

CAUSES OF MALNUTRITION IN MANGAUNG

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Declaration of Independent Work

DECLARATION WITH REGARDS TO INDEPENDENT WORK

I, **Michéle Pienaar**, identity number **8011250075081** and student number **1999324864**, do hereby declare that this research project submitted to the **University of the Free State** for the degree **MAGISTER SCIENTIAE: Causes of Malnutrition in Mangaung**, is my own independent work, and has not been submitted before to any institution by myself or any other person in fulfilment of the requirements for the attainment of any qualification. I further cede copyright of this research in favour of the University of the Free State.

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TABLE OF CONTENTS	PAGES
ACKNOWLEDGEMENTS	i
LIST OF TABLES	x
LIST OF FIGURES	xiii
LIST OF ABBREVIATIONS	xiv
LIST OF APPENDICES	xvii
SUMMARY	a
OPSOMMING	d

CHAPTER 1: PROBLEM STATEMENT

1.1 Introduction and problem statement	2
1.2 Objectives	12
1.2.1 Main Objective	12
1.2.2 Sub-aims necessary to achieve the main objective	12
1.3 Outline of dissertation	13

CHAPTER 2: LITERATURE REVIEW: CAUSES OF MALNUTRITION

2.1 Introduction	15
2.2 Prevalence of Malnutrition	17
2.2.1 Globally	17
2.2.2 South Africa	19
2.3 Causes of Malnutrition	21
2.3.1 Immediate Causes	24
2.3.1.1 Inadequate Dietary Intake	25
2.3.1.2 Psychosocial Care	29
2.3.1.3 Disease	31
2.3.2 Underlying Causes	38
2.3.2.1 Inadequate Education	38
2.3.2.2 Insufficient Household Food Security	40
2.3.2.3 Inadequate Maternal and Child Care	45
2.3.2.4 Insufficient Health Services and Unhealthy Environment	48
2.3.3 Basic Causes	51
2.3.3.1 Economic Structure	52
2.3.3.2 Political and Ideological Superstructure	55
2.4 Manifestations of Malnutrition	58

2.5 Measurement of Growth	64
2.5.1 Indicators and Cut-off Points	64
2.5.2 Interpretation	66

CHAPTER 3: EXPERIMENTAL PROCEDURE

3.1 Introduction	70
3.2 Pilot Study	71
3.3 Population and Sampling	71
3.3.1 Study design	71
3.3.2 Study population	72
3.4 Operational Definitions	73
3.4.1 Household and socio-demographic information	73
3.4.2 Weight and height status	74
3.4.3 Dietary Intake	75
3.5 Apparatus and Techniques	75
3.5.1 Questionnaire	75
3.5.2 Weight and height status	76
3.5.3 Dietary Intake	77

3.6 Reliability and Validity	77
3.6.1 Questionnaire	78
3.6.2 Anthropometric measurements	79
3.6.3 Dietary Intake	79
3.7 Statistical Analysis	79
3.7.1 Household Information	80
3.7.2 Anthropometry	80
3.7.3 Dietary Intake	80
3.7.4 Associations between variables	81
3.8 The role of the researcher	81
3.9 Study Procedures	82
 CHAPTER 4: RESULTS	
4.1 Introduction	86
4.2 Demographic profile of respondents	86
4.3 Household and socio-demographic information	88
4.4 Anthropometry	94
4.4.1 Weight and height status of the caregiver	94

4.4.2 Weight and height status of children < 6 years	95
4.5 Dietary intake	96
4.6 Associations	102
4.6.1 BMI of caregivers and household information	103
4.6.2 BMI of caregivers and socio-demographic information	104
4.6.3 BMI of caregivers and medical conditions	107
4.6.4 BMI of caregivers and clinic attendance and efficacy (PSNP and PEM)	109
4.6.5 BMI of caregivers and dietary intake of adults, children and babies	111
4.6.6 Z-scores and household information	113
4.6.7 Z-Scores and socio-demographic information	115
4.6.8 Z-Scores and medical conditions	122
4.6.9 Z-Scores and clinic attendance and efficacy (PSNP and PEM)	128
4.6.10 Z-Scores and dietary intake of adults, children and babies	132

CHAPTER 5: DISCUSSION OF RESULTS

5.1 Introduction	138
5.2 Limitations of the study	138

5.2.1 Study population	139
5.2.2 Survey limitations	139
5.2.3 Dietary intake	140
5.3 Validity and reliability of questionnaire	141
5.3.1 Reliability	141
5.3.2 Validity	142
5.4 Demographic profile of respondents	143
5.5 Household and socio-demographic information	144
5.6 Anthropometry	151
5.6.1 Weight and height status of the caregiver	152
5.6.2 Weight and height status of children < 6 years	153
5.6.2.1 Weight-for-age	153
5.6.2.2 Height-for-age	154
5.6.2.3 Weight-for-height	155
5.7 Dietary intake	156
5.7.1 Adequate dietary intake	156
5.7.2 Frequency of food intake	158
5.7.2.1 Frequency of snack intake	158
5.7.2.2 Frequency of tea and coffee intake	159
5.7.2.3 Frequency of milk intake	159

5.7.2.4 Frequency of meat and meat product intake	160
5.7.2.5 Frequency of starch intake	161
5.7.2.6 Frequency of fruit and vegetable intake	162
5.7.2.7 Frequency of other foods intake	162
 5.8 Discussion of associations	 163
5.8.1 Associations between BMI of caregivers and household and socio-demographic information	163
5.8.2 Associations between BMI of caregivers and dietary intake	166
5.8.3 Associations between Z-scores and household and socio-demographic information	166
5.8.4 Associations between Z-Scores and dietary intake	169

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction	172
 6.2 Conclusions	 172
6.2.1 Immediate causes of malnutrition in Margaung	172
6.2.2 Underlying causes of malnutrition in Margaung	175
6.2.3 Basic causes of malnutrition in Margaung	177
 6.3 Recommendations	 178
6.3.1 Immediate causes	178

6.3.2 Underlying causes	180
6.3.3 Basic causes	182
LIST OF REFERENCES	183

LIST OF TABLES

Table 2.1	Cut-off points of BMI	68
Table 4.1	Demographic profile	87
Table 4.2	Household information	88
Table 4.3	Health information	92
Table 4.4	Weight and height status of caregiver	94
Table 4.5	Weight-for-age	95
Table 4.6	Height-for-age	95
Table 4.7	Weight-for-height	96
Table 4.8	Adequate Dietary Intake	97
Table 4.9	Food Frequency – Snacks	98
Table 4.10	Food Frequency – Tea and Coffee	99
Table 4.11	Food Frequency – Milk	99
Table 4.12	Food Frequency – Meat and meat products	100
Table 4.13	Food Frequency – Starches	101
Table 4.14	Food Frequency – Fats	101
Table 4.15	Food Frequency – Fruits and vegetables	101
Table 4.16	Food Frequency – Other	102
Table 4.17	Association between BMI of caregivers and household information	103
Table 4.18	Association between BMI of caregivers and socio-demographic information	105
Table 4.19	Association between BMI of caregivers and	

	medical conditions	109
Table 4.20	Association between BMI of caregivers and clinic attendance and efficacy	110
Table 4.21	Association between BMI of caregivers and inadequate dietary intake of adults and children	112
Table 4.22	Association between weight-for-age and household information	113
Table 4.23	Association between height-for-age and household information	114
Table 4.24	Association between weight-for-height and household information	115
Table 4.25	Association between weight-for-age and socio-demographic information	116
Table 4.26	Association between height-for-age and socio-demographic information	118
Table 4.27	Association between weight-for-height and socio-demographic information	120
Table 4.28	Association between weight-for-age and medical conditions	123
Table 4.29	Association between height-for-age and medical conditions	125
Table 4.30	Association between weight-for-height and medical conditions	127
Table 4.31	Association between weight-for-age and clinic attendance and efficacy	128

