measuring the social well-being of the subject. In measuring poverty in a community, various demographical factors such as age, gender, occupation, level of education and level of income must be obtained in order to measure the impact of these variables. A validated socio-demographic questionnaire is used as an assessment tool (Napier, 2006).

2.14.2 Dietary assessment methods

Different types of questionnaires can be used for the collection of dietary intake data. Some questionnaires are open-ended, e.g. like a 24 hour dietary recall data sheet or for a dietary intake record. In the open-ended questionnaire no directive is given about the type of food or portion sizes of the specific food consumed. Food frequency questionnaires are structured questionnaires designed to collect information on the type of food consumed and the frequency of consumption. Quantified food frequency questionnaires can also be compiled in such a way they collect information on the quantities of foods consumed. This type of food frequency is referred to as quantified food frequency questionnaire. The use of a valid instrument is important when dietary intake data are collected (Cameron and Van Staveren, 1988; Gibson, 2005).

In South Africa validated quantified food frequency questionnaires have been developed for the collection of dietary intake data from different age and ethnic groups (Steyn 1988; Charlton et al., 1997; MacIntyre, 2001a,b,c; Lombard and Burger, 2007). Charlton et al. (2008) also developed a short questionnaire to determine sodium intake.

a) Assessment of dietary intake in the elderly

Two of the major studies have been carried out to assess the internal and external validity of dietary intakes in the elderly (Oldewage-Theron et al., 2005b; Charlton, 2001a). There is insufficient scientific data to conclude that well functioning elderly are faced with specific problems compared to the younger age group with respect to dietary intake assessment. Energy requirements for elderly have not been accurately recorded for being utilised in dietary assessment methods.

b) Uses and limitations of dietary intake methodologies

Various methods can be used to assess dietary intake. All these methods have various advantages and disadvantages as can be seen in Table 2.7.

Table 2.7: A combination of dietary assessment methods (Adapted by Wolmarans and Wentzel- Viljoen, 2008)

Method	Advantages	Disadvantages
Food records	<ul style="list-style-type: none"> Describes usual dietary intake Classifies the individuals information high or low consumers, or those meeting/ not meeting reference values Correlates dietary intake with other markers e.g. biochemical, anthropometric Often used as a standard when other dietary intake methodologies are validated 	<ul style="list-style-type: none"> Questionnaires validated for different gender, age and cultural groups not generally available Extensive training required for interviewers Literate respondents required Respondents may change their diet due to heavy respondent burden Time consuming With estimated records the conversion of food intake reported in household or other

		measures to gram of food is time consuming.
Method	Advantage	Disadvantages
Diet histories	<ul style="list-style-type: none"> Collects information on a total food intake Determines usual meal pattern and food combinations eaten by the individual over specified period of time Uses a detailed list of foods as a checklist to verify dietary intakes Classifies the individuals into high or low consumers, or those meeting/ not meeting reference values Correlates dietary intake with other markers e.g. biochemical, anthropometric 	<ul style="list-style-type: none"> An interview of one of two hours by a highly trained interviewer is necessary Difficult to standardise between interviewers Nutrient intake tends to be overestimated A co-operative respondent with the ability to recall the usual diet is required
One 24 hr- recall	<ul style="list-style-type: none"> Used for collection and describing intake of a group of individuals To report on mean intakes of a group, 24 hour recalls from many subjects should be collected. The exact number of subjects required for a study can be calculated, making use of specific formulas (Gibson, 2005) 	<ul style="list-style-type: none"> Information depends on the memory of the respondent Does not represent usual dietary intake Cannot be used to describe the dietary intake of an individual Not appropriate for the collection of dietary intake that from children less than seven years of age Should be used for the classification of dietary intake, e.g. percentage of respondents consuming more or less than reference values

		<ul style="list-style-type: none"> • Cannot be used for correlation of dietary intakes with biochemical markers • Extensive training required.
Method	Advantage	Disadvantages
Repeated 24 hour-recall	<ul style="list-style-type: none"> • Collection of quantitative dietary intake data from individuals or groups of individuals • To describe habitual dietary intake • Used for classification of individuals into high/low consumers, or those meeting/not meeting reference values 	<ul style="list-style-type: none"> • Information depends on the memory of the respondent • Not applicable for the collection of dietary intake data from children less than seven years of age. • Extensive-training required for interviewers
Quantitative food frequency questionnaire	<ul style="list-style-type: none"> • To describe usual dietary intake • Classification of individuals into high/low consumers, or those meeting/not meeting reference values • To collate dietary intake with other markers. 	<ul style="list-style-type: none"> • Information depends on the memory of the respondent • Developing the questionnaire is time consuming • Have to be developed for the study group • Do not provide information on intakes at different meal times • May not be valid for use in the elderly where memory is a factor • Not applicable for use in young children

c) Combining different types of dietary assessment methods

Combining methods can improve accuracy and facilitate interpretation of the dietary data. Methods may also be combined for practical reasons. Food records have been combined with 24 hour recalls to make the best use of resources in past surveys of the US Department for

Agriculture. An FFQ focused on selected nutrients was used in addition to the 24 hour recall in the Third National Health and Nutrition Examination Survey (NHANES 111). A 24 hour recall is frequently used to help establish the typical meal plan for conducting a diet history and a FFQ may be used as a cross-check for the other three types of methods (Lee and Nieman, 2003).

It is becoming increasingly common to use another valid method of dietary assessment on a random sub-sample of the study population. Comparison of the results from the two methods permits adjustment of mean intake values obtained from the primary method. If an FFQ is the primary method used, a more detailed method, such as multiple recalls or food records is also used in a subset of survey participants. The more detailed method along with the FFQ is expected to provide more accurate estimates of intake distributions. Results from the sub-sample are then used to adjust the mean estimates from the FFQ for the total population (Briefel, 1994).

2.14.3 Anthropometric data collection methods

a) Anthropometric evaluation of nutritional status

Anthropometry involves obtaining the physical measurements of an individual, and relating these to standards that reflect, among other factors, the health and nutritional status of the individual. In this way malnutrition (both under-nutrition and over nutrition) can be identified, growth can be monitored and the impact of intervention programmes can be determined. Measures of anthropometry, such as weight and fat percentage, can be used to predict risk of developing diseases of lifestyle such as obesity. The single most important characteristic of an anthropometric measurement is simplicity of measurement. In epidemiological studies the most commonly used measurements are height, weight, skin fold thickness and circumference measurements. All of these need to be measured using the correct techniques to ensure reliability of the results obtained (Gibson, 2005; Lee and Nieman, 2003).

b) Assessing the nutritional status of adults

In adults, body weight may be interpreted by various methods, including ideal weight-for-height and BMI. Ideal weight-for-height can be calculated from reference standards such as

the Metropolitan Life Insurance Tables, or the National Centre of Health Statistics-NCHS medians (Lee and Nieman, 2003).

In elderly people it is advisable to conduct nutritional assessment in an incorporated routine. The following table can be used a tool of assessment.

Table 2.8: Assessment of weight loss in older persons over time (Charlton et al. 2008a)

Time	Significant weight loss %	Severe weight loss %
One week	1-2	>2
One month	5	>5
3 months	7.5	>7.5
6 months or more	10-20	>20

c) Body composition

Body composition is defined as the ratio of fat mass to fat-free or lean body mass (mostly muscle and bone). These two body compartments can be indirectly assessed by anthropometry techniques, and variations in their amount and proportion can be used as indices of nutritional status (Gibson, 2005). Body composition can be determined by a number of techniques that are mostly not practicable in epidemiological studies as well as by skin fold thickness and bioelectrical impedance. Using skin fold callipers the thickness of a double fold of skin and compressed fat under the skin is measured in millimetres. Accuracy of skin fold measurements decreases with an increase in body fatness (Lee and Nieman, 2003). Older adults tend to have lower bone density and therefore may weigh less than younger adults of the same height. Indirect methods for measuring body composition include triceps skin-fold (TSF), mid-arm muscle circumference (MAMC) and mid-arm circumference (MAC).

Genton and Det (2001) argue that individuals who are 75 years of age no longer have increasing body fat mass, but once at this age it increases or either remains stable. Other studies correlate with these findings (there is some evidence that central accumulation of fat

increases with ageing, while appendicular fat mass decreases). As previously discussed fat distribution is associated with an increased risk of stroke, diabetes, hyperlipidaemia, heart disease and hypertension. These have far more detrimental effects on older people (Kuczmarski, Kuczmarski and Najjar, 2000). As age decreases there is also a decrease in mostly fat-free mass which is due to reduction in skeletal, muscle, and bone mineral density in women. When weighing and measuring the elderly in this study some of these truths were observed and taken into account.

i. Height and length

Height and weight are useful in determining nutrition status in adults. Both should be measured because the tendency is to overestimate height and underestimate weight, resulting in an underestimation of the relative BMI. In addition many adults are shrinking as a result to osteoporosis, joint deterioration, and poor posture. Height measurement is valuable when used in conjunction with other anthropometric and clinical assessment measurements. Various methods may be used to measure length and height. Measurements of height can be obtained using a direct height or indirect approach. The direct method involves a measuring rod, or stadiometer, and the person must be able to stand or recline flat. Indirect methods including arm span, recumbent length (using a tape measure), and knee height measurements, may be options for those who cannot stand or stand straight such as individuals with scoliosis, hypnosis (curvature of the spine), cerebral palsy, muscular dystrophy of contractures. The armspan value which reflects the true length of the body frame, may be used instead of height (Omaran and Morley, 2000).

Knee height has been shown to be a better predictor of height than armspan in older South Africans, as the latter tends to overestimate height (Marias, Marias and Labadorios, 2007).

ii. Weight

Weight is another measure that is easy to obtain but is very telling. Weight also provides a crude evaluation of overall fat and muscle stores (Hopkins, 1993). Body weight is obtained and interpreted using various methods including BMI, usual weight and actual weight. Actual body weight is the weight measurement obtained at the time of examination. This measurement may be influenced by changes in the individual's fluid status. Weight loss in kilograms can reflect dehydration but can also reflect an immediate inability to access

nutrition requirements and thus may indicate nutritional risk. The percentage of weight loss is highly indicative of the extent and severity of an individual's illness (CDC, 2002).

iii. Body mass index calculation

The Quetelet's (W/H^2 - weight over height squared), is the most widely used calculation. Weight over height is commonly referred to as the body mass index (BMI) and is a validity measurement of nutritional status. The BMI scores are calculated using both an individual's weight and height measurements. The result clearly indicates whether an individual falls into an over nutrition on an undernutrition category. The vital importance of BMI is that it accounts for differences in body composition by defining the level of adiposity and relating it to height, thus eliminating dependence on frame size index (Lee and Niemen, 2003; 2010).

BMI values are age-independent and the same for both genders. However, BMI may not correspond to the same degree of fatness in different populations due, in part, to different body proportions. The health risks associated with increasing BMI are continuous and the interpretation of BMI gradings in relation to risk may differ for different populations. BMI can be calculated using the following formulas:

Metric Formula: $BMI = \text{Weight (kg)} \div \text{Height (m}^2\text{)}$

English formula: $BMI = \text{Weight (lb)} \div (\text{Height (in)} \times \text{Height (in)}) \times 703$

E.g. $BMI = 70\text{kg} / (1.75\text{m})^2 = 70 / 3.0625 = 22.9$ (WHO, 2004).

BMI values are presented in various classification groups ranging from severe thinness to obese (Refer Table 2.9).

Table 2.9: Classification of the body mass index (Adapted from WHO, 1995, WHO, 2000 and WHO, 2004)

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 range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Classification	BMI(kg/m)	
	Principal cut-off points	Additional cut-off points
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

iv. Waist to height ratio calculation

- ❖ Waist to height ratio (WHTR) can be used as an early predictor of health risk since it is more detailed in assessing risk. Although having a moderate range of BMI one can still be at higher metabolic risk. The WHTR does indicate this element of central obesity which relates to metabolic risk (Hsieh, Yoshinaga and Muto, 2000). Research has also shown that in various populations the WHTR is a more critical assessment than simply measuring waist circumference scores. This is due to the reality that it encompasses adjustment to different statures and because of the negative correlation of height to certain metabolic risk factors (Henriksson, Lindblad, Agren, Nilsson-Ehle, and Rastam, 2001).

- ❖ WHTR has advantage of being a much cheaper and more convenient method of measurement as opposed to BMI.

Basic equipment is used which makes it easier to conduct field work. The most essential requirements to understand are height and waist. With height it is important to note that self-assessment is more stable and reliable than that of weight in the absence of standard measuring equipment. Waist circumference measurement simply requires a measuring tape which is much more convenient than applying weighing scales (Ashwell and Hsieh, 2005).

- ❖ WHTR allows the same boundary values for men and women.

Waist circumferences of men and women are not the same. This is due to the fact that men are taller, and they also have larger waist circumferences, whereas women are generally shorter in length when compared to men. This means that average WHTR values are closer for men and women than average waist circumference values because of the adjustment for height, and the same boundary value can be used for both to indicate increased risk. A proposed simple boundary value of $WHTR = 0.5$ indicates increased risk. The simple boundary value of $WHTR=0.5$ indicates increased risk for adult men and women (Hsieh, Yoshinaga and Muto, 2003).

- ❖ WHTR for different ethnic group allows the same boundary value.

There is a great global variation in average height of both men and women. For Caucasian populations (where height is not an important contributor) the WHO waist circumference values are still essential in predicting risk (WHO, 2000).

Asian populations tend to be shorter than their Caucasian counterparts. Further, the health risks for Asians begin to increase for smaller amounts of central fat and smaller waist circumferences than their Caucasian counterparts (WHO, 2002; WHO, 2004).

Division of waist circumference by height has the effect of counteracting these differences such that the same values are appropriate in both ethnic groups. A boundary value at $WHTR= 0.5$ was originally proposed by these groups to indicate where health risk started to increase. Further research to indicate that $WHTR= 0.5$ is the simplest value that corresponds to more precise cut off values in both sexes (Lin,

Lee and Chen, 2002; Sargent, Bennet and Forrester, 2002; Bertsias, Mammas, Linardakasis, 2003).

- ❖ WHTR for children and adults may allow the same boundary value.

The prediction of risk in children using WHTR cannot be advocated since there is still limiting data to encourage this (Savva, Tornaritis and Savva 2000; Hara, Saitou, Iwata, Okada and Harada 2002; Kahn, 2005).

WHR circumference ratio is used to detect possible signs of excess fat deposition (lipodystrophy) in those infected with the human immunodeficiency virus (HIV); it is used less often today, but a ratio of 0.8 or above indicates risk in a woman and 1 and above indicates risk in a man (Hammond, 2008). According to Shils, Shike, Ross, Caballero and Cousins (2006), waist circumference is a fundamental tool to be used when diagnosing criteria for metabolic syndrome. Secondary measures should include; blood pressure, plasma triglyceride, high density lipoprotein cholesterol, insulin resistance, microalbuminuria, and fasting plasma glucose.

2.14.4 Circumference measurements

These include additional skin-fold and circumference measurements. Depending on the setting of patient care, some measurements may be more appropriate than others. For an example, in the acute-care setting where the patient has more acute pathological- physiologic changes going on such as daily fluid shifts, measurements are not usually performed. But in the long-term setting or home setting, these measurements can be tracked over time and provide valuable information on long-term nutrition status (Hammond, 2008).

There are various important pointers to note when conducting measurements for elderly people. Firstly most of the normative reference values are not available (particularly those who are 75 and older), due to them being affected by an ageing process. Some of the limitations when conducting circumference measurements include lack of accuracy in skinfold measurements due to fluid losses, increased compressibility of fat and reduced elasticity of triceps skin fold thickness (SFT) and mid-upper arm muscle circumference (MUAC) in older people. Arm and skinfold measurements are also affected by the redistribution of adipose tissue from the extremities to the abdominal region. Elderly people who are frail as well as those who bedridden are also difficult to measure (Mahan and Escott-Stump, 2008).

a) Subcutaneous fat (skin fold thickness)

Triceps skin fold thickness (SFT) provides a measure of subcutaneous fat. Triceps SFT is measured using a calibrated callipers on the posterior surface of the arm, midway between the acromion process and the elbow (i.e. mid-upper arm) with the arm hanging loosely by the side, while the subject is in a standing position. A value of <4mm (men) or <9mm (women) indicates under nutrition (Woodward, 2002).

b) Waist circumference

A non-stretchable tape measure is often used to measure the distance around the smallest area below the rib cage and above the umbilicus where the waist circumference is situated. Waist circumference measurements assess abdominal fat content. A measurement greater than 40 inches (102cm) for men and greater than 35 inches (88cm) for women is an independent risk factor for diseases (CDC, 2002). These measurements may not be as useful for those greater than 60 inches tall or with BMI of 35 or above (CDC, 2002).

c) Calf circumference

According to Eveleth, Andres, Chumlea, Eiben, Ge, Harris, Heymsfield, Launer, Rosenberg, Solomons, Svanborg, van Staveren and Vellas (1998), in their report to WHO's Nutrition Unit, the Expert Subcommittee on the use and interpretation of anthropometry in the elderly did not recommend universal reference data at the time but rather the development of local standards.

d) Mid-arm circumference (MUAC)

MUAC is derived from measurements of both the MUAC and triceps SFT and can be used to assess protein-energy malnutrition, as the size of the muscle mass is an index of protein reserves. MUAC measurement is most suitable for individuals who cannot be weighed and for older persons with severe oedema in whom BMI or percentage weight loss may be misleadingly normal (Kuczmarski et al. 2000; Mahan and Escott-Stump, 2008).