Table 4.32	Association between height-for-age and clinic attendance and efficacy	130
Table 4.33	Association between weight-for-height and clinic attendance and efficacy	131
Table 4.34	Association between weight-for-age and inadequate dietary intake of adults and children	132
Table 4.35	Association between height-for-age and inadequate dietary intake of adults and children	134
Table 4.36	Association between weight-for-height and inadequate dietary intake of adults and children	135

LIST OF FIGURES

Figure 2.1	Causes of Malnutrition are Multisectoral	23
Figure 2.2	Viscous cycle between inadequate dietary intake and disease	24
Figure 2.3	Stages in the development of a nutrient deficiency	59
Figure 3.1	A schematic representation of the study procedures	84

LIST OF ABBREVIATIONS

AI	adequate intake
AIDS	Acquired Immunodeficiency Syndrome
ARI	acute respiratory infections
BMI	body mass index
CI	confidence intervals
CV	coefficient of variation
DHS	Demographic and Health Survey
DoE	Department of Education
DoH	Department of Health
ETOVS	Ethics committee of the Faculty of Health Sciences, University of the Free State
FFQ	food frequency questionnaire
H/A	height-for-age
HIV	Human Immunodeficiency Virus
HOW	Health Of Women
HST	Health System Trust
IDD	Iodine Deficiency Disorder Survey
INP	Integrated Nutrition Programme
kg	kilogram
kg/m²	unit of body mass index
kJ	kilojoules
LMI	liggaamsmassa-indeks
mm Hg	millimeters Mercury
m²	meters square

N	total
NALEDI	National Labour and Economic Development Institute
NCD	noncommunicable diseases
NCHS	National Centre for Health Statistics
NFCS	National Food Consumption Survey
NGO	non governmental organisation
NPA	National Programme of Action for Children in South Africa
NRF	National Research Foundation
OHS	October Household Survey
PEM	protein-energy malnutrition
PHC	primary health care
PSNP	Primary School Nutrition Programme
RDA	recommended dietary allowances
RDP	Reconstruction Development Programme
SA	South Africa
SARPN	South African Regional Poverty Network
SAVACG	South African Vitamin A Consultancy Group Survey
SD	standard deviation
TB	Tuberculosis
TE	total energy
THUSA	Transition and Health during Urbanisation of South Africans
UFS	University of the Free State
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Financial Fund
USAID	United States Agency for International Development

W/A	weight-for-age
W/H	weight-for-height
WHO	World Health Organisation
μg	micro gram
W/H²	W is weight in kilograms and H is height in square meters
>	bigger than
<	smaller than
≥	equal to, and bigger than
≤	equal to, and smaller than

LIST OF APPENDICES

Appendix A	Questionnaire	I
Appendix B	Informed consent (English)	VI
Appendix C	Informed consent (SeSotho)	VIII
Appendix D	Letter to Councilor	X
Appendix E	Criteria used by fieldworkers in the completion of the questionnaire	XI

SUMMARY

Malnutrition is often a silent and invisible problem and its persistence has profound and devastating implications for children, society and the future of humankind. While good nutrition is extremely important for a healthy lifestyle and quality of life, the effects of poor nutrition are devastating. Before interventions can be implemented however, it is essential to determine the specific causes of malnutrition in a community.

The community of Mangaung is a rapidly urbanizing community where the double burden of malnutrition and diseases of lifestyle occur simultaneously. The causes of malnutrition are seen as deeply rooted in environmental factors, such as poverty and lack of education. In any attempt to improve nutritional status it is therefore important to assess the relationship between certain environmental factors and nutritional status indicators.

The aim of this study was to assess nutritional status (anthropometric status and dietary intake) and household resources (household and parent/caregiver particulars), in an attempt to identify specific issues that play a role in the development of malnutrition. The main objective of this study was thus to provide baseline data on causes of malnutrition in two areas of Mangaung, namely JB Mafora and Namibia.

Household information and socio-demographic status were determined by means of a questionnaire completed in an interview. BMI of caregivers and weight-for-age, height-for-age and weight-for-height of children younger than six years were obtained using standard techniques. Dietary intake was determined by a questionnaire during an interview.

The results in the study identified a number of socio-demographic factors associated with malnutrition. A concerning percentage of households had no income and in most households only one person contributed to income. Although a large proportion of breadwinners in the study areas were employed, a large proportion of household members were either unemployed or were dependent on another source of income, i.e. pension. In a large proportion of households, none of the women used any family planning. The percentage of respondents who ever attended clinics, were high. Level of education of household members older than 18 years showed that only a few of household members received education on tertiary level, while more than ten percent had no schooling. Regarding medical conditions a significant amount of household members indicated hypertension. As expected, diarrhea, loss of appetite and weight loss was generally more prevalent in underweight caregivers, but differences were not statistically significant.

The prevalence of overweight and obesity in the studied group of household members was an outstanding anthropometric feature, with almost half of caregivers falling in the overweight or obese categories. Results of this study indicated that the number of well-nourished children in this study was small.

The percentage of underweight children (17%) was higher when compared with the NFCS (1999), while a large percentage (30.3%) of children were stunted. As expected, a much smaller percentage of children (9.2%) in the study had a reduced weight-for-height than a weight-for-age or height-for-age.

A relatively large proportion of the respondents did not consume foods from all three groups during each meal. Almost all adults did not consume a balanced breakfast, the majority did not include all three food groups for lunch and more than half did not have a balanced supper. In the case of children, a high percentage did not eat a balanced diet. In the case of babies (between birth and six months), results showed that approximately 80.0% of babies received a well balanced diet throughout the day. This is due to the high percentage of mothers who exclusively breastfed their babies.

With the view to implementing a relevant nutrition education intervention program in Mangaung in the future, this base-line study (2004) was considered essential. Findings on the existing nutritional status and specific causes of nutritional problems of the community of Mangaung, can make a meaningful contribution to the design of effective nutrition intervention programmes.

OPSOMMING

Wanvoeding is dikwels 'n onopmerklike probleem en die voortbestaan het belangrike en skadelike gevolge vir kinders, die gemeenskap en die toekoms van die mens. Terwyl gebalanseerde voeding van uiterste belang is vir 'n gesonde lewensstyl, kan die gevolg van ongebalanseerde voeding verwoestend wees. Alhoewel verskeie intervensies geïmplementeer kan word, is dit noodsaaklik om eers die oorsake van wanvoeding in die gemeenskap vas te stel.

Die gemeenskap van Mangaung is 'n vinnig verstedeliking gemeenskap waar die dubbele las van wanvoeding en lewensstyl siektes gelyktydig geskied. Die oorsake van wanvoeding kan beskryf word as diep gewortel in omgewingsfaktore, byvoorbeeld armoede en gebrek aan onderrig. Dit is dus belangrik om die verhouding tussen sekere omgewingsfaktore en voedingsstatus aanwysers vas te stel om sodoende voedingstatus te verbeter.

Die doel van die studie was om voedingstatus (antropometriese status en dieetinname) asook huishoudelike bronne (huishouding en ouer/versorger besonderhede) te evalueer, om sodoende spesifieke aspekte wat moontlik kan bydrae tot wanvoeding te identifiseer. Die hoofdoel van die studie was dus om basiese inligting oor die oorsake van wanvoeding in twee areas in Mangaung, naamlik JB Mafora en Namibia, te versamel.

Huishoudelike inligting asook sosio-demografiese status is bepaal deur middel van 'n vraelys wat voltooi is gedurende 'n onderhoud. Liggaamsmassa-indeks (LMI) van versorgers, asook massa-vir-ouderdom, lengte-vir-ouderdom en massa-vir-lengte van kinders jonger as ses jaar, is versamel deur middel van standaard tegnieke. Dieetinnome is bepaal deur middel van 'n vraelys wat voltooi is tydens 'n onderhoud.

Die resultate van die studie het 'n aantal sosio-demografiese faktore wat met wanvoeding geassosieer kan word, identifiseer. Dit is kommerwekkend dat 'n groot aantal huishoudings geen vaste inkomste ontvang het nie. In meeste huishoudings het slegs een persoon bygedra tot inkomste. Alhoewel 'n groot aantal broodwinners in die studie werkend was, was 'n groot persentasie van die huishoudlede of werkloos of afhanklik van 'n ander bron van inkomste, byvoorbeeld pensioen. In 'n groot persentasie huishoudings het vrouens geen gesinsbeplanning gebruik nie. Die persentasie van huishoudlede wat klinieke besoek het, was relatief hoog. Vlak van onderrig van huishoudlede ouer as 18 jaar dui aan dat slegs 'n paar huishoudlede tersiêre onderrig ontvang het, terwyl meer as tien persent nooit skool bygewoon het nie. Rakende mediese toestande het 'n betekenisvolle hoeveelheid van huishoudlede hipertensie rapporteer. Soos verwag, was die voorkoms van diaree, aptytverlies en massaverlies hoër by ondermassa versorgers, maar verskille was nie betekenisvol nie.

Die voorkoms van oormassa en vetsugtige huishoudlede was 'n uitstaande antropometriese eienskap in die studie. Meer as die helfde van die versorgers

het in die groep van oormassa of vetsug geval. Resultate van die studie het aangedui dat die aantal goed gevoede kinders in die studie min was. Die persentasie ondermassa kinders (17%) was hoër indien vergelyk word met die NFCS (1999), en 'n groot persentasie (30.3%) kinders het groeivertraging getoon. Soos verwag, het 'n kleiner persentasie kinders (9.2%) in die studie verlaagde massa-vir-lengte as massa-vir-ouderdom en lengte-vir-ouderdom getoon.

'n Relatief groot proporsie van huishoudlede het nie voedsel van al drie voedselgroepe gedurende maaltye ingeneem nie. Byna al die volwassenes het nie 'n gebalanseerde ontbyt en laat-oggend versnappering geniet nie. Die meerderheid volwassenes het nie 'n gebalanseerde middagete en laat-middag versnappering ingeneem nie, terwyl meer as die helfte nie 'n gebalanseerde aandete en laataandvoeding rapporteer het nie. In die geval van kinders, het 'n hoë persentasie nie gebalanseerde maaltye ingeneem nie. Resultate rakende die dieetinname van babas (tussen geboorte en ses maande) het getoon dat ongeveer 80% babas 'n gebalanseerde dieet gevolg het. Dit is as gevolg van die hoë persentasie ma's wat eksklusief geborsvoed het.

Met die vooruitsig om 'n relevante voedingsonderrig intervensie program in Mangaung te implementeer, word hierdie basislyn studie (2004) as belangrik beskou. Bevindinge op die huidige voedingsstatus en spesifieke oorsake van voedingsprobleme in die gemeenskap van Mangaung kan 'n betekensvolle bydrae maak tot die ontwerp van 'n effektiewe voeding intervensie program.

CHAPTER 1

PROBLEM STATEMENT



(UNICEF, 2004)

CHAPTER 1

PROBLEM STATEMENT

1.1 Introduction and problem statement

‘Every man, women 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’ (United Nations Children’s Education Fund, UNICEF, 2004). Access to good nutrition is a basic human right set out in the *Convention on the rights of the Child* and other human right agreements (UNICEF, 2004).

Nutrition is one of the most important health factors affecting quality of life (King and Burgess, 1998, p. 334). Good nutrition is the cornerstone for survival, health and development. The reduction and elimination of hunger and undernutrition are one of the greatest world questions, because hunger, famine and malnutrition are conditions that destroy the lives of many of the world’s population. A secure supply of food is necessary for good nutrition, but it does not assure that everyone is well nourished. This is because other factors such as infection, appetite and people’s workloads also affect nutrition (King and Burgess, 1998, p. 334).

Malnutrition is by no means a situation where one starves of hunger. A person who eats enough to satisfy immediate hunger can still be malnourished. Malnutrition is the underlying cause of half of child mortality (Penny et al., 2002). Three quarters of the children who die worldwide of causes related to malnutrition can be described as mildly to moderately malnourished and may present no visible signs of problems to a casual observer. Severe malnutrition is an important cause of preventable mortality in most South African hospitals (Puoane et al., 2001). Malnutrition is often a silent and invisible problem and its persistence has profound and devastating implications for children, society and the future of humankind (UNICEF, 2004).

Fetuses, children up to the age of three and women before and during pregnancy and while they are breastfeeding, are most susceptible to malnutrition due to nutritionally inadequate diets, compounded by regular illness and insufficient care (UNICEF, 2004). However, it has been found that continued breastfeeding during the second year of life had a positive association with growth (Onyango et al., 1999). Unfortunately, exclusive breastfeeding, although recommended worldwide, is not commonly practiced (Morrow et al., 1999). Among children, malnutrition is especially prevalent in those who lack nutritionally adequate diets, are not protected from frequent illness and do not receive adequate care. Malnutrition in children is also considered to be a good indicator of the nutritional status of the whole community.