2.14.5 Health assessment methods

This method involves assessing both nutritional assessment methods and health related questions, disabilities, physical activities, tobacco and alcohol use and medications consumed. The disease profile is essential in community studies. Similar studies for the

elderly in South African have used this method to collect this data and validated this questionnaire (Oldewage-Theron, Salami, Zotor, and Venter, 2008a). The importance of reading and recording accurate blood pressure measurements is further highlighted in various stages (Refer Table 2.10).

a) Clinical blood pressure measurement

A general definition of hypertension is persistently high arterial blood pressure, the force exerted per unit area on the walls of arteries. To be defined as hypertension, the systolic blood pressure (SBP), that is the blood pressure during the contraction phase of the cardiac cycle, has to be 140 mm Hg or higher; or the diastolic blood pressure (DBP), the pressure during the relaxation phase of the cardiac cycle has to be 90mm Hg or higher, and they are reported as 140/ 90mm Hg. The normotensive individual has a blood pressure of less than 120mm Hg and a diastolic blood pressure of less than 80mm Hg; read as a blood pressure of 120/80 (Hypertension, 2003).

b) Self measurement

Self-monitoring of BP at home and work is a practical approach to assess differences between office-BP prior to consideration of ambulatory monitoring. For those who are out-of-the office BP's are consistently < 130/80 mmHg despite an elevated office BP and who lack evidence of target organ disease, 24 hour monitoring or drug therapy can be avoided. Smokers can well monitor their BP levels through self measurement since it a much more feasible method. It is important to note though that smoking does raise BP acutely although the level returns to baseline in about 15 minutes after stopping (Hypertension, 2003). Table 2.10 further illustrates the classification stages of blood pressure in both diastolic and systolic values.

Table 2.10: Classification and management of blood pressure for adults aged 18 years or older (Hypertension, 2003)

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

a) Biochemical indices

Biochemical indices are more sensitive than anthropometric and clinical measurements, and they reflect changes in nutritional status earlier than these measures. Indicators of visceral protein status and immune function are useful in assessing compromised nutritional status. Measures of levels of circulating proteins can be markers of protein deficiency (Charlton, Ferreira and du Plessis, 2008a).

2.15 CONCLUSION

The literature reviewed in this chapter focused at looking at various aspects of both health, nutritional and general wellbeing of the elderly. It is clear that ageing is associated with various changes in body composition, socio-economically, nutritionally and health wise. Therefore all these aspects play a major role in the overall well being of the elderly. Although complications may occur in later life, maximising optimal health is essential. Literature on micronutrient requirements and physiological changes in elderly needs to be further investigated.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

The purpose of this chapter is to explain how data was collected in order to obtain the socio economic, nutritional and health status of elderly in the community of Umlazi in KwaZulu-Natal using reliable instruments. Proper planning, research design, and measuring instruments were critical components in gathering good quality data. Community studies are essential for empowering those communities involved. When selecting the research methods the following factors were taken into account in order to meet the research objectives:

- The need for group versus individual data
- The need for absolute intake versus relative estimates
- Population characteristics (age, sex, motivation, education/ literacy, cultural diversity)
- The time frame of interest
- Available resources including food models, food composition data if nutrients are to be calculated.

According to May (2002), South Africa has the most rapidly ageing population in Africa and therefore this study of elderly people was essential in determining the socioeconomic, health and nutritional status of older persons in KwaZulu-Natal. To achieve this, it was essential that the correct sampling, data collection methods and instruments were used.

3.2 ETHICAL CONSIDERATIONS

The ethics committee at Durban University of Technology approved the study. The protocol was submitted in accordance with the Medical Research Council guidelines for medical research. Permission was granted by the eThekweni municipality to conduct interviews in municipal halls which are used as pension sites (Annexure A). All voluntary participants were requested to sign a consent form which was part of the health questionnaire. Prior to the study, numbers were allocated to each participant in order to ensure confidentiality and anonymity.

3.3 EMPIRICAL STUDY DESIGN

- Stage 1: Literature review
Stage 2: Planning the study design
Stage 3: Stakeholder consultation and plan implementation
Stage 4: Rolling out of the study
Stage 5: Reporting on the results

3.3.1 Developmental stages of the study

Stage 1: Literature review

This stage involved an analysis of scientific literature relevant to study.



Stage 2: Planning the study design



The planning procedure consisted of the following steps:

- Writing a research proposal
- Setting up appointments with relevant stakeholders
- Running a site visit to the largest ward to view procedures followed during pension day



Stage 3: Stakeholder consultation and plan implementation



- Holding meetings with the City Manager of the eThekweni Municipality
- Holding meetings with ward councillors
- Holding meetings with the Department of Social Welfare

Initially the researcher wanted to focus the study on a specific ward of Umlazi which has a large population but during the presentation at the councillors meeting, the councillors representing different wards wanted their wards to participate because choosing specific wards meant favouritism and this had political implications. Umlazi has 13 wards and ward 13 was excluded in this study because it covers hostel dwellers which are not representative of sample required for this study. It was decided that all wards (12) would participate and

each ward has various sections falling under it. Some sections overlap to other wards. All wards are administered by eThekweni (Durban) Municipality.

A three month timetable of the wards and dates of pension payments were obtained from South African Social Security Agency -SASSA and this was used to plan the dates for fieldwork.

Umlazi is situated in south of Durban with various municipals wards. Figure 3.1 illustrates the various wards situated in Umlazi.



Figure 3.1: Umlazi map with all the wards (Ethekewini Municipality, 2008).



Stage 4: Rolling out of study

The rolling out of study was done over a period of three months in 2008 on specific pension payment dates for specific wards according to the timetable mentioned above.



Stage 5: Reporting on results

The results will be discussed in detail in Chapter 4.

3.4 STUDY TYPE

The study was of a descriptive nature with a cross-sectional design. Quantitative data were collected using questionnaires during personal interviews. Anthropometric measurements

were collected at the same time. Interviews of between 30 and 60 minutes were conducted with all the participants. Data were recorded daily.

3.5 STUDY VARIABLES

The study variables for the study are illustrated refer to Figure 3.2.

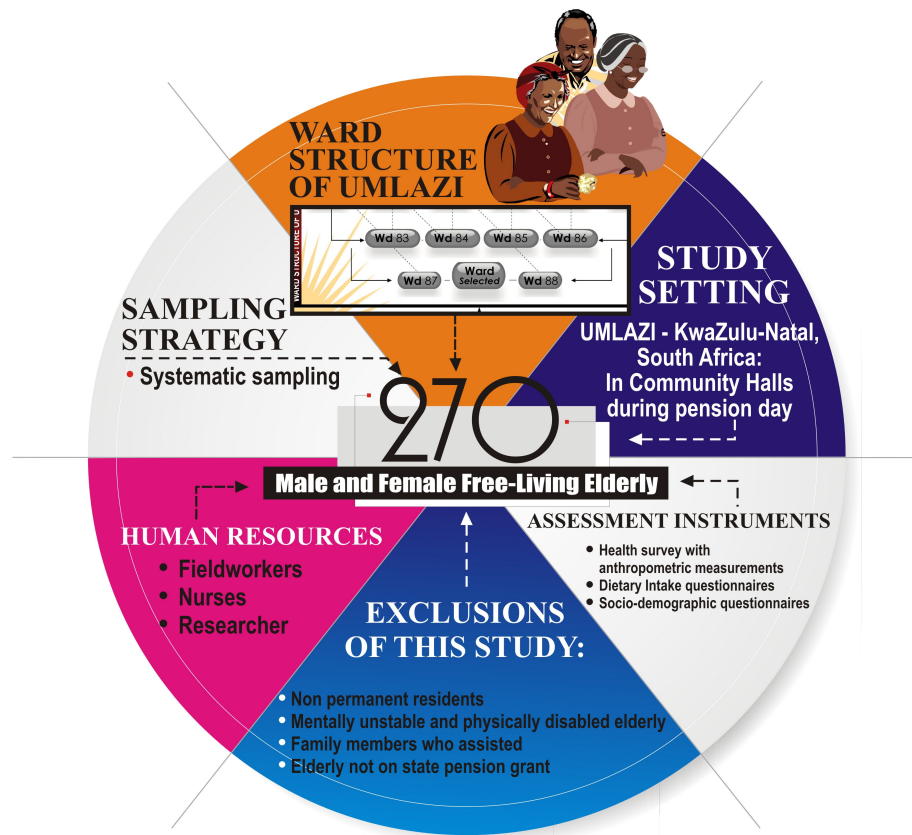


Figure 3.2: The model of the study variables

Figure 3.2 indicates the sampling strategy (systematic sampling), ward structure, study setting, sample size, assessment instruments, exclusions of the study which were critical for the correct selection and human resources needed during fieldwork.

The variables measured in the study included: gender, age, employment and health status, anthropometric measurements and dietary intake and the how often the respondent ate a meal. The elements of a given population may be described in terms of the individual attributes on a given variable. Social research often aims to describe the distribution of attributes of a

variable in a population. Variables to be collected in a study should be within the scope of the study, keeping the length of time to complete the questionnaire within reasonable limits (Katzenellenbogen and Joubert, 2008).

3.6 SAMPLING STRATEGY

The sample was calculated using a power calculation and was 263 subjects out of a population base of 17 000 elderly in Umlazi. The sample size was rounded to 270 to account for possible dropouts (Cole, 1997).

Sample Size

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

Where:

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal

(.5 used for sample size needed)

c = confidence interval, expressed as decimal = .06 (three units on both sides of the normal).

The sample was defined as elderly persons aged sixty five and older. The respondents had to be Umlazi (permanent residents) who were registered pensioners with SASSA. Each ward comprised of 22 respondents who were interviewed which made a total of 270 respondents that participated in the study.

The following were used as the exclusion criteria for the study:

- Transfer pensioners who were residing in the area on a temporary basis
- Physically disabled people (for collection of weight and height data)
- Mentally unstable people
- Registered relatives who collect pension on behalf of a pensioner
- Individuals who are on disability grants
- Elderly people living in institutions for the elderly

The main reasons cited by some of the pensioners for refusing to participate included lack of time, fear of theft, suspected political agenda, poor hearing, old age, fragile or they had a bad memory, tiredness and or illness.

Systematic sampling was conducted in this study: A random first number was selected and from then onwards every 10th person on the total list was chosen systematically for inclusion in the sample. This method is technically referred to as a systematic sample with a random start. All 12 wards have a pension day schedule for the month and samples were selected on pension day. Using a loud hailer (to accommodate those with hearing problems) the researcher made an announcement every day before pension payment. The announcement included information on what the research was about and where it would take place. The community was also informed that permission had been granted by the eThekweni Municipality and SASSA. During the course of the day a SASSA official also assisted in briefing the groups coming in for the research (Refer Figure 3.3).



Figure 3.3: Researcher informing the community of the study.

This strategy allowed an equal chance for all respondents to participate in the study. Data collection took place between 8:00am and 3:00pm (Refer Figure 3.2). It was vital that everyone had an equal chance throughout the day to participate in the study, not only respondents who had arrived early (possibly because of access to private transport) to collect their pensions. Refreshments were served to each respondent as soon as they had finished answering the questionnaires and had had their measurements taken.



Figure 3.4: Respondents completing consent forms

3.7 RESPONSIBILITY OF FIELD WORKERS

Twenty field workers were recruited from amongst 3rd year and B-Tech students in the Food and Nutrition Consumer Science Department at Durban University of Technology- DUT fieldworker training workshop. English was the medium of instruction for the training session and the training manual for the fieldworkers to refer to later if needed (Annexure B) was also written in English. All fieldworkers were able to speak the local language (isiZulu) in order to avoid any language barriers between them and the respondents. The fieldworkers were trained in how to complete 24-hour recalls using food samples to assist in estimating portion sizes and memory in the elderly, socio-demographic questionnaires and health questionnaires. The fieldworkers were trained in a role play situation on how to take anthropometric measurements. The fieldworkers were expected to show respect, friendliness, and patience which are of importance when dealing with elderly in a black community since they are sensitive about younger people asking them too many questions. Punctuality and reliability were also key to successful fieldwork since participation depended on time that the respondents had available. Because it was pay day, most pensioners were rushing off to other commitments so they did not want to spend a lot of time answering questions. All questionnaires had to be completed accurately and in full.

3.8 ADMINISTRATION OF MEASURING INSTRUMENTS

Various types of questionnaires were used as measuring instruments for all variables of the study. During the fieldwork stage, socio-economic, dietary, anthropometric and health data were collected which will be discussed in detail below.

3.8.1 Socio-demographic survey:

- Socio demographic questionnaire

The socio demographic questionnaire was compiled in English, pretested and validated (Oldewage-Theron et al. 2005b). Its purpose was to measure the socioeconomic status of subjects, main categories included personal information, accommodation and family composition, work and economic status, education and language and household assets (refer to Annexure D). The questionnaire is lengthy and could therefore be time consuming, particularly for the elderly. Two hundred and seventy questionnaires were completed (Refer Figure 3.4).



Figure 3.5: Field worker during an interview with various questionnaires

3.8.2 Dietary intake

Three 24hr- recalls were used to gather data for nutrient analysis which was then used in conjunction with a food frequency questionnaire for validity testing.

a) 24hr- recall

A structured 24hr-recall questionnaire was drawn up and tested for reliability (refer to Annexure E). This is a dietary assessment questionnaire that records the eating patterns, food

items and quantities consumed over a 24 hour period. It is a “multiple pass” method which is repeated on non-consecutive days and was completed. The pre-validated 24hr-recall questionnaire was conducted over two interviews for a three day food consumption assessment (Oldewage-Theron et al. 2005b). Individual interviews were conducted with the assistance of fieldworkers. Food models were simultaneously used to determine portion sizes and to explain food items to the subjects. For this study the candidates were asked for three x 24hr recalls: one weekend day and two weekdays. The top twenty food items consumed by the group as a whole, were then determined.

b) Food frequency list questionnaire -FFQ

The FFQ gathers data on the food variety which will be a good indicator of the dietary diversity consumed by participants. This questionnaire determines how often food was consumed over a period of seven days and identifies food group focusing. The food was categorised into nine groups. The FFQ for this group was adapted during a focus group discussion with ten ladies from this community to identify all the various foods consumed in this community, the questionnaire was then updated and used (Annexure F). This instrument was also used to validate the 24-hr recall questionnaires (Oldewage-Theron and Kruger, 2008b).

3.8.3 Anthropometric, medical and health survey

The health questionnaire used was validated and tested by Oldewage-Theron et al. (2005b) in an earlier study which they conducted in Sharpeville. The questionnaire was compiled in English. Anthropometric measurements, health and medical information were gathered using this questionnaire. The health questionnaire focused on the health conditions of the elderly. The nature and severity of any health conditions as well as the use of alcohol, traditional medicines and type of health care service used, were included. For the purpose of this study qualified nurses were used to collect the blood pressure measurements, waist circumference, height and weight of each participant (refer to Annexure C).

a) Salt use questionnaire

This section of the questionnaire recorded the amount of salt used by determining the level of salt consumed (which is referred to as administration of salt) by the elderly. Questions focused on the types of salty foods consumed, as well as salt addition patterns. The salt use

questionnaire formed part of the health, medical and health survey (refer to Annexure C) (Oldewage-Theron et al. 2005b).

3.9 PROCEDURES FOR CONDUCTING ANTHROPOMETRIC MEASUREMENTS

Anthropometric measurements included weight, height and waist circumference.

3.9.1 Weight

Weight was determined to nearest kilogram on a good quality, electronic standardised medical scale (Scales 2000, model: portable physician scale- pps). Each subject was dressed in light clothing and they removed their shoes prior to being weighed. Two qualified nurses were responsible for taking all anthropometric measurements and blood pressure measurements.

The scale was placed on an uncarpeted area and was levelled with the spirit level indication in the middle. The scale was switched on and waited until the zero indication (0,0) appeared as well as the stable indicator. The subjects had to stand upright on the platform, facing the nurse and looking straight ahead. Their feet had to be flat and slightly apart and they also had to stand still until the measurements were recorded in the space provided on the form. The subject then stepped down from the scale and the nurse would wait for zero recording to appear on the digital display before weighing the next respondent (WHO, 1995).

3.9.2 Height

Height was measured according to the following procedures:

- The respondent had to remove his/her shoes
- The respondent was positioned facing the fieldworker
- Shoulders relaxed, with shoulders, buttocks and heels touching each other against the wall.
- Arms relaxed at the sides and legs straight, knees together, feet flat, heels touching
- The respondent had to look straight ahead before the headpiece.

- The nurse then had to record the respondent's height in mm in the space provided on the health questionnaire. The procedure was repeated twice as well as with the next respondent. The two readings should not vary by more than 5mm and these measurements were taken to the nearest 0.5cm by using a stadiometer. The procedure was repeated with the next respondent (Gibson, 2005; Lee and Nieman, 2003; 2010) (refer Figure 3.6).



Figure 3.6: An elderly man's height measurement being taken

3.9.3 Waist circumference

Waist circumference was at a level between the lower rib and iliac crest with the non-stretchable tape around the body in a horizontal position. The measuring tape was held firmly, ensuring its horizontal position. The tape was loose enough to allow the observer to place one finger between the tape and the subject's body. Readings were then recorded on the Health questionnaire. The procedure was repeated twice. The measurement was rounded to the nearest 0.1cm. The participants had to stand with their feet fairly close together (about 12-15cm) and with their weight equally distributed on each leg. Participants were asked to breathe normally and the measurement was then taken at the end of exhaling. This prevented respondents from contracting their abdominal muscles or from holding their breath. Heavy clothing had to be removed and a tape measure was wrapped around the waist. Cut off points

followed in this study were women ($\leq 88\text{cm}$) and men ($\leq 102\text{cm}$) and $\text{WHR} \geq 0.8$ for women whilst at ≥ 1.0 for men (Gibson, 2005; Lee and Nieman, 2003; 2010).

3.9.4 Blood pressure measurement

Blood pressure was measured by trained nurses. Using a blood pressure pump, both systolic and diastolic measurement was recorded. Equipment used for measuring was:

- Constant tension tape
- Pen
- Chair or coat stand on which participants could place their clothes

Prior to the reading being taken, participants had to sit down until they felt comfortable in order to relax and to normalise the blood pressure (WHO, 1995). Privacy was essential in all measurements but research was conducted in an open area so it was quite difficult to achieve this. Blood pressure measurements were recorded on the Health questionnaire.

3.10 STATISTICAL ANALYSIS OF DATA

3.10.1 Socio-demographic and health questionnaires

Once the fieldwork was complete, questionnaires were sorted and checked for completeness and accuracy by the researcher. The data from the questionnaires were captured onto an Excel^(R) spreadsheet by the researcher. These questionnaires were analysed using the Statistical Package for Social Sciences (SPSS) for Windows Version 17, 0 software program. Descriptive statistics (frequencies, means, standard deviations and confidence intervals) were determined with the assistance of a bio-statistician. Data was presented in tables, frequencies and percentages as well as standardised methods, were used.

3.10.2 Dietary assessment questionnaires

The dietary intake and food consumption data from the 24hr recall questionnaires were analysed by a registered dietician using the Food Finder Version 3 computer program to determine the top 20 food items (Langenhoven, Kruger, Gouws and Faber, 1991; Food Finder 3, 2002). Means, standard deviation and nutrient intakes were calculated and compared with the DRI's. The FFQ data were put in an Excel spreadsheet and interpreted by a bio-statistician to determine food diversity, variety scores and means for food groups to validate the results of 24 hr recalls.

3.10.3 Anthropometric measurements

All weight and height (averages of the two readings) measurements were captured on an Excel spreadsheet. Body mass index (BMI) was calculated by dividing weight (kg) by height squared (m^2) results were between these groups [moderate weight (BMI 18.5- 24.9), overweight (BMI = 25-29.9), obese 1 >30 and obese 2 >35 obese 3 >40].

Waist circumference [Women $\geq 88cm$ and men $\geq 102cm$] and blood pressure measurements [Normal S BP <120 DBP <80 , Pre-hypertension SBP 120-139 DBP 80-89, Stage 1 hypertension SBP 140-159 DSP 90-99, Stage 2 hypertension SBP ≥ 160 DBP ≥ 100] were also captured on an Excel spreadsheet and converted to SPSS for descriptive statistics (mean and SD's). The World Health Organisation cut-off points were used for analysis of BMI, blood pressure (Hypertension, 2003) and waist circumference (CDC, 2002).

3.11 CONCLUSION

In this chapter all the instruments to determine the socioeconomic, health and nutritional profile of elderly people have been discussed. The instruments used in this study were appropriate in gathering the data to achieve the purpose of the study. The purpose of the study was essentially to conduct a situational analysis of free-living elderly in the community of Umlazi and results will be reported in detail in Chapter 4.

CHAPTER 4: RESULTS AND FINDINGS

4. INTRODUCTION

The purpose of the study was to determine the socio-economic conditions, dietary intake and food consumption patterns and health status of the elderly population of Umlazi. This chapter will focus on reporting the results obtained in this study, including analyses of results. The findings include socio-economic factors, dietary intake and food frequency scores, anthropometric and health results. A total of 270 respondents participated in the study. The sample included 224 women and 46 men and the mean age was 70 and $\pm SD \pm 7.4$.

4.1 SOCIO-DEMOGRAPHIC RESULTS

Table 4.1: Accommodation and family composition

Variable	Number (n= 270)	Percentage (%)
Type of house:		
Brick	229	84.8
Clay	13	4.8
Grass	1	0.4
Wood	11	4.1
Shack	16	5.9
Total		100
No of rooms per household:		
≤ 2 rooms	34	12.6
3-4 rooms	98	36.3
≥ 4 rooms	138	51.1
Total		100
Water facilities available per home :		
Tap inside the house	185	68.5
Tap outside house	64	23.7
Borehole	10	3.7
Spring/ river/ dam	1	0.4
Fetch else	10	3.7
Total		100

Variable	Number (n= 270)	Percentage (%)
Toilet facilities available per home		
None	4	1.5
Pit latrine	40	14.8
Flush/sewerage	211	78.1
Bucket system	15	5.6
Total		100
Operational waste removal system:		
Yes	258	95.6
No	12	4.4
Total		100
No of other people living with elderly per household:		
None	4	1.5
1-3	84	31.1
4-6	107	39.6
7-9	45	16.7
>10	30	11.1
Total		100
Mean & SD of people living per household	Mean: 5.1	SD: 2.9
Children per household:		
Children	183	68.0
No children	87	32.0
Total		100
Grandchildren	189	70.0
No grandchildren	81	30.0
Total		100
Great grand children	20	7.4
No great grandchildren	250	92.6
Total		100
Mean & SD of grandchildren per household	Mean: 3	SD: 5

The information in Table 4.1 indicates that the majority of respondents lived in brick houses (84.8%) and for the majority the living space comprised more than three rooms (87.4%). For the majority of respondents (68.5%) water was accessible inside the house. Almost all (98.5%) reported that toilet facilities were also accessible, and the waste removal system was operational in 95.6% of respondents' homes. Table 4.1 also highlights the accommodation and family indices which indicate that 98.5% of the elderly were living with other members of the family. The majority of respondents (67.4%) lived with between four and ten members whilst only 32.6% of households consisted of less than four members. The mean household size was 5.1 people (\pm SD 2.9), further illustrating that the majority of respondents lived with 5 people per household. Grandchildren were present in 70% of the households with a mean of 3 (\pm SD5) grandchildren in each household. Results clearly indicate that grandchildren are the most common family members residing with the elderly of this sample.

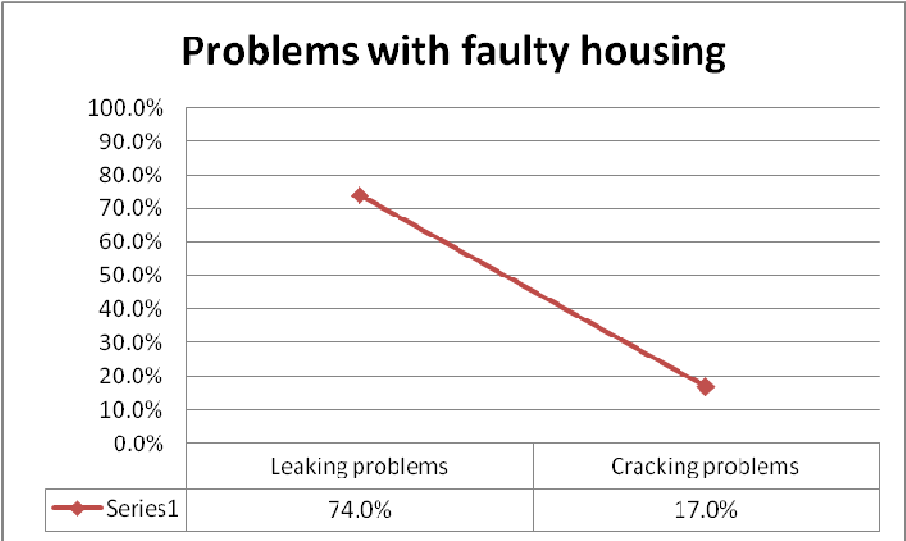


Figure 4.1: Percentage population reporting major problems with faulty housing

Although Table 4.1 showed that the majority of respondents lived in brick houses (84.8%) and had taps inside their households (68.5%), these houses were not always in a good condition. The majority of respondents (74.0%) reported problems with leaks followed by those who reported that the houses had cracks (17.0%) (refer to figure 4.1).

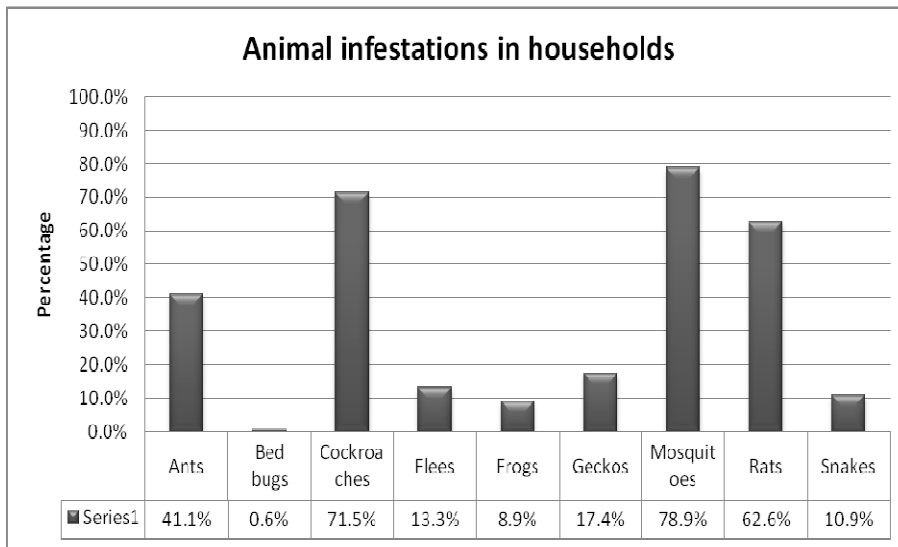


Figure 4.2: Households with animal infestation problems

Problems experienced by respondents included animal infestation which affects the residents' safety and hygiene conditions. Mosquitoes were the most commonly reported infestation (78.9%) followed by cockroaches (71.5%) rats (62.6%) and ants (41.1%).

4.2 INCOME AND EXPENDITURE RESULTS

Figure 4.3 indicated that 84.6% of elderly were breadwinners in their households. This has a great significance in terms of income and expenditure considering that the results in Table 4.1 have indicated that the majority of the elderly were living with other family members, particularly children and grandchildren.

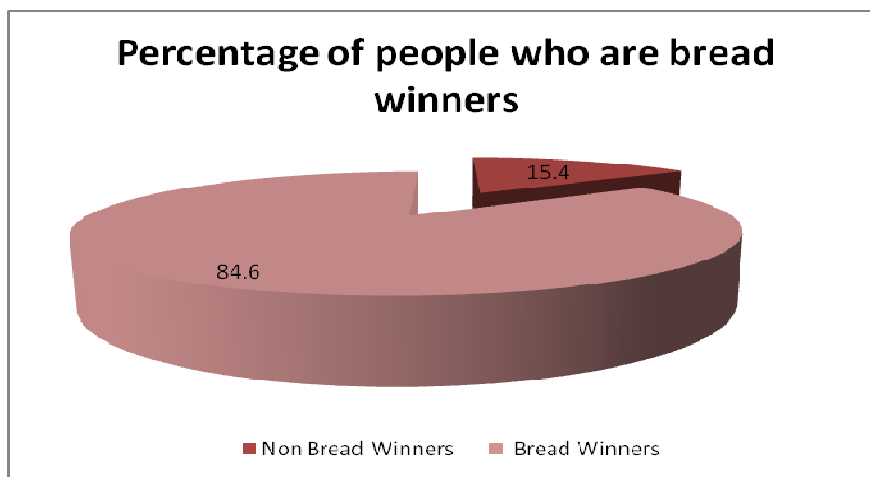


Figure 4.3: Percentage of the sample population who are breadwinners

Figure 4.4 indicates that 87.8% of the population has no other source of income except their state pension while 12.2% of the population indicated that they did have other sources of income.

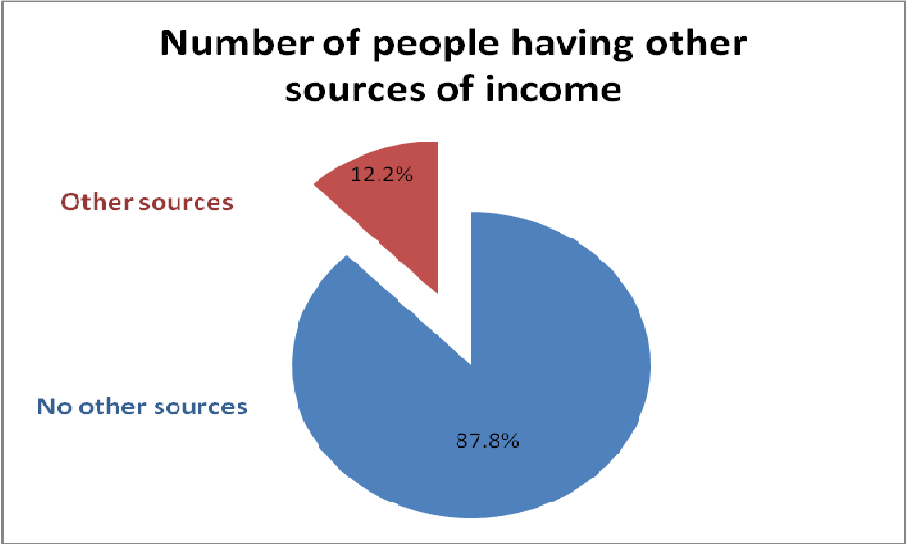


Figure 4.4: Number of people having other sources of income

Table 4.2 illustrates that 74.1% of the respondents have been employed in the past whilst 25.9% have never worked. However, a large number (43%) worked for a period of between 6 and 25 years. The majority (65.9%) of the total population had an income budget per household between R500 and R1000 per month, followed by (28.5%) that earned between R1000 and R2000 and only 5.6% had an income of > R2000 per month respectively. The majority of the respondents lived without a spouse (72.2%) and only 27.8% had spouses living with them.

Table 4.2: Work and income status

Variable	Number (n=270)	Percentage (%)
Previously employed:		
Yes	200	74.1
No	70	25.9
Duration of employment:	n=200	
< 5years	35	17.5
6-12years	57	28.5
13-25years	59	29.5
> 25years	49	24.5.
Total		100
Type of employment:		
Fulltime, permanent	127	63.5
Part time, permanent	55	27.5
Temporary	18	9.0
Total		100
Spouse currently living:		
Yes	195	72.2
No	70	27.8
Other sources of income besides pension:		
Yes	35	13.0
No	235	87.0
		100
Total income per household:		
R500- R1000	178	65.9
R1001-R1500	46	17.0
R15001-R2000	31	11.5
R2001-R2500	7	2.6
>R2500	8	3.0
		100

Variable	Number (n=270)	Percentage (%)
Food buying shortages:		
Always	146	54.0
Often	41	15.2
Sometimes	70	26.0
Seldom	7	2.6
Never	6	2.2
		100
Food expenditure budget per month:		
< R250	19	7.0
>R250- R500	29	11.0
>R500	216	80.0
Don't know	6	2.0
Total		100

Table 4.2 further indicates that the majority of the respondents (74.1%) had been previously employed and the longest period of employment by the majority of respondents was 6-25 years (58%) followed by an employment period of > 25 years was 24.5%. The majority were employed fulltime (63.5%). Respondents who were widowed were 72.2% which links up with results in Figure 4.1 that the majority of respondents were breadwinners and had no other sources of income (87.%). The majority of respondents had a total income of R500-R1500 (82.9%) followed by R1501- R2500 (14.1%) and only 3% had more than R2500 total income. Food expenditure for most (80%) households was >R500. Food shortages due to limited income were frequent in 54% of households who always experience this problem, whilst 26% sometimes experienced shortages, 15.4% often encountered shortages whereas 2.6% encountered shortages seldomly and 2.2% never. These results indicate that food shortages could be linked with the low total income received by the majority of respondents.