Globally it is estimated that among preschool-age children in developing countries 183 million are underweight, 226 million are stunted and 67 million wasted (UNICEF, 2004). According to Sawaya et al. (2004) malnutrition is still highly prevalent in developing countries. Malnutrition contributes to over 6 million child deaths each year, 55 percent of the nearly 12 million deaths among children under five in developing countries. Half of all children under five years of age in South Asia and one third of those in sub-Saharan Africa are malnourished (UNICEF, 2004). In Africa, one of every three children is underweight, and in several countries of the continent, the nutritional status of children is worsening. Although world hunger is usually associated with famine, the numbers affected by famine are relatively small compared with those suffering from persistent hunger and malnutrition (Darnton-Hill, 1997).

These statistics indicate the seriousness of the many forms of malnutrition and serve to increase awareness and importance of addressing the problem. Malnutrition can take a variety of forms that often appear in combination and contribute to each other, such as protein-energy malnutrition (PEM), and micronutrient deficiencies, especially vitamin A, iron and iodine (Darnton-Hill, 1997). According to Makonnen et al. (2003) PEM remains one of the common causes of morbidity and mortality among children throughout the world. Although a considerable amount of work regarding prevalence of various types of malnutrition has been done, less attention has been given to the prevention of problems

(UNICEF, 1992). More can be done to improve the health of a community through the prevention of malnutrition, than through the treatment of the manifestations.

Causes of malnutrition can be classified into three categories (UNICEF, 2004): Immediate causes of malnutrition include dietary intake, care and disease prevalence. The underlying causes of malnutrition include insufficient household food, inadequate maternal and / or childcare, insufficient health services and / or an unhealthy environment and lack of education and information. Basic causes of malnutrition include economic structure and political and ideological superstructure (UNICEF, 2004).

Inadequate dietary intake and disease are described as the most important immediate causes of malnutrition and measurement of nutrient intake is probably the most widely used indirect indicator of nutritional status (UNICEF, 2004). The estimation of the usual dietary and nutrient intake of children is, however, difficult (Dwyer, 1994, p. 844). An infant often becomes malnourished because of illness in combination with inadequate food intake. Breastfeeding is recommended as the best nutrition for infants and if not provided adequately, can impair the child's health, more so in the case of children living in areas with poor hygiene and sanitation.

In addition to the problem of undernutrition, diseases of lifestyle in developing countries are also a matter of concern (UNICEF, 2004). Most work in lower income countries has focused on undernutrition and its effects on survival, mortality and development. Concurrent changes in nutrition involving a change from the traditional diet are also occurring and are equally important for many low-income countries. According to Popkin (1994), "Several major changes seem to be emerging, resulting in a marked shift in the type of diet being eaten by low-income populations with imitation of the Western diet increasing. In general, these changes reflect the trend in which an increasing proportion of people consume the type of diets associated with a number of chronic diseases i.e. obesity, cardiovascular disease, hypertension and type 2 diabetes". The growing burden of these noncommunicable diseases has generally been neglected (Beaglehole and Yach, 2003). These diseases of lifestyle have taken on epidemic proportions amongst women, especially urbanised Black and Coloured women in South Africa. These chronic diseases often affect socio-economically-disadvantaged adults living in impoverished families with undernourished children (Sawaya et al., 2003). According to Rivera et al. (2004) these diseases are becoming public health problems as populations experience important reductions in physical activity and an increase in energy-dense diets. Obesity is a major public health problem among black women living in urban South Africa (Puoane et al., 2001). Malnutrition is often a result of illness and conversely illness occurs due to malnutrition (UNICEF, 2004). Malnutrition includes therefore both undernutrition as well as overnutrition.

Malnutrition is also the result of a complex interplay of underlying factors involving education, household access to food, child and maternal care, safe water and sanitation and access to basic health services.

According to Article 29 of Section 29.1 Constitution, "Education shall aim at developing the child's personality, talents and mental and physical abilities to the fullest extent. Education shall prepare the child for an active adult life in a free society and foster respect for the child's parents, his or her own cultural identity, language and values and for the cultural background and values of others" (National Programme of Action for Children in South Africa, NPA, 2001, p.43). South African school enrolment rates compare favourably with other African countries, and many developing countries in other parts of the world. A high proportion of public expenditure is allocated to education. However, there are high repetition rates at all levels and poor learning outcomes (NPA, 2001, p. 43). Absence of education affects the application of healthy diets, hygiene and the psychology of development of children, often due to lack of interaction between parents and children. These factors impact upon children, both physically and psychologically.

Nutrition security is defined as the ingestion of all nutrients in adequate amounts every day (King and Burgess, 1998, p. 334). The two components of food security

include food availability (through domestic production, storage and/or trade) and food access (through home production, purchase in the market and food transfers). Food security is part of the section 27 Constitutional rights in South Africa (Department of Agriculture, 2002). On these rights, the Constitution states that every citizen has the right to have access to sufficient food and water. Food security should include all steps in the food chain such as production, harvesting, storage, distribution, marketing and preparation (King and Burgess, 1998, p. 334). Authors and practitioners have been concerned with vulnerability as related to food security and famine. "Vulnerability" has become a term of art and a basis for assessment methods in several contexts, including food security analysis (Dilley and Boudreau, 2001). Poor families are always at risk of undernutrition because they do not produce enough food to feed themselves, do not produce enough cash crops to earn money for all their food and often live in unhygienic places/houses (King and Burgess, 1998, p. 353). Nutrition adequacy is determined by the volume and composition of food intake (De Klerk et al., 2004). However, because adequacy of composition is also a matter of household awareness, it is a public health and a public education issue as well.

Inadequate care for children and women is an underlying cause of malnutrition only recently recognised in all its harmful ramifications (UNICEF, 2004). According to Health Of Women (HOW, 2004), discrimination against women and girls is an important cause of malnutrition. Care includes all interaction between parent and child that helps children develop emotionally as well as physically. Several studies

have found that malnourished children who were stimulated verbally and cognitively had higher growth rates than those who were not (UNICEF, 2004).

It is estimated that in as many as 35 of the poorest countries, 30-50 percent of the population may have no access to health services at all (UNICEF, 2004). More than 1.1 billion people lack access to safe drinking water and some 2.9 billion people lack access to adequate sanitation. The already high utilisation of available water resources in South Africa is causing fears that 100% utilisation will occur by 2030 and that somewhere in the future economic growth will be limited by this lack of water (Hazelton, 2002). The result is the spread of infectious diseases, including childhood diarrhea, which in turn is a major cause of malnutrition. Each year, diarrhoeal dehydration claims the lives of 2.2 million children under five in developing countries (UNICEF, 2004).

The unequal distribution and availability of resources in communities and the resultant poverty can play a part as basic causes in the development of malnutrition. Over the last decade the incidence of poverty in the Southern African region has escalated (South African Regional Poverty Network, SAPRN, 2005). This is confirmed by the high prevalence of nutritional problems in lower socio-economic developing communities, especially where the rate of unemployment is high.