Table 4.3: Household assets and appliances

Variable	Number (n=270)	Percentage (%)
Electrical Assets:	The first value is yes and second represents a no	
Radio	203 67	75.5 25.5 100
Television	217 53	80.3 19.7 100
Electric stove	195 75	72.2 27.8 100
Microwave	111 159	41.1 58.9 100
Hot plate	66 204	24.5 75.5 100
Refrigerator	203 67	75.1 24.9 100
Freezer	77 193	28.6 71.4 100
Non Electrical Assets:		
Gas stove	8 262	3.0 97.0 100
Primus/paraffin stove	78 192	28.9 71.1 100
Mattress bed	256 14	94.8 5.2 100
Lounge suite	139 131	51.5 48.5 100
Dining room suite	153 117	56.7 43.3 100

Although Table 4.1 showed the poor income status amongst the majority of respondents in this community, the results in Table 4.3 show positive access to household assets. A large majority of respondents owned electrical assets, the most commonly owned included television (80.3%), radio (75.5%) and refrigerator (75.1%). Although electric stoves were owned by the majority (72.2%), other forms of stoves were utilised for cooking and these included primus/paraffin stoves (28.9%) or hot plates (24.5%) and followed by gas stoves (3.0%). Non-electrical assets were also owned by the majority of respondents. These included mattress beds (94.8%), followed dining room suites (56.7%) and lounge suites (51.5%).

4.3 DIETARY INTAKE AND FOOD CONSUMPTION PATTERN INDICATORS

The majority of food items consumed were carbohydrate based. The top three food items consumed though included maize meal (n=267), tea (n=267) and chicken stew (n=106) as can be seen in Table 4.4.

Table 4.4: The mean top 20 food items ranked by total consumption (portion size x number of respondents) as measured by three 24- hr recalls (n=267).

No	FOOD ITEM	Total intake	Mean intake	Number
1	Maize meal, cooked crumbly porridge	60698.33	227.33	267
2	Tea, brewed	42976.67	160.96	267
3	Chicken stew (with skin)	13422.66	126.62	106
4	Bread/rolls, white/brown	12951.66	84.65	153
5	Rice, white, cooked	12760.40	83.95	152
6	Stew, beef, with vegetables	11028.33	139.99	79
7	Beans, sugar, dried, cooked	6659.16	125.64	53
8	Fresh milk, full cream	6487.50	56.90	114
9	Samp And Beans, 1:1	5685.83	270.75	21
10	Cabbage, cooked with potato, onion and sunflower oil	4403.33	84.67	52
11	Spinach (swiss chard), cooked with potato, onion, sunflower oil	3769.16	144.96	26
12	Steamed bread	32363.33	1348.47	24

No	FOOD ITEM	Total intake	Mean intake	Number
13	Sugar, white, granulated	3171.50	14.09	225
14	Fruit punch (alcohol-free)	2916.66	265.18	11
15	Orange, raw (peeled)	2696.66	224.72	12
16	Mahewu/mageu, liquid	2483.33	496.66	5
17	Coffee, brewed/ instant	2400.00	184.61	13
18	Breakfast cereal	2231.00	123.94	18
19	Pilchard in tomato sauce	2143.16	133.94	16
20	Tomato and onion, stewed (no sugar)	2084.16	184.61	13

Other sources of carbohydrates which were consumed by the minority of respondents were steamed bread (this is made from cake flour with yeast/baking powder eaten with meat/stews) (n=24), samp and beans (n=21), mahewu (n=5) and breakfast cereal (n=16). The observation in this 24 hr recall is that portion sizes for carbohydrates were relatively big, ranging from 1348.5g for steamed bread (being the highest) to white rice, cooked (being the lowest at 83.95g) excluding sugar. This can be linked to results in Table 4.5 which shows that the total sample had a 66% contribution of carbohydrates which is considered as a higher contribution. Although eight of the foods consumed by a relatively large proportion of people were carbohydrate based, a small number of people consumed all the eight in large quantities, including foods like samp and beans (n=21) steamed bread (n=24) mahewu (n=5).

However, the main sources of protein was chicken (n=106) and milk (n=114) whilst other sources which were consumed by the minority were beef (n=79), beans (n=53) and pilchards (n=16). Protein intake including chicken, beef, pilchards and beans were consumed as a fairly good portion by the majority. Milk, however, was also consumed by a large number of respondents, but in inadequate quantities. Although fruit and vegetables appeared on the Top 20 food consumption list, orange and fruit juice were the major source of fruit. The vegetable dishes most frequently consumed by the group at number 10 and 11 on the top 20 list were cabbage (84.7g) and spinach (145g). Not only was the frequency of vegetable and fruit intake

very low, the portion sizes were also small and did not meet the recommended intake of 400g per day (Mann and Truswell, 2007; Lee and Niemann, 2003) (Refer Table 4.4).

Table 4.5: Analysis of three 24hr- recalls: mean macronutrient Intakes (n= 267) (Institute of Medicine, 2004; NICUS, 2003)

Nutrient	Women (mean \pm SD) n= 222	Women (%) < 100% of EAR	Men (mean \pm SD) n= 45	Men (%) < 100 of EAR	DRIs
Energy (KJ)	4745.33 \pm 1232.55	89.2	4793.07 \pm 1092.10	100	Women 6316.8kJ Men 8185.8kJ EER*
Total protein (g)	42.73 \pm 14.37	63.1	40.23 \pm 11.84	91.1	Women 46g/day and Men 56g/day\$
Carbohydrates (g)	168.31 \pm 43.7	4.1	174.91 \pm 47.26	0	Women and men 100g/day&
Total Dietary fibre (g)	14.15 \pm 5.82	86.5	15.41 \pm 5.12	33.3	Women 25g/day# Men 30g/day #

*- Estimated Energy Requirements (EER) low activity individuals 51-70 and >70 old

\$- Recommended Dietary Allowances (RDA)

&- Estimated Average Requirements (EAR)

- Adequate Intake (AI)

Table 4.5 indicates the mean macronutrient intakes for both men and women. The energy contributions showed that 89.2% of the women consumed a diet that supplied <100% of EARs and all the men consumed <100% of the EARs for energy. Sixty three percent of the women and 91.1% of the men consumed <100% of the EARs for protein. The mean

carbohydrate intake in the sample were significantly higher than EAR but even so, 4.1% of the women consumed <100% of the EARs for carbohydrates and all men consumed >100% of the EARs. Table 4.5 shows that 86.5% of and 33.3% of men consumed <100% of fibre requirements.

Table 4.6: Comparison intakes of macronutrients with the WHO (2003) nutrient intake goals and the elderly in Umlazi nutrient intakes

Nutrient	Goal	Women N=222	Men N=45
Total fat % E	15-30%	20%	20%
Total protein % E	10- 15%	15%	15%
Total carbohydrates	55-75%	65%	65%
Mean sodium mg/day	<2000	549.72	518.51
Dietary fibre (g)	> 25	14.0	14.4

The recommended nutrient intake goals (WHO, 2003) were used to compare with the results in this study. The energy contribution made by the dietary intake in this group for both women and men was very similar and within normal range. Total fat was 20%, total protein was 15% and carbohydrates were 65%. These nutrients were consumed within the higher readings of recommended goal percentages. Results indicate that sodium and fibre intakes were low. Although this sample was within the recommended goals of a balanced diet there was still low intake in terms of specific foods.

Table 4.7: Analysis of three 24-hr recalls: mean vitamin intake in the elderly respondents (n= 267) (Institute of Medicine, 2004; NICUS, 2003)

Nutrient	Women (mean ± SD) n= 222	Women (%) < 100% of EAR	Men (mean ± SD) n=45	Men (%) < 100 of EAR	DRIs
Vitamin A	359.20 ± 640.41	89.0	445.92 ± 776.31	100	Women 500.00 mcg/day & Men 625.00 mcg/day&

Nutrient	Women (mean \pm SD) n= 222	Women (%) < 100 % of EAR	Men (mean \pm SD) n=45	Men (%) < 100 of EAR	DRIs
Vitamin D	2.37 \pm 2.63	98.2	2.42 \pm 2.74	91.00	10.00 mg/day men and women #
Vitamin E	4.47 \pm 2.58	98.6	5.04 \pm 3.16	95.6	12.00 mg/day women and men &
Vitamin K	88.36 \pm 133.16	76.6	112.08 \pm 145.71	91	90.00 mcg/day women 120.00 mcg/day men #
Vitamin B12	3.45 \pm 7.25	58.1	2.01 \pm 2.14	70	2.00 m μ g /day women and men &
Vitamin B6	0.70 \pm 0.33	95.5	2.57 \pm 7.78	86	1.30mg/day women 1.40 mg/day men &
Vitamin C	33.79 \pm 44.7	86.5	32.67 \pm 31.32	93	60.00 mg/day women 75.00mg/day men&
Thaimin	0.7 \pm 0.26	82.9	0.76 \pm 0.29	73	0.90mg/day women 1.00mg/day men &
Riboflavin	0.61 \pm 0.48	82.9	0.63 \pm 0.45	89	0.90mg/day women 1.10mg/day men &
Niacin	9.47 \pm 4.66	71.6	9.08 \pm 4.58	61	11.00mg/day women 12.00mg/day men&

Nutrient	Women (mean \pm SD) n= 222	Women (%) < 100 % of EAR	Men (mean \pm SD) n=45	Men (%) < 100 of EAR	DRIs
Folate	150 \pm 89.05	96.8	165.21 \pm 83.90	77	320.00 μ g /day men and women &
Panthothenate	3.73 \pm 2.06	85.6	4.04 \pm 2.45	64	5.00mg/day women and men #
Biotin	18.51 \pm 14.63	93.7	18.38 \pm 13.73	84	30.00 μ g /day women and men #

*- Estimated Energy Requirements (EER) low activity individuals 51-70 and >70 old

\$- Recommended Dietary Allowances (RDA)

&- Estimated Average Requirements (EAR)

- Adequate Intake (AI)

Table 4.7 indicates low intakes for the majority of the vitamins for both genders except for vitamin B12 and B6 (in the case of men only).

Although the mean vitamin B12 intake was sufficient compared to EAR, 51.8% of the women and 70% of the men consumed less than 100% EAR. The same is true for vitamin B6 where 86% of the men had insufficient intakes, although for the women, the mean intake was sufficient.

Table 4.8: Analysis of three 24hr- recalls: mean micromineral intakes of a sample of elderly respondents (n= 266) (Institute of Medicine, 2004; NICUS, 2003)

Nutrient	Women (mean \pm SD) n= 222	Women (%) < 100% of EAR	Men (mean \pm SD) n=45	Men (%) < 100 of EAR	DRIs
Calcium	240.42 \pm 175.91	99.5	253.16 \pm 165.24	98.0	800(mg)/day women/men
Iron	6.11 \pm 3.23	47.0	6.68 \pm 3.83	38.6	5.00(mg)/day women 6.00(mg)/day men &
Magnesium(mg)	641.21 \pm 300.96	92.3	189.28 \pm 48.34	89.0	265.00(mg)/day women 350.00(mg)/day men &
Potassium(mg)	641 \pm 212.18	41.4	645.07 \pm 180.10	39.0	580.00 (mg)/day women 580.00(mg)/day men &
Choline (mg)	334 \pm 310.11	83.3	384.76 \pm 338.75	82	425.00(mg)/day women 550.00(mg)/day men #
Zinc (mg)	6.06 \pm 2.33	67.6	5.61 \pm 2.12	77	6.80(mg)/day women 9.40(mg)/day men &
Chromium (mcg)	23.23 \pm 14.56	45.0	21.53 \pm 14.07	73	20.00(mg)/day women 30.00(mg)/day men #

Nutrient	Women (mean \pm SD) n= 222	Women (%) < 100% of EAR	Men (mean \pm SD) =45	Men (%) < 100 of EAR	DRIs
Selenium (mcg)	12.95 \pm 10.08	98.6	13.05 \pm 8.59	95	45.00(mg)/day women 45.00(mg)/day men &
Iodine	13.57 \pm 8.98	0	12.19 \pm 7.24	0	95.00(μ g g/day women 95.00(μ g g/day) men &

*- Estimated Energy Requirements (EER) low activity individuals 51-70 and >70 old

\$- Recommended Dietary Allowances (RDA)

&- Estimated Average Requirements (EAR)

- Adequate Intake (AI)

Table 4.8 indicates low intakes of the majority minerals (similar indications were also observed in Table 4.7 for vitamins) except for iron (36.6% for men) and potassium (39.0% for men). These were both consumed more amongst men than women. Although the majority of respondents had sufficient intakes compared to EAR, however the mean intake values for iron and potassium were still insufficient.

4. 3.1 Food variety score, dietary diversity and nutrient adequacy

The Food Variety Score consisted of a simple count of single foods within the nine nutritional food groups. In total, 79 different individual food items were consumed in seven days by all the respondents. However, the total range of individual food items consumed by an individual during the seven day data collection period was between one and 22 foods (refer to Table 4.9).

A large number of respondents consumed only two (n=57, 21.1%) or three (n=59, 21.9%) food types of the cereal group in seven days. Maize meal was commonly consumed in two forms as maize porridge and maize crumbly pap. A large proportion of respondents (n= 123

which amounts to 45.5%) consumed 10 to 22 food items in seven days. The highest number of individual food items consumed was 20 in 20 (7.4%) of the respondents.

In this community, the mean FVS (\pm SD) for all the foods consumed from all the food groups in a period of seven days was 25.8 (\pm 14.6), revealing poor dietary diversity scoring. The cereal group had the highest mean variety score 5.3 (\pm 2.5) followed by vegetable 4.5 (\pm 2.6), fruit 3.5 (\pm 3.1), flesh foods 3.2 (\pm 1.6), vitamin A-rich fruit and vegetable group 3.1 (\pm 1.7) (Refer Table 4.9).

Table 4.9: Household food access as measured by food variety within the food groups consumed over a period of seven days (n= 270)

Flesh Group (n = 8)	Eggs Group (n = 1)	Dairy Group (n = 8)	Cereals Group (n=16)	Legumes Group (n=4)	Vitamin A Group (n=8)	Fruit Group (n=19)	Vegetable Group (n=14)	Fats Group (n=4)	Total Individual Food items in all food Groups (n= 79)
0 = 20	0 = 98	0 = 37	0 = 3	0 = 27	0 = 43	0 = 53	0 = 17	0 = 34	
1 = 34	1 = 172	1 = 128	1 = 8	1 = 146	1 = 43	1 = 45	1 = 23	1 = 87	1 = 5
2 = 57		2 = 62	2 = 8	2 = 81	2 = 50	2 = 57	2 = 19	2 = 128	5 = 9
3 = 59		3 = 15	3 = 44	3 = 10	3 = 62	3 = 44	3 = 58	3 = 13	6 = 4
4 = 47		4 = 13	4 = 63	4 = 6	4 = 33	4 = 30	4 = 57	4 = 8	7 = 8
5 = 27		5 = 3	5 = 32		5 = 21	5 = 14	5 = 34		8 = 2
6 = 16		6 = 3	6 = 41		6 = 5	6 = 9	6 = 20		9 = 3
7 = 7		7 = 3	7 = 34		7 = 2	7 = 7	7 = 16		10 = 9
8 = 3		8 = 6	8 = 12		8 = 11	8 = 2	8 = 6		11 = 5
			9 = 11			9 = 2	9 = 5		12 = 11
			10 = 1			10 = 1	10 = 5		13 = 5
			11 = 2			11 = 0	11 = 3		14 = 8
			12 = 5			12 = 1	12 = 2		15 = 15
			13 = 3			13 = 1	13 = 3		16 = 11
			14 = 1			14 = 1	14 = 2		17 = 4
			15 = 1			15 = 2			18 = 7
			16 = 1			16 = 1			19 = 7
						17 = 0			20 = 20
						18 = 1			21 = 7
						19 = 2			22 = 14

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

The results in Table 4.9 showed that the fruit group showed the most variety with 19 different food items, followed by the cereal group and the vegetable group with 16 and 14 different food items respectively. The total number of different food items consumed by the sample was 79.

The results in Table 4.9 show that a variety of foods were consumed by the group. Within the cereal group between 3-7 cereal food varieties were consumed by a large percentage of the sample (214) which links up with the Top 20 results of the 24hr recall questionnaires (refer to Table 4.4) where cereals were the highest group consumed. The flesh and legume group indicates that a mean of 2-3 varieties were consumed by the majority. However, it was observed that the wider the variety the fewer the people who continued to consume the flesh and legume group. Although the fruit group had more variety (n=19), vegetables were consumed at a rate of between 3-5 varieties by the large majority of respondents (n=149). The fats group was consumed by the majority (128) in 2 varieties.

The results in Table 4.10 showed the largest variety in the cereal (5.3 ± 2.5), followed by the vegetable (4.4 ± 2.5) and fruit group (3.4 ± 3.1).

Table 4.10: Mean, standard deviations and the range of scores for the 9 food groups

Food Group	Mean	SD	Range of Scores
Flesh Foods	3.2 (4)	1.6	0-8
Eggs	1.0	0.0	0-1
Diary	1.9	1.5	0-8
Cereals	5.3 (1)	2.5	0-16
Legumes	1.4	0.7	0-4
Vitamin A	3.1 (5)	1.7	0-8
Fruit	3.4 (3)	3.1	0-19
Vegetable	4.4 (2)	2.5	0-14
Fats	1.7	0.7	0-4

Table 4.11: Summary of food group diversity (n = 270)

Number of Food Groups Consumed (n = 9)	Frequency	Percentage %
1	1	0.4
2	2	0.7
3	5	1.9
4	11	4.1
5	9	3.3
6	15	5.6
7	34	12.6
8	70	25.9
9	123	45.6
TOTAL	270	100

According to Table 4.10 the majority of respondents (89.6%) consumed between six and nine food groups. These people can be deemed to have a high dietary diversity score, followed by 7.4% with a medium score of four to five food groups and 3% with the lowest score of between zero and three food groups. A high variety of 79 different food items were generally consumed, which was evident by the number of respondents (89%) who consumed food from six to nine groups. Although the results show good variety scores, this seems contradictory to the results of the 24hr- recalls reflected in Table 4.4 which only reported on food consumed within the previous 3 days which clearly did not represent normal food intake. This clearly shows that there is a limitation since the food frequency scores represents the consumption of food over a seven day period and also memory could affect 24hr recall recordings.



Figure 4.5: Mean nutrient adequacy ratio (NAR Expressed as %) of energy and nutrients at different levels of diversity score (Women)

The relationship between dietary diversity score and nutrient adequacy ratios of energy, protein and selected minerals showed an increase in nutrient adequacy ratio for all the nutrients as dietary diversity score increases. This can be seen for calcium and energy. However, very few people consumed 1-5 food groups and therefore, the results indicate the results for 1-5 group is not representative of the total sample. Energy reached >70% with a dietary diversity score of seven food groups for women. The women's protein intakes reached just below 100% for a dietary diversity score of seven, iron also reached 100% for a dietary diversity score of seven. Although the relationship for protein, zinc and iron was not clearly established in this sample, these NAR's were between 90 and 100% and good intakes were already observed by more food groups consumed.

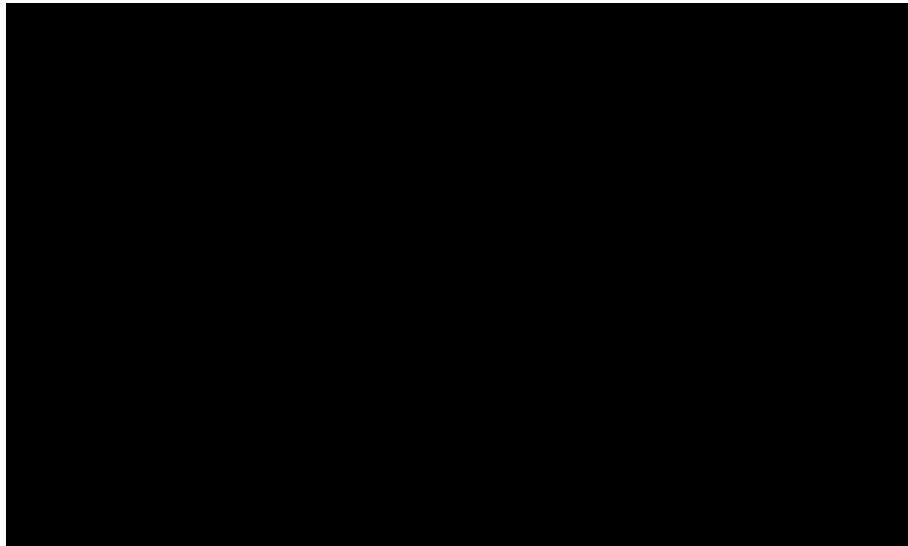


Figure 4.6: Mean NAR of energy and nutrients at different levels of FGDS (men)

The relationship between FGDS and NAR showed that energy and zinc become lower with more food groups. However, the nutrient intakes of calcium, protein and iron increased as food groups increased.

4.4 ANTHROPOMETRIC AND HEALTH INDICATORS

4.4.1 Anthropometry findings

Table 4.12: Means and standard deviations for age, weight and BMI (n= 270)

Variable	mean	Mean age (n=270)	Mean weight (n=270)	Mean height	Mean BMI (n=270)
Both genders		69.7 ±	76.5	1.6	31.2
Standard Deviation		7.1	17.3	.08	7.3
Men (n= 46)		72.8	71.8	1.6	25.9
Women (n= 224)		69.1	77.5	1.5	32.2

Table 4.12 describes the mean age, weight and BMI of the total group, and then for men and women separately. The mean age was 69.7 years with a SD of 7.1, mean weight of 76.5 kg with a SD of 17.3. The results indicate a mean BMI for the entire sample at 31.2 which

indicates that the sample is obese (Obese 1-111 is between ≥ 30 - ≥ 40 of BMI scores) according to BMI classifications. However, a closer examination revealed that the women were obese and the men slightly overweight when BMI is compared.

Table 4.13: BMI classification table for men and women

Parameter	Classification	% of Men n=46	% of Women n=224
Body Mass Index- BMI	Underweight	4%	4%
	Normal Weight	43%	14%
	Overweight	34.2%	21.9%
	Obese 1 (30.00 - 34.99) 11 (35.00 - 39.99), 111 (≥ 40)	18.8%	60.1%
	Total	100%	100%

The results in Table 4.13 showed that 53% of the males and 82% of females were either overweight or obese. The BMI scores in this table classified the findings according to women and men. The BMI scores for the total group indicated that 52% respondents fell into the obese category (BMI = obese 1 >30 and obese 2 >35 obese 3 >40) and 24% respondents were overweight (BMI = 25-29.9) with only 20% of moderate weight (BMI 18.5- 24.9). Although more men showed overweight results (34.2%) compared to 21.9% of the women, more women (60.1%) were obese compared to the men (18.8%).

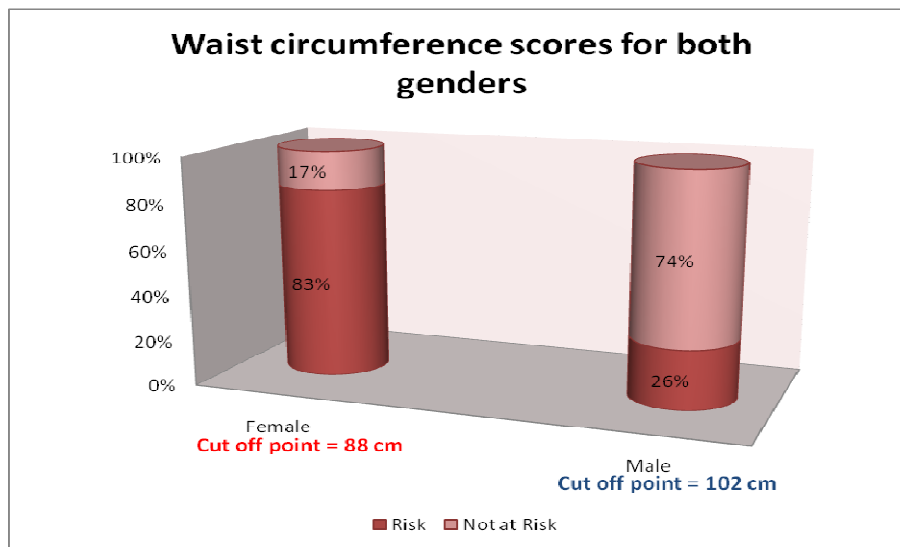


Figure 4.7: Cut off points for waist circumference in both male and female groups

The majority (83%) of the women were above the cut off points for waist circumference ($\geq 88\text{cm}$) while 17% were within the normal values. However, the majority (74%) of their male counterparts showed abdominal fat distribution within recommended cut of points ($\geq 102\text{cm}$) and 26% of the men exceeded the recommended scores. These results confirm the findings in Table 4.13 which showed increased overweight and obesity trends, with obesity particularly prevalent amongst women.

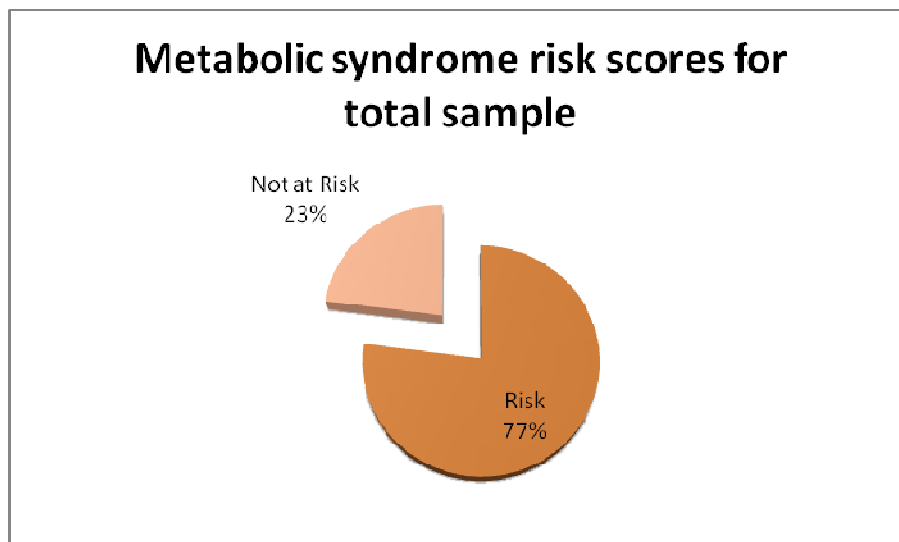


Figure 4.8: Metabolic syndrome risk scores as measured by waist to height ratio-(WHTR)

These scores are determined by calculating waist circumference and height measurements (refer to Chapter 2.14). The results show that the majority of respondents were at risk for

metabolic syndrome. Figure 4.8 indicates the percentage of the total sample who were at high risk of developing metabolic syndrome: 77% of respondents were at risk of developing metabolic syndrome exceeding >0.5 WHTR and 23% were at lower risk.

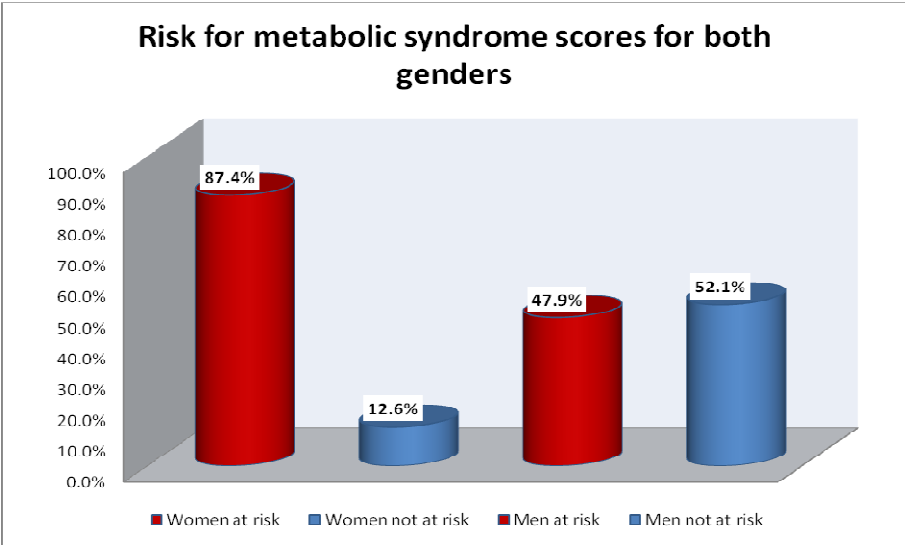


Figure 4.9: Metabolic risk scores for women and men

Although Figure 4.8 included the total sample, Figure 4.9 indicates that the female counterparts were more commonly associated with the risk of metabolic syndrome (87.4%) compared to men with only 47.9.%. The results correlate with results in Figure 4.7 indicating that waist circumference cut off points had been exceeded by majority of women as opposed to men.

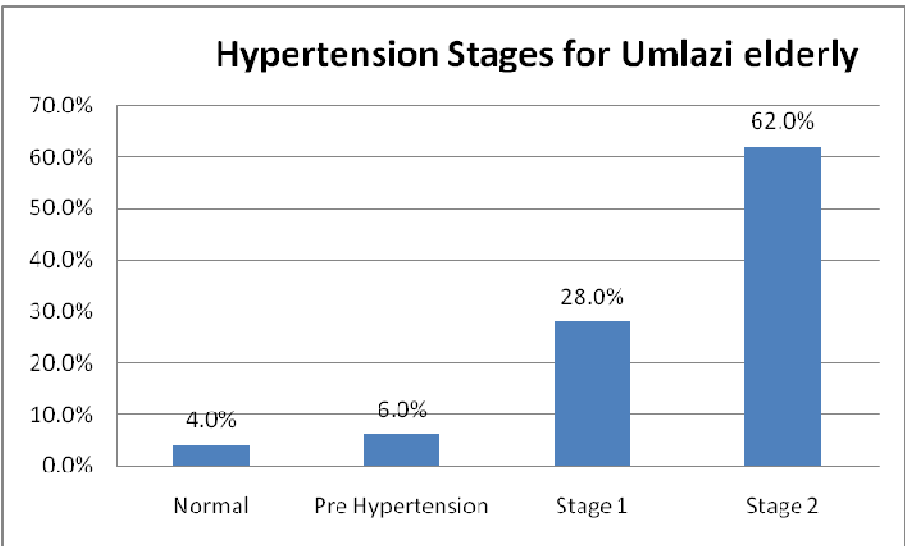


Figure 4.10: Hypertension stages in Umlazi elderly

Results represented in Figure 4.10 show that 90% of the elderly population were in various stages of hypertension and 6% showed signs of developing hypertension.

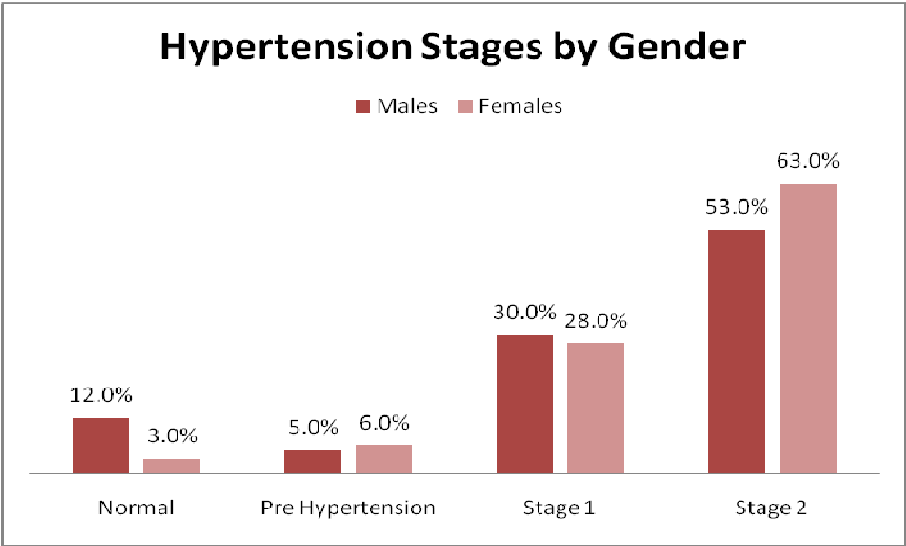


Figure 4.11: Hypertension stages by gender

Although Figure 4.10 has shown alarming figures of hypertension in this sample, the results in Figure 4.11 showed that hypertension was more prevalent in women (91%) than in the men (83%). Results clearly indicate that women were highly overweight and obese as opposed to their male counterparts and are at high risk for metabolic syndrome and hypertension and abdominal obesity. Although overweight and obesity is generally linked with hypertension, most of the men in this sample were within normal weight (refer to Table 4.14) and only the minority (47%) were underweight.

4.4.2 Health survey indicators

Because the elderly are most susceptible to health risks and diseases, the health survey data results in this chapter will look at the current prevailing health status of the elderly in this community.

Table 4.14: Problematic health conditions

Variable	Number	Percentage
Skin problems:		
Yes	80	29.6
No	190	70.4

Variable	Number	Percentage
Skeletal joints:		
Yes	196	72.6
No	74	27.4
Eyes and Teeth:		
Yes	205	75.9
No	65	24.1
Ears and Nose:		
Yes	77	28.6
No	192	71.4
Chest/ respiratory:		
Yes	50	18.5
No	220	81.5
Digestive:		
Yes	21	7.8
No	249	92.2

Problematic conditions that showed prevalence were skeletal joints (72.6%). This could be linked with results indicating the prevalence of overweight/ obese individuals and those with a weak abdominal area due to central obesity (refer to Table 4.13 and Figure 4.8). Eyes and teeth were problematic in 75.9% of respondents. These results can be linked with findings (refer to Table 4.7) indicating poor intakes of micronutrients, particularly of vitamin A and vitamin D which are contributing factors to good vision and strong teeth. Skin problems were mentioned by 29.6% and ears and nose by 28.6%. These are possibly linked to normal physiological changes.