The implications of undernutrition are far-reaching. Apart from the cost involved in treating these children, early chronic malnutrition limits the intellectual and biological abilities with long-term effects in adulthood (UNICEF, 1998). Thus it is important to overcome the problem in South Africa.

Malnutrition leads to reduced productivity, hampering economic growth and the effectiveness of investments in health and education. Vitamin and mineral deficiencies alone are estimated to cost some countries the equivalent of more than 5 percent of their gross national product in lost lives, disability and productivity (UNICEF, 2004).

Although malnutrition is not an infectious disease, it affects woman, children, families and the well being of whole societies. The consequences of nutrient deficiencies are felt not only by individuals, but also by entire nations (Matorell, 1996). Malnourished children are much more likely to die as a result of a common childhood disease than those who are adequately nourished (UNICEF, 2004).

With this in mind, the planning and implementation of effective nutrition intervention programmes should be based on the specific needs of individuals and communities. The effect of nutrition intervention programmes in developing countries is likely to vary with the degree to which the programme can be successfully targeted at the most vulnerable (Morris et al., 2000). A household vulnerability to food insecurity is high if it has to use the most of its human,

material and financial resources to meet food needs, with just a little or nothing left to address other basic needs like clean water or housing (Bonti-Ankoman, 2001). Though food aid has traditionally been the domain of international donors, governments, including the South African government, have often contributed too (De Klerk et al., 2004).

The high rates of malnutrition among South African children have motivated the Department of Health (DoH) to implement various national intervention programmes, including food aid and nutrition education interventions (Chopra and McCoy, 2000). Nutrition education based on individual needs is more important and in the long term more effective than the distribution of free food (UNICEF, 2004). According to Cowan et al. (2004), however, research is still needed into the detection, prevalence, causes and effects of malnutrition. Many programmes attempt to remedy this issue, but there is a lack of evidence on effective ways to decrease malnutrition (Penny et al., 2005).

The environment can thus be seen as one of the most critical contributors to malnutrition. The basic causes of malnutrition are seen as deeply rooted in environmental factors, such as poverty and lack of education. In any attempt to improve nutritional status it is therefore important to assess the relationship between certain environmental factors and indicators of nutritional status.

Mangaung is an urban area situated in Bloemfontein where environmental factors are not always optimal and prevalence of malnutrition is high. This makes

Mangaung an ideal area to evaluate the causes of malnutrition. The causes of malnutrition are multifactorial and include immediate, underlying and basic causes. Adequate information on the existing nutritional status and specific causes of nutritional problems of the community of Mangaung should be obtained in order to design better and more effective nutrition intervention programmes.

1.2 Objectives

1.2.1 Main Objective

The aim of this study is to assess nutritional status (anthropometric status and dietary intake) and household resources (household and parent/caregiver particulars), in an attempt to identify specific issues that play a role in the development in malnutrition.

The main objective of this study is thus to provide baseline data on causes of malnutrition in two areas of Mangaung, namely JB Mafora and Namibia.

1.2.2 Sub-aims necessary to achieve the main objective

To determine:

1.2.2.1 Dietary intake of household members.

- 1.2.2.2 Anthropometric status of both children under the age of six years, as well as the caregivers.
- 1.2.2.3 Household resources / information including composition of the household, socio-demographic status (head of household, income, water supply), health status (prevalence of disease, clinic attendance, growth monitoring, family planning and smoking) and food aid coverage.
- 1.3.2.4 To determine possible associations between nutritional status (anthropometric status and dietary intake) and household resources / information.

1.3 Outline of dissertation

Chapter 1:	Introduction and Motivation for the Study (Problem Statement)
Chapter 2:	Literature Review: Causes of Malnutrition
Chapter 3:	Experimental Procedures
Chapter 4:	Results
Chapter 5:	Discussion of Results
Chapter 6:	Conclusions and Recommendations

CHAPTER 2

CAUSES OF MALNUTRITION



(UNICEF, 2004)

CHAPTER 2

CAUSES OF MALNUTRITION

2.1 Introduction

Malnutrition is a silent and invisible crisis that has a significant effect on children and their families (UNICEF, 2004). While good nutrition is extremely important for a healthy lifestyle and quality of life, the effects of poor nutrition are devastating.

According to Caballero (2002), almost two-thirds of the deaths of children around the world are directly associated with nutritional deficiencies. Most Africans enter old age after a lifetime of poverty, poor access to health care and a diet that is usually inadequate in quantity and quality (Charlton and Rose, 2001).

Optimal nutritional status contributes to health maintenance and the prevention of infection (Felblinger, 2003). The function of healthy cells is maintained by the provision of adequate nutrition. When nutrient availability is disrupted, primary and secondary malnutrition develop. The relationship between nutritional status and the immune system has been a topic of study for much of the 20th century (Keusch, 2003). According to Felblinger (2003), malnutrition contributes to adverse metabolic events that compromise the immune system and impair the

body's ability to adapt, recover, and survive. The effects of malnutrition on human performance, health and survival have been the subject of extensive research for several decades (Pelletier and Frongillo, 2002).

Malnutrition is a complex condition that can involve multiple, overlapping deficiencies of protein, energy and micronutrients. Both PEM and micronutrient deficiencies increase the risk of death from common diseases such as diarrhea, pneumonia and measles (Caballero, 2002). Malnutrition may also lead to micronutrient deficiencies such as night blindness and cretinism (Bonti-Ankoman, 2001). A child becomes malnourished because of illness in combination with inadequate food intake. Poverty, low levels of education, and poor access to health services are major contributors to malnutrition (UNICEF, 2004).

Our health and well-being, quality of life and ability to learn, work and play, depend on how well we are nourished (Chopra and McCoy, 2000). Good nutrition or nutritional status is the outcome of many complex and interrelated determinants such as adequate, safe, affordable and nutritious food, care and health services (Chopra and McCoy, 2000).

As indicated by Meth and Dias (2004), a substantial number of people may live in “respectable” houses, but suffer from malnutrition. There might be free health care services available to them, but they cannot access them because they cannot afford transportation.

2.2 Prevalence of Malnutrition

2.2.1 Globally

Although numbers overlap (due to the fact that many children suffer from more than one type of malnutrition), statistics estimate that, worldwide some 226 million children are stunted i.e. shorter than they should be for their age, and not due to a genetic variation (UNICEF, 2004). According to UNICEF (2004), one of every three children in Africa is underweight.

The consequences of malnutrition are enormous (WHO, 2002). Being underweight was estimated to cause 3.7 million deaths in 2000, accounting for about one in 15 deaths globally. Most developing countries have significantly reduced the proportion of malnourished children during the past three decades, however, because of population growth, the absolute number of malnourished children has fallen much less sharply (Rosegrant and Meijer, 2002). Malnutrition plays a role in more than half of the nearly 11 million deaths each year of children under five in developing countries (UNICEF, 2004). Of the nearly 12 million children under five who die each year in developing countries, mainly from preventable causes, the deaths of over 6 million, or 55 percent, are either directly or indirectly attributable to malnutrition. In terms of nutrition, 40 percent of households do not have enough to eat, and nearly 25 percent of children under

five years of age are stunted due to long-term undernutrition, and 10 percent are underweight (NPA, 2001, p. 8).