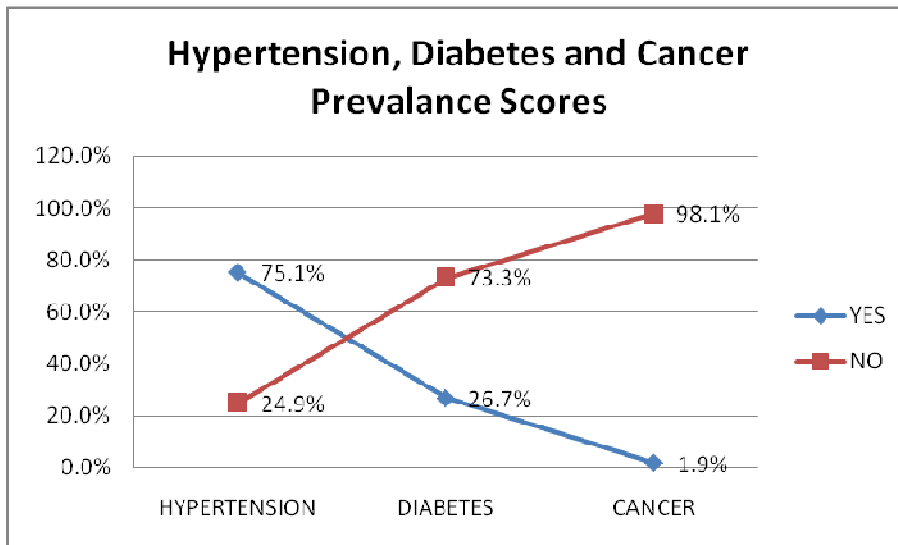


Figure 4.12: The percentage population with self reported lifestyle diseases (n=270)

The results in Figure 4.12 show that 75.1% of the respondents reported hypertension followed by 26.7% with diabetes and 1.9% with cancer. In the case of hypertension, these results could have been based on older measurements taken by respondents, because the current readings taken during study showed that only 62% had hypertension stage 2.

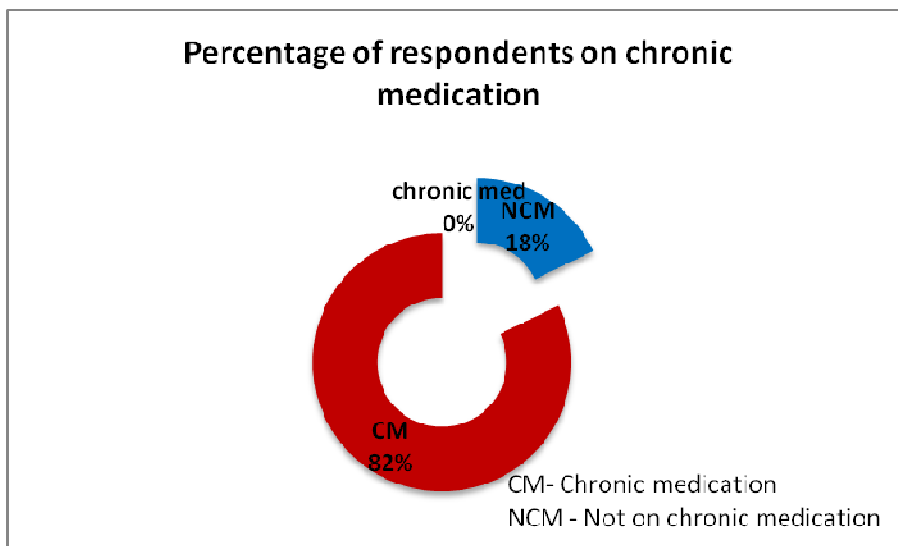


Figure 4.13: Percentage of respondents currently on chronic medication

Figure 4.13 indicates that a high percentage (82%) of the participants has reported to be on chronic medication currently whereas 18% were not using any chronic medication at this time. These results correlate with the results in Figure 4.10 of the hypertension prevalence within this community, showing the impact of disease and the demand for medical treatment.

Table 4.15: Health facility results

Variable	Number	Percentage%
Health facility:		
Private doctor	35	12.2
Clinic	156	58.5
Hospital	72	26.7
Tradition healer	6	2.2
Other	1	0.4
Total	270	100%

Table 4.15 shows that 58.5% visited frequented clinics frequently, 26.7% went to hospitals and 12.2% to private doctors to obtain medication. Smaller numbers got their medication from traditional healers (2.2%) and other facilities (0.4).

4.4.3 Salt intake results

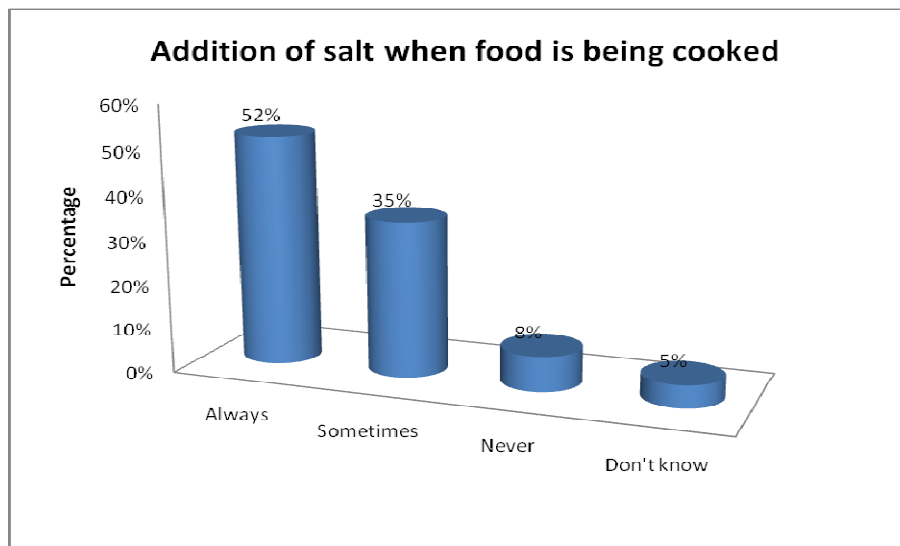


Figure 4.14: Frequency of the addition of salt when cooking food

Although Table 4.6 indicated that sodium intakes were below (<2000mg) in dietary intake, Figure 4.14 indicates salt usage during the cooking of foods. Of the group, 52% always add salt when cooking, whilst 35% did sometimes include salt when preparing food and a small amount (5%) was not aware about the level of salt they consumed.

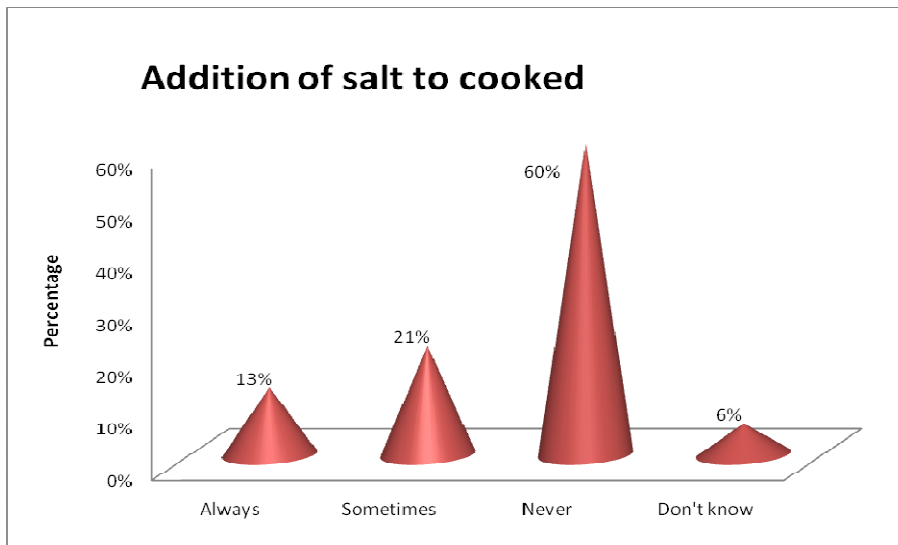


Figure 4.15: Frequent addition of salt to cooked food

A higher percentage (60%) of respondents generally never added salt to cooked food as the majority saw it as a health risk. Only 13% added it always to cooked food and 21% added it sometimes (Refer Figure 4.14). This indicates that only the minority of respondents could increase their salt intake shown in Table 4.6 which could increase their mean daily intake of (14.0mg).

4.5 CORRELATIONS

Positive correlations identified in this study were BMI and WHTR as well as BMI and systolic for women. The men had a significant between correlation BMI and systolic blood pressure.

4.5.1 BMI and waist-to-height ratio correlations in women

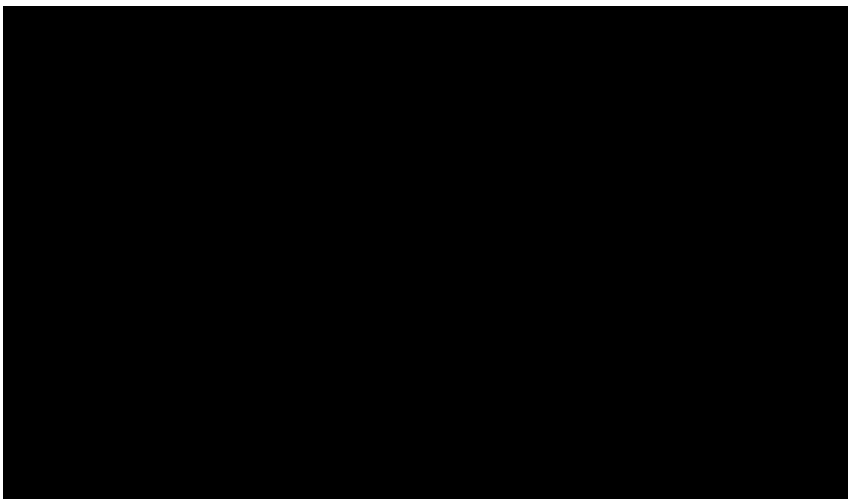


Figure 4.16: The relationship between BMI and waist to height ratio for women.

Correlation is significance at the $p=0.01$ level. There is thus as highly significant relationship between BMI and WHR ratio.

4.5.2 BMI and systolic BP correlations in women

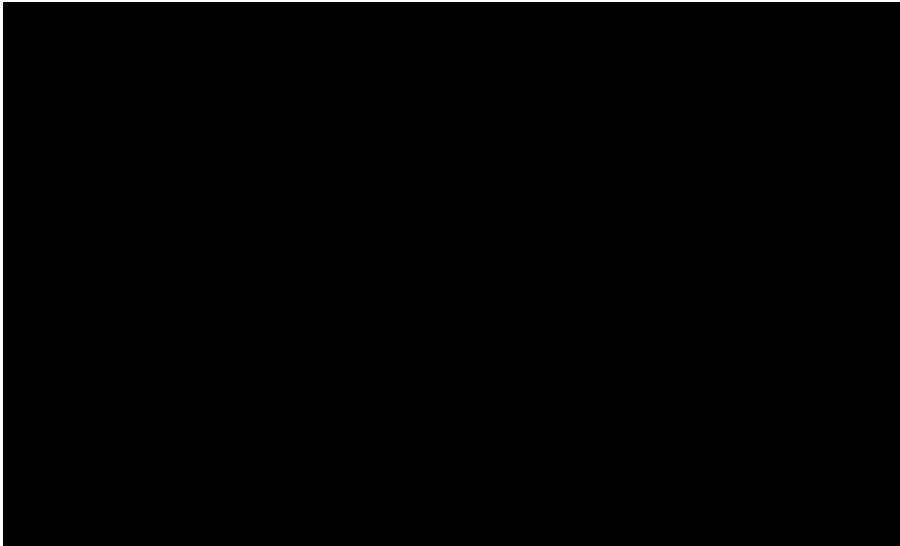


Figure 4.17: The relationship between BMI and systolic BP in women

Correlation is significance at the $p=0.01$ level. It can thus it can be concluded that BMI and WHR and BP are highly correlated and that the chances are good that people with a higher BMI would also present with BP and higher WHR and vice versa.

4.5.3 BMI and systolic BP correlations in men

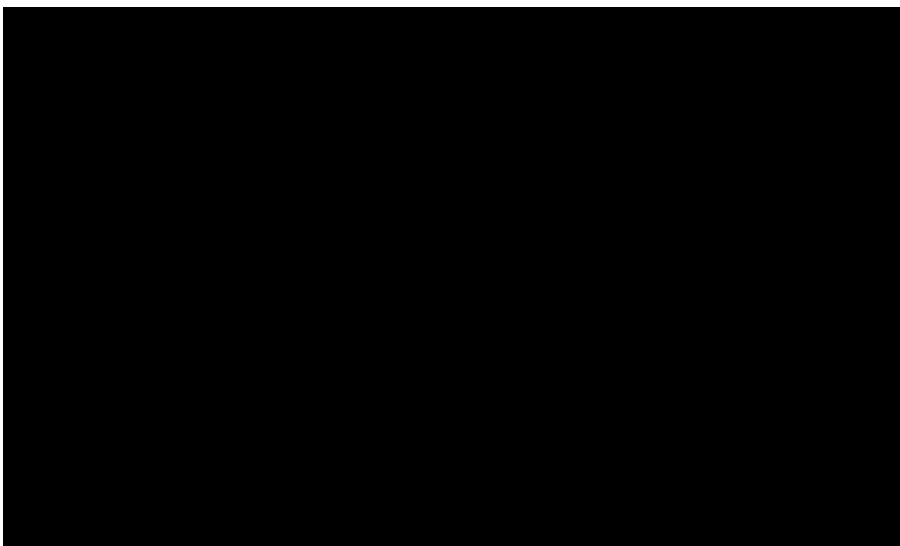


Figure 4.18: The relationship between BMI and systolic BP in men

Correlation is significant at the $p=0.01$ level, there is thus a highly significant relationship between BMI and systolic BP.

4.6 DISCUSSION OF RESULTS

The results analysed in this chapter clearly indicate the high prevalence of poverty and levels of food insecurity and poor nutritional status compromises the quality of life of the elderly living in this community. Socio-economic status plays a vital role in quality of life, including in the food choices that these elderly are able to make. The observation from the study regarding the socio-economic status of this community is that there are high levels of extreme poverty and the elderly remain the breadwinners in many households within this community. Poverty, unemployment and the increasing social burden of children (who are in the main, unemployed) and grandchildren who form a major part of many households are putting a great deal of strain on the limited financial resources of many pensioners. There is a correlation in this observation with a study that observed demographic changes of increasing numbers of people who have been seen playing a significant contribution to family welfare and income, compounded by SASSA. The unique role of elderly as caregivers of their AIDS-stricken children and orphaned grandchildren, warrants greater focus and more comprehensive approach to elevate this burden. Elderly should be a priority in social development, health and nutrition programmes of countries in SAA which primarily target children, women (lactating and pregnant), and people living with HIV/AIDS (Kimokoti et al. 2008). The results also correlate with a study conducted in 15 African countries where the number of elderly living in poverty was higher than national average for particularly the elderly living with children. Social support and regular income are essential in providing social security within this population group (Help Age International, 2008).

The sample is malnourished and at a high risk of disease, mainly due to overnutrition which affects the bodyweight. The majority of the population was either overweight or obese. Women continue to be at a higher risk than men for obesity and disease. The elderly of this community are overburdened with the social responsibility of grandchildren and trying to stabilise various households which is a double burden and puts more strain in the quality of life.

- Dietary intake: The intake of carbohydrates is high amongst the elderly living Umlazi. This could be the main cause of weight gain in this community. The results of top 20 food items consumed as shown in Table 4.4, reveals similar consumption patterns in comparison with as a study conducted in Sharpeville (Oldewage-Theron et al. 2008a). Both elderly groups showed a high carbohydrate diet with maize meal being the main staple. The mean daily intake for elderly in Umlazi was 227g and for those in Sharpeville elderly 273g. Rice was ranked as the 5th most often consumed item in this population whereas the Sharpeville it was the 18th item on the top 20 list. We can conclude that the elderly in Umlazi had a lower 227g (whilst Sharpeville intake was 273g) maize meal consumption but however, a variety of carbohydrates were more prevalent in the top 20 list for this study compared to the elderly in Sharpeville. The current economic status of the population is one of extreme poverty which in turn leads to limited food choice. Staples were the main focus for survival and the average spent on food was R300 per household. The present data confirms observations also conducted by (Townsend et al. 2009) which showed that less energy dense diets were associated with higher energy adjusted diet costs, therefore the low cost are associated with energy dense diets which contain sugar, total fat and saturated fat and less dietary fibre and micronutrients.