According to Ramakrishnan (2002), “recent estimates indicate that globally over two billion people are at risk for vitamin A, iodine, and/or iron deficiency, in spite of efforts in the prevention and control of these deficiencies”. More than 2 billion people, especially women and children, are iron deficient, and the WHO has estimated that 51 percent of children under the age of four in developing countries are anaemic. According to Labadarios (1999), anaemia and marginal vitamin A status are widespread micronutrient deficiencies in South Africa. Anaemia and marginal vitamin A status affects between 20% and 30% of young children (Labadarios, 1999). Rural children and mothers with limited education are most affected (Bonti-Ankoman, 2001). Africa remains the only region in the world where the number of hungry people will still be on the increase in 2020, and the number of malnourished children will have increased correspondingly (Rukundi, 2002).

The crisis is nowhere more urgent than in sub-Saharan Africa, where Human Immunodeficiency Virus (HIV) or Acquired Immunodeficiency Syndrome (AIDS) is exacerbating this situation (Standing Committee on Nutrition, 2004). The claim that the current Southern African food crisis is directly linked to the widespread HIV epidemic, which has worsened the crisis, is supported in much of the food security literature (De Klerk et al., 2004). In this region, all nutritional indicators are

moving in the wrong direction and more and more people do not have access to food they need.

2.2.2 South Africa

The NFCS of 1999 showed that more than one out of five of children between the ages of 1-9 years old were stunted, indicating chronic past undernutrition (Labadarios, 1999). Younger children (1-3 years of age) are most severely affected, as well as those living on commercial farms (30.6%) and in tribal and rural areas. Underweight (weight-for-age < -2 SD) affects 10.3% (18% on commercial farms) and severe underweight 1.4% (weight-for-age < -3 SD) of children in this age group. Wasting, an indicator of acute current undernutrition, is not common in South Africa and the prevalence rate is 3.7% of children between 1-9 years old. Despite the low prevalence of wasting, South Africa has high levels of chronic malnutrition as indicated by stunting (UNICEF, 2004).

Micronutrient deficiencies are a serious public health concern in developing countries (Chakravarty and Sinha, 2002). Micronutrient deficiencies are prevalent in South Africa and are affecting especially vulnerable groups such as children and women. The NFCS showed that most children appear to consume a diet low in energy and poor in protein quality and micronutrient density (Labadarios, 1999). It is also found that one of two children aged 1-9 years have an intake of

approximately less than half the recommended level for vitamin A, vitamin C, riboflavin, niacin, vitamin B6, folate, calcium, iron and zinc. Although anaemia could be a result of malaria and parasite infestations, dietary deficiency of iron is also a major concern (Labadarios, 1999). According to Bhaskaram (2002) several micronutrients, such as vitamin A, beta-carotene, folic acid, vitamin B12, vitamin C, riboflavin, iron, zinc and selenium, have immunomodulating functions and thus influence the susceptibility of a host to infectious diseases.

The National Iodine Deficiency Disorder Survey (IDD), which was conducted in 1998 among primary school children in South Africa, has shown that learners in 89.4% of primary schools surveyed have a normal iodine status, following the mandatory iodinations of food grade salt in 1995. However learners in 10.6% of the schools, mostly in rural areas, were iodine-deficient. IDD mostly occurs in pockets in the central areas of Mpumalanga, Limpopo, especially Venda, parts of the Eastern Cape and the gold field of southern Gauteng, Free State and North West (UNICEF, 2004).

The NFCS findings support the results from the 1994 South African Vitamin A Consultancy Group Survey (SAVACG, 1996) in terms of overall nutritional status. Stunting was the biggest problem with 23% of the study population affected. Among children 6 – 71 months, 33.3% of children are vitamin A deficient; a prevalence rate that indicates that vitamin A deficiency is a serious health problem in the country. The SAVACG survey also found 21.4% prevalence of anaemia,

10% prevalence of iron deficiency and 5% prevalence of iron deficiency anaemia (SAVACG, 1996).

Globally, 13 percent of children are overweight and 5 percent obese. Girls are slightly more often overweight (15%) than boys (12%). Research also shows that undernourished children with stunted growth have an increased risk of becoming obese (Power, 2004). The NFCS (1999) found that in South Africa, one out of thirteen children were overweight in the formal urban areas. This was higher among children (one out of eight children) of well-educated mothers.

2.3 Causes of Malnutrition

The causes of malnutrition can be divided into immediate, underlying, and basic causes (UNICEF, 2004) as seen in Figure 2.1.

This conceptual framework describing causes of malnutrition was developed in 1990 as part of the UNICEF nutrition strategy. The framework shows that causes of malnutrition are multisectoral, including food, health and caring practices. They are classified as immediate, underlying, and basic, whereby factors at one level influence other levels. The framework is used, at national, district and local levels, to help plan effective actions to improve nutrition. It serves as a guide in assessing

and analysing the causes of the nutrition problem and helps in identifying the most appropriate mixture of actions (UNICEF, 2004).

Last-mentioned explains malnutrition as an outcome of interrelated, complex, causes. The Conceptual Framework enables the analysis of the causes of malnutrition and death in any community as it indicates the interrelationship between the various contributing factors (DoH, Integrated Nutrition Programme (INP), 2004). It also helps to clarify the objectives of actions selected for implementation. In a given context the Conceptual Framework will change and become more focused as assessment and further analysis takes place through the application of the Triple A Cycle of Assessment, Analysis and Action (DoH, INP, 2004).