- Trends of overweight, obesity and central obesity were very prevalent, particularly in women. This also suggests the high prevalence of hypertension and this continues to be a risk for other lifestyle diseases. The results correlate with a study conducted amongst South African Black women, testing the link between obesity and hypertension (Schutte et al. 2008). The finding also link up with results obtained during this study. According to Tyrovolas, Psaltopoulou, Pounis, Papairakleous, Bountziouka, Zeimbekis, Gotsis, Antonopoulou, Metallinos, Polychronopoulos, Lionis and Panagiotakos (2010), a 1% increase in carbohydrate consumption was associated with a 12% (95% CI 0.78-0.99) lower likelihood of having central obesity, while a 1% increase in carbohydrate and protein consumption was associated with a 14% (95% CI 0.78-0.95) and 16% (95% CI 0.72-0.97) lower likelihood of being obese, respectively. However in this study under-reporting could be a limitation due to memory of elderly, reporting also on physical activity levels and the influence on metabolic rate could contribute to weight gain. According to Townsend (2006) food insecurity is positively associated with overweight among women. Vegetable protein

was found to be associated with a 15% (95% CI 0.77-0.93) lower likelihood of being obese while, only low glycaemic index carbohydrates seem to be associated with a 6% (95% CI 0.90-0.98) lower likelihood of having central obesity. The presented findings suggest that a diet high in carbohydrates and vegetable protein is associated with a lower likelihood of being obese and may help elderly people to preserve normal weight. The findings in this study have shown a high consumption of carbohydrates which could be a link to central obesity and the results have shown that animal protein was the most commonly consumed type of protein.

- Micronutrient deficiency was observed amongst both male and female respondents. Although there was food diversity, the NAR's for vitamins were below 100% for both male and female. Results from Charlton et al. (2007), study in Cape Town – South Africa study showed that the consumption of micronutrients in elderly was also poor, with more than half of older adults had intakes of vitamins A,B6, C, D, E, K and folate, minerals (calcium, selenium, magnesium, copper, and biotin) that were less than the 67% of RDA. This suggests that they are not taken in adequate amounts. The results correlate with this study's findings and supplementary micronutrient intake is imperative for this population. However, financial constraints could be a limiting factor in accessing supplements since the community is poor.

- Although the results in this chapter show that the majority of respondents were on chronic medication and accessed this medication in clinics (refer to Table 4.15) other studies have (Help Age International, 2008) shown that there are limiting factors for elderly having easy access to health care. Other reasons include poor access to transport money, lack of identity documents to give them access to free or discounted services within the health care centre, a lack of knowledge of their entitlements, physical disability, the trauma of standing in long queues and the issue of geographical limitations as the major limitations.
The prevalence of poor sight is also a major medical problem among the population group which could be linked to vitamin A deficiency in their diet and the results clearly indicate low intakes of vitamin A (Table 4.7).

4.7 CONCLUSION

The results analysed in this chapter clearly indicate the high prevalence of poverty and levels of food insecurity and poor nutritional status compromises the quality of life of elderly living in this community. The purpose of this study was to determine the demographic and health profile, as well as the dietary intake and food consumption patterns of the elderly population in this community. Further conclusions will be drawn in this study in the next chapter.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5. INTRODUCTION

The main aim of the study was to conduct a situation analysis on free-living elderly people of Umlazi who are currently living on state pensions. This was done by measuring the current socio-economic, health status and dietary intake of this population. This portion of the population is growing rapidly, particularly in the developing countries. South Africa has the fastest growing elderly population in the Southern African Region. This factor, as described in the literature, highlighted the urgent need to study this group of society. The role of HIV-AIDS and teenage pregnancies has placed a double burden on the elderly in society as they continue to be the primary caregivers, despite the fact that the majority have a meagre state pension as the only source of income.

5.1 LIMITATIONS OF THE STUDY

- The first limitation was getting permission from the Ethekwini municipality. The relevant members from the Mayor's office who had authorisation to write the permission letter were not available. This delayed the implementation of the project.
- The second limitation was politically inspired as the various ward councillors wanted the study to be conducted in their own wards. After many discussions, it was finally agreed that no specific wards would be given preference in the study and so all 12 wards were included in the study. This affected the logistics of the study and the areas to be covered were vast.
- The third limitation was that even after permission had been obtained to conduct the fieldwork in the municipal halls, these venues became unsafe after the first session because they were also used for pension pay-outs so there were security concerns. The fieldwork had to be conducted outside on the street or just inside the fenced area of the facilities. This was problematic as privacy was an issue and the researcher had to obtain screens, chairs and a gazebo to construct an enclosed research fieldwork area.
- The fourth limitation was that some of the elderly refused to participate due to a lack of time, fear of theft, giving confidential information, associating this study with a political agenda, poor hearing, old age, fragile or having bad memory, tiredness and or illness.

- The 24hr recall questionnaires were completed after the socio and health questionnaires and by then the respondents were tired. Three participants failed to complete the 24hr recalls, resulting in only 267 completed questionnaires being available. The rest of questionnaires were completed by the entire sample size of 270.
- The availability of literature that relates to the elderly was limited therefore not enough current sources were used.

5.2 MAIN FINDINGS OF THE STUDY

- It is reported in the literature that South Africa is facing an increasing demand to prioritise the elderly in society as this is the fastest growing population. Literature has also indicated that there is very little data available on South African elderly, specifically on their nutritional and health status. It is evident that the nutritional and social needs of elderly people need to be addressed through developmental programmes and policy. Malnutrition continues to be a global problem affecting the elderly even in their compromised lifestyle due to physical, psychological and socio-economic status. The role of elderly people in South Africa and African community is evident and by improving their household food security, household stability can be improved. Although South Africa is one of the few countries in Africa that provides social grants to this population group, it is evident that this initiative alone is not enough to overcome the burden placed on elderly people within the South African society.
- The socio-demographic survey indicated that the elderly continue to be overburdened with social responsibility within households and that female elderly continue to carry the bulk of this burden within this social environment. The role of social grants (in a form of pension) is a key resource in bringing stability within this society. Although the social living environment is poor, there are still the basic facilities even within the low household budget. The food budget was also compromised because there are large numbers of people living within each elderly household and this leads to high levels of food insecurity. Grandchildren continued to be ever present household members with the elderly which places a further demand of being overburdened with this social responsibility of taking care of them and the rest of the family. The rate of unemployment in South Africa also obviously affects the household budget in these

elderly headed households. The majority of unemployed children were still dependent on their parents and those who did work, showed minimal support to the elderly. The lack of education, and also the lack of access to financial resources also affected the current living state. The majority of the elderly had no financial investments which they could reap benefits from in their later life. The stress of the social burden alone can contribute to further medical complications and compromised quality of life.

- The dietary intake questionnaire highlighted the importance of educating the elderly about the role of good nutrition. This however, needs to be backed up with increasing social support since the results have shown limited financial resources result in limited food choices. Micronutrient deficiencies were evident in the elderly of this community (in both men and women) as well as in various previous studies and this could be linked to the high cost of fruit and vegetables compared to the starchy foods. This was evident in the 24hr- recall report, particularly for fruit intake. However, the food frequency scores indicated moderate variety. The results also indicated that fruit and vegetables were not consumed frequently. Essential micronutrients such as potassium, magnesium and folate which are essential in reducing risk for hypertension were poorly consumed. This clearly indicates that urgent intervention is needed for dietary improvement. The majority of the foods that were consumed by the respondents were mainly carbohydrate based and in South Africa the major staples are maize meal, bread and rice. These foods are generally more affordable than other starches (such as whole grain products) which are rich in fibre. The main protein source was chicken which correlates with the increasing demand for this meat globally. Chapter 1 mentioned this as one of the major imports into South Africa. Diet alone in this population may not be sufficient in addressing some of the nutritional deficiencies facing the elderly population as a result of other complications associated with later life challenges. Other interventions that can be adopted include nutritional supplementation programmes although these require high financial injections, nutrition education, community based programmes that should address nutrition services, psychological and physiological needs. These are vital in addressing this problem in the elderly.

- The health survey indicated that the women were more at risk than the men for hypertension, metabolic syndrome and obesity. Other lifestyle related diseases were not detected as a concern, however, the prevalence of those mentioned above can lead to the development of other diseases and this is a general concern for this population group. The evidence of obtaining chronic medication was also high due to the increased prevalence of hypertension in this population. Other health related concerns included prevalence of eye, teething and skeletal joint related problems which are detrimental during later life. Women should be the priority in addressing this problem within the community. Degenerating health status is linked to vast disease progression and this is a public health concern as it not only increases medical bills but also because the increased intake of medication in order to deal with this, does affect the wellbeing of the elderly and can compromise their nutritional status.

5.3 CONCLUSION

The available literature found that the majority of free living elderly have a similar eating pattern to that of the general population. Risk factors are, however, multifaceted and numerous and can be instrumental in creating health concerns which interfere with nutritional status. Research shows that older adults, especially women are more vulnerable to malnutrition, and to being overweight/obese, both of which contribute to a double burden of disease.

5.4 RECOMMENDATIONS

5.4.1 Recommendations for the community

Effective nutrition intervention programmes need to consider economic, health, social and demographic factors and future research is needed urgently to cater for the growing needs of this population group. Nutrition knowledge is still lacking in this community and continuous nutrition education highlighting the importance of improving eating patterns and food habits within the limited financial budget of households, should thus be implemented in this community to address the household food insecurity and its resulting malnutrition in this elderly community.

5.4.2 Recommendations for policy makers

- More assistance programmes need to be implemented at national and community levels and should address all determinants of nutritional status in elderly, social grants of elderly living with orphans and include income generating projects.
- More interventions are needed, particularly by government agencies to be able to mainstream older people's concern into policy issues, capacity building, including in humanitarian and community development. Collaborative research between the Department of Social Welfare, Department of Health, Senior Citizens' Sector within municipalities and NGO is essential for the success in rolling out any community programmes. Partnerships need to incorporate other organisations already involved in research and programme development.

5.4.3 Recommendations for future research

- One of the major findings in this research indicated extreme levels of food insecurity due to poor financial status and the social responsibility burden that elderly headed households face. Further research needs to be conducted to check that the social grants which are paid for children 1-18years are assisting the elderly headed households since they are the primary care givers and usually have ± 3 children per household. This government support could further alleviate the burden on the elderly.
- Long-term intervention studies, such as home gardening involving the grandchildren to address household food insecurity as well as nutrition education programmes to address malnutrition, are recommended.

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ANNEXURE A:

ETHEKWINI MUNICIPALITY
Office of the Speaker

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Our Ref: *FN/DM/XolileMkhize*

Your Ref:

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12 March 2008

TO WHOM IT MAY CONCERN

REQUEST FOR PERMISSION TO DO A RESEARCH ON ELDERLY CITIZENS OF UMLAZI

Please be advised that Xolile Mkhize, a Student and a Part-time Lecturer at the Durban Institute of Technology has been granted permission to do a research on elderly citizens of Umlazi as part of her Masters Studies.

She will be visiting their homes and also interviewing them on pension sites.

Your support would be greatly appreciated.

Yours faithfully

DESMOND MYEZA
MANAGER: OFFICE OF THE SPEAKER



"We care, we belong, we serve"



ANNEXURE B:

FIELD WORKER MANUAL

Why am I here?

The Department of Food and Nutrition Consumer Sciences has started a variety of research projects in communities around Durban.

The main projects are as follows:

- L.Makhaza: Wellness programmes in Organisations in Durban.
- H. Grobbelaar: The effect of nutrition education on the food intake of immune compromised children in Durban Children's homes.
- P.Dlungela: Nutritional status and dietary intake patterns of adolescent girls living in a rural high school hostel.
- B. Silangwe: Nutritional status and dietary intake patterns of adolescent girls in an Urban high school.
- K. Phetsula: Evaluation of the lunch box content of adolescent girls in a high school in Lindelani.
- L.Gila: Nutritional knowledge and nutritional status of students attending a Hotel School in Durban.
- A. Reddy: The effect of a nutrition education programme on the nutritional knowledge and food intake of University students.
- I. Shabane: Nutritional status of FET college students in Durban.
- Frayne: Nutritional status and dietary intake of primary school school children in a urban community in Uganda.
- T. Govender: Nutritional status and dietary intake patterns of the elderly resident in a frail care facility.
- X. Mkhize: Nutritional status and dietary intake patterns of the elderly visiting an elderly community centre.

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.

How should I behave?

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.
8. Neat Appearance: the field worker must always look neat and well groomed, but never overdressed. The following guidelines for dress should be followed:

- wear neat, simple and comfortable clothes
- do not wear badges or emblems of organisations, churches, etc. as these may influence the way subjects answer.
- dress so that the subject will concentrate on the interview and not on the way you are dressed.

How do I interview the subject?

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.

Interview for the Quantitative Food Frequency Questionnaire.

Quantitative = amounts of food

Frequency = number of times food is eaten

1. Part I

Part I of the QFFQ is aimed at finding out the eating pattern of the subject, that is, how many times a day he eats, at about what times he eats, where he eats and does he consume snacks or drinks between his main meals (and also what does he think of as a snack). We need this information to be able to compare the eating habits of people in different areas and to be able to give people relevant advice.

We start by asking the number of meals the subject ate 'yesterday' because it is easy to remember what you ate yesterday. ('What is a meal?'). Put a circle around the day, which was

'yesterday'. Then ask at about the times at which he ate each meal. The number of questions to ask next will depend on the subject's answer to question 1. So, if the subject answered that he ate 2 meals yesterday ask questions 2.1.1-2.2.2.

We then ask if this is the number of meals he usually eats (2.5). If the answer is YES do not ask questions 2.5.1. We also ask if he eats at these times usually. If the answer is YES do not ask questions 2.6.1-2.6.7.

2. Part 2

We now come to the main part of the QFFQ. It is very important that this information be filled in as accurately as possible. All that the subject tells us will be put onto a computer and analysed to tell use how much energy, protein, fat, vitamins and minerals the subject is eating and whether it is too little or too much to be healthy or whether it is the correct amount.

The subject must answer about what he has eaten or drunk in the last few months. Anything, which he has not eaten in this time, must be marked with an X under 'Seldom/Never'.

Filling in the amounts and frequencies.

For the direct questions, e.g. "Do you eat maize-meal?" circle the number next to the subject's answer.

To fill in the amount: estimate the portion size of the food using the food samples or crockery and utensils available, i.e. cups, spoons, bowls, etc. Write this amount in the column under 'AMOUNT'. If the subject describes the amount as spoons or teaspoons, ask him which size of spoon and whether it is level or heaped. Use L for level and H for heaped. For example: If a subject takes one small, heaped teaspoon of sugar in a cup of tea write *1 x small heaped tsp* under 'AMOUNT' or if he takes 2 level 5 ml teaspoons of sugar per cup of tea write *2 x level tsp* under 'AMOUNT'. Use the sizes of the cups and glasses in the sample pack for amounts of drinks, or the sizes of cans or bottles.

Remember that amount of most foods should be the cooked amount and not the raw amount.

To fill in the frequency: ask the subject how many times he has the food per day; how many times he has it per week or how many times per month. Write the number under the column 'Per

day' 'per week' or 'Per month' For example, a subject has 500g stiff porridge in the morning and evening every day. It will be filled in as follows:

Example 1: The subject eats a medium size dish of maize-meal porridge once every day, except on Sundays.

FOOD	DESCRIPTION	Amount	TIMES EATEN				CODE	AMOUNT/DAY
			Per day	Per week	Per month	Seldom Never		
Maize-meal porridge	Stiff	2 cups	2	7				

Interviewer: How do you like your maize-meal porridge?

Subject: I eat it stiff

Interviewer: (Circle 'Stiff') How much do you eat at a time? (Show the cup and let the subject tell you how many at a time))

Subject: About 1 of those cups.

Interviewer: How many times a day do you eat this amount of stiff porridge?

Subject: I eat it once every day.

Interviewer: (Write 1 under the column Per Day).

Do you eat stiff porridge every day?

Subject: No, I do not eat it on Sunday.

Interviewer: So you eat stiff maize-meal porridge six times a week (Write 6 under the column Per Week)

FOOD	DESCRIPTION	Amount	TIMES EATEN				CODE	AMOUNT/DAY
			Per day	Per week	Per month	Seldom Never		
Maize-meal porridge	Stiff	1 cup	1	6				

Example 2. The subject eats a large dish of ting twice a month

I: Do you eat ting?

S: Yes

I: How much do you eat (*Show the cup and let the subject tell you how much would fit in the cup*)

S: About 2 of those cups.

I: How many times a day do you eat ting?

S: I don't eat ting every day.

I: How many times a week do you eat ting?

S: I eat it less than once a week

I: How many times a month do you eat it?

S: I eat it twice a month.

I: (*Write 2 under the 'per month' column*)

FOOD	DESCRIPTION	<i>Amount</i>	TIMES EATEN				<i>CODE</i>	<i>AMOUNT/DAY</i>
			Per day	Per week	Per month	Seldom Never		
Ting		<i>2 cups</i>	1		2			

Brand names.

In some sections, the subject is asked what brand he uses. This is so that we can be sure to use the correct item for nutrient analyses. For example, some maize-meals have vitamins added, others do not. The subject may not know whether the maize-meal he uses has added vitamins or not, but he should know the brand name. We can then check if that brand has added vitamins or not. The same applies to margarines, milk powders, fruit juices, and breakfast cereals.

Preparation methods (meat and vegetables).

Do not read out the list of all the possible preparation methods to the subject. Ask 'How do you prepare your beef?' Then circle the option closest to the subject's answer. If the answer does not fit one of the options, circle 'other' and write in the description.

Also, check if the subject cooks the food in more than one way.

If the subject does not know the preparation method (men or if eaten away from home), help him by reading the list. If he still does not know, circle 'Don't know' and fill in the amounts and frequency next to 'Don't know'.

Example: The subject sometimes cooks cabbage with potato and onions and sometimes fries it.

I: How do you cook cabbage?

S: I cook it with potato and onion.

I: *(Circle boiled with potato, onion and fat).*

Do you cook it any other way?

S: Sometimes I fry it.

I: *(circle Fried, nothing added)*

What is the amount you eat if it is cooked with potato and onion? *(Show the samples, cutlery or crockery available)*

S: This one *(Subject points to ladle)*

I: *(Write 1 ladle under 'Amount' next to boiled, potato, onions and fat).*

How often do you eat it?

S: About three times a week.

I: *(Write 3 under 'per week')*

What is the amount you eat when you fry cabbage?

(Show the samples, cutlery or crockery available)

S: This one *(Subject points to ladle)*

I: *(Write 1 ladle under 'Amount' next to fried, nothing added).*

How often do you eat it?

S: I only fry it if I haven't got any potatoes?

I: How many times per month is that?

S: Usually at month end, when the potatoes are finished.

I: So, how many times a month?

S: Say twice a month.

I: (*Write 2 under 'per month'*) Can I check that I have got this right? You eat cabbage with potato and onion three times a week and fried cabbage with nothing added twice a month.

S: That is right.

FOOD	DESCRIPTION	Amount	TIMES EATEN				CODE	AMOUNT/DAY
			Per day	Per week	Per month	Seldom Never		
Cabbage	How do you cook cabbage?							
	Boiled nothing added							
	Boiled with potato, onion and fat	30	1	3				
	Fried nothing added	30	1		2			
	Boiled then fried with potato onion							
	Other describe Don't know							

Other foods.

Vegetables and fruit: Ask the subject which vegetables and fruits he eats and mark them on the questionnaire, then go back to each answer and ask about the preparation, amount and frequency. Do not read the list to the subject.

Tomato and onion gravy: Use the ladle to help the subject judge the amount of gravy used with the porridge.

Canned fruit with custard: Custard is included under fruit as it is usually eaten with canned fruit. This is also a control question, as canned fruit and custard is also included under puddings. The answers to both questions must be the same. If not, make sure the subject has understood the question.

Bread and spreads: Ask the subject if he spreads anything on his bread. If he answers **YES** ask him what he spreads and mark them on the questionnaire, then go back to each answer and ask about the amount and frequency. Do not read the list to the subject. (Remember not to ask how much is put on per slice of bread, but how much is used every day or every week or every month).

Atchar: Atchar is included here as a spread on bread, it is also asked about later under 'condiments' for when it is used as sesebo.

Polony: Polony is asked about here again (it was included with cold meat) as something put on bread, whereas previously it was asked about as cold meat. Make sure with the subject whether he uses polony only on bread (e.g. with atchar) or if he also eats it on its own.

Margarine: There is a difference between the type of fat in soft (tub) margarines and hard (brick) margarines. When you ask about the brand also ask whether it is the hard or soft type and write the answer with the brand e.g. '*Rama - soft*' or '*Rama - hard*'.

Fats, drinks and snacks: As for vegetables, fruit and spreads. Ask the subject what he uses and mark them on the questionnaire, then go back to each answer and ask about the preparation, amount and frequency. Do not read the list to the subject.

Fats: Most people will add fat to vegetables or other food while it is being cooked. So to try to find out how much fat one person is getting, we need to ask how much fat is used for the whole amount of food and then how many people will eat the food. These are also checking questions for the cooking methods of vegetables.

Alcoholic drinks: Some questions are asked in the first general questionnaire about the use of alcohol. The subject may want to know why he is being asked again. The first questionnaire is to assess the general state of health of the subject and alcohol is a part of this. In our questionnaire we want to find out the amounts used as alcoholic drinks are 'food' and contribute energy and some nutrients to the diet.

Repetition: Some questions are repeated e.g. custard, atchar, polony. This has been done as a double check to make sure that everything is included. For example, atchar may be spread

on bread or eaten as 'sesebo'. The subject may only think of it as sesebo, if it was not also included under spreads.

Storing food: Keeping food can affect its nutritional value and other properties of the food. If food is regularly stored, it could have an important effect on the quality of the diet.

Salt: Separate questions are asked about the use of salt, as it is very difficult to estimate the amount of salt used.

Interview for the 24-Hour 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	1x		
		With milk	little milk		
		And sugar	2 heaped tsp		
		Soft mealie meal porridge	2 cups		
		With sugar	2 heaped tsp		
		And margarine	1 tsp		

Portion sizes

FOOD	Smaller than smallest	Between small and medium	Between medium and large	Between large and very large	Larger than large/very large
Stiff porridge	125 g	275 g	425 g	600 g	800 g
Soft porridge	125 g	275 g	425 g		575 g
Samp and beans	100 g	200 g	375 g	600 g	800 g
Rice	70 g	105 g	190 g		310 g
French fries	30 g	90 g	185 g		340 g
Fried beef	15 g	45 g	80 g		120 g
Beef with bone	45 g	75 g	120 g		180 g
Meat stew	55 g	165 g	275 g		385 g
Sausage/ Wors	20 g	50 g	90 g		135 g
Offal	20 g	60 g	100 g		140 g
Pilchards	15 g	45 g	90 g		150 g
Mashed pilchards	15 g	45 g	90 g		240 g
Fried fish	50 g	70 g	105 g		155 g
Cabbage, potato and onion	15 g	45 g	75 g		105 g
Spinach, potato	15 g	45 g	75 g		105 g
Tomato and onion	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
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
Cheese curls	6 g	18 g	38 g		62 g

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

Other questionnaires

We may also use any of the following questionnaires:

Socio-demographic questionnaire

Health questionnaire

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

ANNEXURE C:

ANTHROPOMETRIC, HEALTH AND MEDICAL AND QUESTIONNAIRE

Section A:

Surname		ID number (if applicable)	
First Names		Age	
Height	, m	Weight	, kg
Gender	Male <input type="checkbox"/> Female <input type="checkbox"/>		
Waist Measure/cm		Blood Pressure	

Section B:

HEALTH QUESTIONNAIRE:

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 or teeth?			
Any affection of the ears or nose?			
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. Do you suffer from Cancer ?			
11. Do you suffer from Diabetes			
12. Do you suffer from Hypertension ?			
How do you know? Professional Diagnosed or Self			Specify
10. Any other illness?			

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)	

	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		

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

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

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

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

Section C:

MEDICATION QUESTIONNAIRE:

	<i>Yes</i>	<i>No</i>
1. Do you use any medication?		
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?

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

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

Has there been a death of a child under 5 years within the family?	Tick the correct block
1. Yes	
2. No	

If yes answer the next two questions

How old was the child?	Tick the correct block
1. Still born	
2. 0-7 days	
3. 0-3 Months	
4. 4-12 Months	

5. 13 – 24 Months	
6. 2-5 years	

Do you know the cause of death	Tick the correct block
1. Yes	
2. No	

If yes please specify:

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

ANNEXURE D:

SOCIO-DEMOGRAPHIC QUESTIONNAIRE:

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

1. GENERAL INFORMATION

Respondent ID number:.....

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

Where do you live?

.....

2. PERSONAL INFORMATION

2.1 Your role in the family

Mother	Grandmother	Caregiver	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 Where do you live?

Town/City	Farm	Informal settlement	Rural village	Hostel	Other, specify.....
-----------	------	---------------------	---------------	--------	---------------------

3.2 Do other people live in your house?

Yes
No

3.3 How many people are living in your house?

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

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

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

3.5 Are all members permanent residents in this house?

Yes	No
-----	----

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

< 1 year	1-5 years	>5 years
----------	-----------	----------

3.7 Do you have another home outside the Vaal Triangle?

Yes	No
-----	----

3.8 In what type of house are you staying?

Brick	Clay	Grass	Zinc/shack
-------	------	-------	------------

3.9 How many rooms does your house have?

< 2 rooms	3-4 rooms	> 4 rooms
-----------	-----------	-----------

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

Yes	No
-----	----

3.10 How would you describe the place where you are currently living?

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

3.11 Do you have the following facilities at home?

3.11.1 Water

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

3.11.2 Toilet facilities

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

3.11.3	Waste removal	Yes	No
--------	---------------	-----	----

3.11.4	Tarred road in front of house	Yes	No
	Gravel road in front of house	Yes	No

3.12 To what extent do you have problems with your housing (e.g. too small, repairs, damp, etc.)?

.....

3.13. Do you have problems with the following?

Mice / Rats	Cockroaches	Ants	Other pests, specify.....
-------------	-------------	------	------------------------------

4. WORK STATUS AND INCOME

4.1. Have you been previously 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. Is your job?

Full time	< 25 hours per week
-----------	---------------------

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

--

4.8 Do you have a second job for extra cash?

Yes	No
-----	----

If YES, go to Question 4.10.

4.9 If NO, is your spouse (partner) in paid employment at present?

Yes, full time, permanent	
Yes, part-time, permanent (< 25 hours p w)	
Yes, temporary	
No, unemployed	
No, retired	
No, other, specify.....	

4.10. If YES, what is your spouse (partner)'s occupation or job?

--

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

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

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

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

Always	Often	Sometimes	Seldom	Never
--------	-------	-----------	--------	-------

4.14 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
--------	---	---	---	---	---	---	---	---	---	---

4.15 How often do you buy food?

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

4.16 Where do you buy food?

Spaza shop	Street vendor	Supermarket	Other, specify.....
------------	---------------	-------------	------------------------

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

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

4.18 How much money do you give to each child to take to school for buying food / snacks PER WEEK?

50 c	R 1 – 2	R 2- 3	R 3 - 4	R 4 - 5	> R 5
------	---------	--------	---------	---------	-------

5 EDUCATION AND LANGUAGE

5.1. What is the highest education you have?

None	Primary School	Standard 8	Standard 10	College	Other post school
------	----------------	------------	-------------	---------	-------------------

5.2 What language is spoken mostly in the house?

Sotho	Xhosa	Zulu	Pedi	Other, specify.....
-------	-------	------	------	---------------------

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

None	1	2	3	4	5	6	7	8	All
------	---	---	---	---	---	---	---	---	-----

5.4 How many children have completed their immunisation schedule?

None	1	2	3	4	5	6	7	8	All
------	---	---	---	---	---	---	---	---	-----

5.5 Number of children attending school

None	1	2	3	4	5	6	7	8	All
------	---	---	---	---	---	---	---	---	-----

5.6 How do the children get to school?

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

6 ASSETS

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

6.6 How many meals do you eat at per day?

0	1	2	3	> 3
---	---	---	---	-----

6.7 Where do you eat most of your meals?

Home	Friends	Work	Buy	Other, specify.....
------	---------	------	-----	---------------------

6.8 Where do your children eat most of their meals?

Home	Friends	School	Buy	Other, specify.....
------	---------	--------	-----	---------------------

6.9 Does your home have the following and how many?

	Yes	No	Quantity
Electrical stove			
Gas stove			
Primus or paraffin stove			
Microwave			
Hot plate			
Radio			
Television			
Refrigerator			
Freezer			
Bed with mattress			
Mattress only			
Lounge suite			
Dining room suite			
Electrical iron			
Kettle, electrical			

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

Food fire	Paraffin	Electricity	Gas	Coal	Other, specify.....
-----------	----------	-------------	-----	------	------------------------

6.11 What type/s of pots do you use to cook your food (tick all relevant options)?

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

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

ANNEXURE E:

24 – HOUR RECALL

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

Interviewer: _____

Name: _____ Date: _____ / _____ / 2003

Address: _____

Tick what the day was yesterday:

Monday	Tuesday	Wednesday	Thursday	Friday
--------	---------	-----------	----------	--------

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

Yes	1	No	2
-----	---	----	---

If not, why? _____

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

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

During the morning at work or at home					

Time (approximately)	Place (Home, school, etc)	Description of food and Preparation method.	Amount	Amount in g (office use Only)	Code (office use only)

Middle of the day (Lunch time)					
During the afternoon					
At night (dinner time)					

Time (approximately)	Place (Home, school, etc)	Description of food and preparation method.	Amount	Amount in g (office use Only)	Code (office use only)

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

ANNEXURE F:

FFQ LIST OF FOODS AND FOOD GROUPS DIVERSITY

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

GROUP 1: Flesh foods (meat, poultry, fish) diversity	Y	N
Chicken Meat:		
Feet and runners		
liver		
gizzards		
sausages		
Beef Meat:		
mince		
liver		
tribe/offal		
sausages		
boerewors		
Mutton/ Lamb Meat		
mince		
liver		
Tribe/offal		
sausages		
Pork Meat		
sausages		
liver		
Fish: (fresh / whole)		
Tinned fish (pilchards)		

Tinned fish (tuna)		
Goat (meat)		
Vienna's / polony		
Russians		
Group 2: Eggs diversity		
Eggs		
Group 3: Dairy products diversity		
Milk, unpasteurized (cow)		
Evaporated milk (unsweetened)		
Condensed milk sweetened		
Maas/ inkomasi		
Powdered milk		
Skim or low-fat milk (pasteurized)		
Full cream milk (pasteurized)		
Cheese		
Custard		
Ice cream		
Yoghurt		
Ultramel		
Yogi sip		

Group 4: Cereals, roots and tubers diversity	Y	N
Rice		
Maize rice (mielierys)		
Pap (Maize)		
Macaroni/pasta/spaghetti		
Maize rice (mielierys)		
Samp (stampmielies)		
Bread (white or brown)		
Whole wheat bread		
Dumpling		
Steamed Bread (ujeqe)		
Mealie Bread (isinkwa sombila)		
Isingingi(maize meal & pumpkin)		
Isigwaqana (maize meal & beans		
Isigwmba (maize meal & wild leafy vegetables)		
Fat koek		
Scones		
Biscuits		
Buns / bread rolls		
Mabela (soft porridge)		
Maize meal porridge		
Morvite		
Corn flakes		
Oats		
Wheat bix		

Mageu		
Potatoes		
Sweet potatoes		
Amadumbe		
Umqombothi		
Traditional beer		
IJuba		
Group 5: Legumes and nuts		
Sugar beans		
Peas (dried)		
Lentils		
Jugo beans		
Peanut butter		
Peanut or any other nuts		
Soya		
Izinkobe (beans & maize stew)		
Popcorn		
Group 6: Vitamin A rich fruits and vegetables diversity		
Pumpkin		
Carrots		
Wild leafy vegetables (Imifino)		
Fresh and dried		
Spinach		
Butternut		

Apricots (Applelkoos)		
Peach (yellow cling)		
Mango		
Group 7: Other fruits (and juices) diversity		
Deciduous fruits		
Apple		
Peaches		
Pear		
Grapes (black/green)		
Plum		

Sub – tropical fruit		
Lemon		
Orange		
Naartjie		
Banana		
Pineapple		
Avocado		
Blueberry		
Cherry		
Kiwi fruit		
Raspberry		
Watermelon		
Wild watermelon(tsamma)		
Guava		

Paw- paw		
Juices/Tea		
Juice (100% pure juice e.g. Ceres/Liquifruit)		
Diluted Juice		
Fizzy Drinks		
Coffee		
Tea		
Group 8: Other vegetables diversity		
Onions		
Cabbage		
Beetroot		
Tomatoes		
Green beans (fresh)		
Peas (fresh – green)		
Cauliflower		
Chili (red/green)		
Lettuce		
Mushroom		
Baby marrow		
Green pepper		
Sweet-corn (baby)		
Corn-on-the-cob(white)		
Garlic		
Mixed Vegetables (fresh/frozen)		

Group 9: oils and Fats diversity		
Butter		
Sunflower oil		
Margarine		
Lard		
Salad dressing/oil		
Potato Crisps		
Group 10: Sugar		
Brown sugar		
White sugar		
Artificial Sweeteners		

Proofreading and Correcting

TO WHOM IT MAY CONCERN:

This letter serves to state that I have proofread a copy of the following Dissertation/ Thesis/ Journal Article and have made suggestions to the researcher in terms of corrections which s/he may choose/choose not to put into effect in the final copy:

TITLE: A situational analysis of free-living elderly people in Umlazi, KwaZulu-Natal, South Africa: (Chapters 1, 2, 3, 4 and 5 only)

RESEARCHER: Xolile Mkhize

The general areas covered in this proofreading include:

- Spelling - with special reference to English UK spellings of specific words.
- Correction of grammatical errors: syntax, concord etc.
- General editing to improve the language and vocabulary used and to, where necessary, adjust to make the work more academic in tone and style.
- Comments on general layout in terms of consistency in style: bullet lists, Figure and Table headings, Chapter headings and sub-headings.
- Comments and corrections of the Reference List entries



Date: 31 January 2011

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