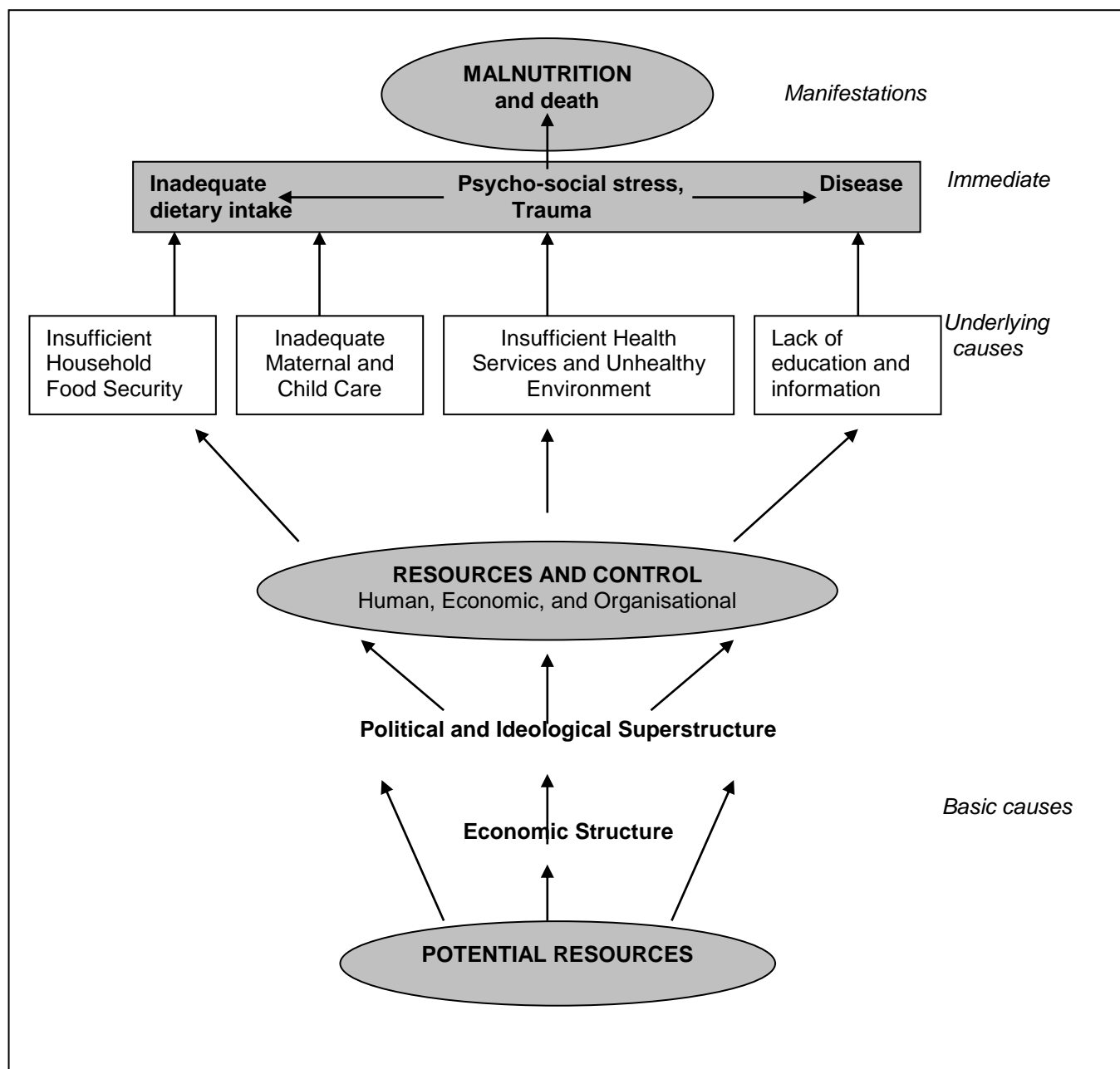


Figure 2.1: Causes of Malnutrition are Multisectoral (UNICEF, 2004).

An understanding of the causes of malnutrition is important to appreciate the scale and depth of the problem, the process achieved to date and possibilities that exist for further progress.

2.3.1 Immediate Causes

The interplay between the three most significant immediate causes of malnutrition; inadequate dietary intake, psychosocial care and disease, tends to create a vicious cycle (Figure 2.2, UNICEF, 2004).

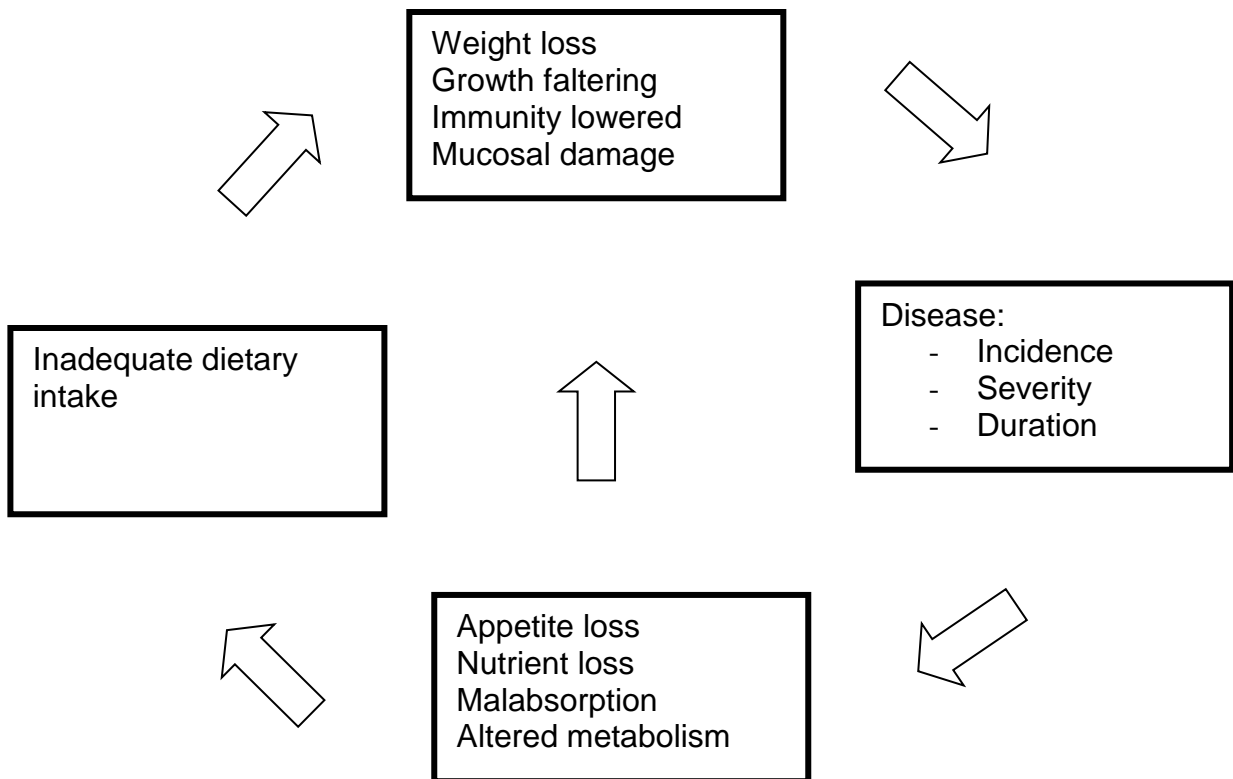


Figure 2.2: Vicious cycle between inadequate dietary intake and disease (Tomkins and Watson, 1989).

2.3.1.1 Inadequate Dietary Intake

Adult dietary habits and feeding practices of young children play a particularly important role in food insecurity and poor nutritional status (United States Agency for International Development, USAID, 2003). Undernutrition develops when nutrient intakes do not meet nutrient requirements (Chopra and McCoy, 2000). Increasing dietary diversification is the most important factor in providing a wide range of micronutrients, and to achieve this objective in a development context, an adequate supply, access and consumption of a variety of foods is required (Tontisirin et al., 2002).

From a nutritional perspective, infancy is a critical and vulnerable period (Picciano, 2001). Breastmilk combines the three fundamentals of sound nutrition, namely food, health and care (UNICEF, 2004). Optimal breastfeeding practices include exclusive breastfeeding (breastmilk with no other foods or liquids) for the first six months of life, followed by breastmilk and complementary semi-solid food from about six months of age, and continued breastfeeding for two years of age while receiving complementary foods (UNICEF, 2004). Results of a study performed by Onyango et al. (1999), suggest that breastfeeding in the second year is a strong positive contributor to linear growth and that when early weaning is unavoidable, interventions to improve household sanitation could limit its potential negative

impact on child growth. Sound weaning practices play an important role in the growth and development of young children (Dannhauser et al., 2000).

Breastfeeding is believed to benefit infants because it contains the ideal mix of nutrients for infants, as well as factors that promote development of the infant's gut and immune system. The World Health Organisation (WHO) and other United Nations agencies recommend that children should be breastfed, with the introduction of safe and nutritionally adequate foods from about six months, until they are at least two years old (Onyango et al., 1999). Human milk is considered the ideal food for newborns during the first six months of life. Breastmilk alone contains all the nutrients, antibodies, hormones and antioxidants an infant needs to thrive (UNICEF, 2004). It protects babies from diarrhoea and acute respiratory infections, stimulates their immune systems and response to vaccination and, according to some studies, leads to cognitive benefits as well. Exclusive breastfeeding also prevents intake of pathogens in food and water (Filteau, 2000). Furthermore, results are consistent with the evolving evidence that the nutritional benefits of long-term breastfeeding are more evident in deprived than in better-off environments (Onyango et al., 1999).

It has been estimated that improved breastfeeding practices could save some 1.5 million children a year (UNICEF, 2004). Yet few of the 129 million babies born globally per year receive optimal breastfeeding and some are not breastfed at all. Early cessation of breastfeeding in favour of commercial breastmilk substitutes, needless supplementation and poorly timed complementary practices are still too

common (UNICEF, 2004). Botma and Grobler (2004) performed a study in the Motheo district, a district in the Free State Province, and the survey indicated that most mothers (84%) breastfed their children for an average period of 12 months. Breastfeeding was, however, not done exclusively, as complementary feeding commenced at an early age.

Transmission of the HIV in breastmilk is recognised, but new data showing reduced transmission in infants who receive exclusive breastfeeding rather than mixed feeding reinforces the importance of promoting this practice in areas where environmental contamination excludes the safe use of other infant feeding regimens (Tomkins, 2000).

Despite overall global improvements in breastfeeding patterns, made during the 1990's, fewer than half of all infants are now being exclusively breastfed for up to four months, and only about half are receiving complementary foods in a timely manner (UNICEF, 2004). Although global levels of continued breastfeeding are relatively high at one year of age (79%), only around half of infants are still breastfeeding at two years of age. Thus, the current breastfeeding patterns are still far from the recommended levels (UNICEF, 2004). A study done by Morrow et al. (1999), found that early and repeated contact with peer counselors was associated with a significant increase in breastfeeding exclusivity and duration.

When exclusive breastfeeding is not practiced during the early months of infancy, complementary foods and fluids could damage the stomach surfaces by various means. The damaged surfaces are then more vulnerable to infections, allergens or physical trauma. This can also allow the transference of the HIV virus across the membrane and into the body tissue (Coutsoudis et al., 2001, pp. 430 – 436). Infants and young children are at increased risk of developing malnutrition from six months of age onwards, when breastmilk alone is no longer sufficient to meet all nutritional requirement and complementary feeding needs to be started (Daelmans et al., 2003). Complementary foods are often of lesser nutritional quality than breastmilk. In addition, they are often given in insufficient amounts, and if given too early or too frequently, they replace breastmilk. Gastric capacity limits the amount of food that a young child can consume during each meal. Repeated infections reduce the appetite and increase the risk of inadequate intakes. According to Daelmans et al. (2003), infants and young children need a caring adult who not only selects and offers appropriate foods, but also assists and encourages them to consume these foods in sufficient quantity.

According to Labadarios (1999), the great majority of children consumed a diet deficient in energy and of poor nutrient density to meet their micronutrient requirements. Energy deficiency is the major cause of PEM. It often results from consuming too little food, especially energy-dense foods and other nutrients. Lack of protein-rich foods, i.e. maize meal porridge without milk, is also prevalent and might be due as a result of household food insecurity and lack of education.

Failure to grow and recover from illness is the most important manifestations of poor dietary intake.

2.3.1.2 Psychosocial Care

Primary responsibility for care still remains with the family (Botma and Grobler, 2004). Children whose parents and caregivers interact with them in consistent, caring ways will be better nourished and healthier than children not so nurtured (UNICEF, 2004). Early nurturing and stimulation lay down the neurological pathways that promote improved learning, health and behaviour throughout life. In particular, the influence of early nurturing and stimulation on brain development includes impacts on the immune and stress regulation systems (UNICEF, 2004). A host of social and economic changes have combined to make traditional family arrangements for care difficult or impossible. For a child to develop and learn in a healthy and normal way, it is important not only to meet the basic needs for protection, food and health care, but also to meet the basic needs for interaction and stimulation, affection, security and learning through exploration and discovery (Botma and Grobler, 2004).

Lack of care for woman and children has recently been identified for its harmful effects (UNICEF, 2004). Children who experience a healthy interaction with parents develop emotionally and physically and, in spite of malnutrition, have higher growth rates. Several studies have found that malnourished children who

were stimulated verbally and cognitively have higher growth rates than those who are not (UNICEF, 2004).

Even when children are not themselves infected, those whose parents / caregivers have AIDS are profoundly affected (NPA, 2001, p. 10). By the end of 1999, the number of South African children under age 15 who had lost either their mother or both parents as a result of AIDS, was about 180 000. The death of a parent can result in the loss of the home with children being left in the care of grandparent(s) and/or the extended family. Because of the social stigma attached to AIDS, children and their families may be socially ostracised (NPA, 2001, p. 10). Adult deaths not only rob children, parents and partners of somebody they love and care for, they invariably also rob the family of a primary or sole breadwinner (NPA, 2001, p. 88).

Among a community sample of 801 rural South Africans, 22.2% of men and 5.0% of women were classified as high-risk drinkers and 3.3% with probable alcohol dependence (Peltzer et al., 2004). Parry et al. (2005) found that one third of current drinkers in their study reported risky drinking over weekends. Symptoms of alcohol problems were significantly associated with lower socioeconomic status, no school education in women and being older than 25 years of age.

It is believed that households under stress from hunger, poverty or disease will be adopting a range of strategies to relieve their impact through complex multiple livelihood strategies (De Klerk et al., 2004).

2.3.1.3 Disease

According to Beaglehole and Yach (2003), noncommunicable diseases (NCD) are leading causes of death in developing and developed countries. In South Africa, the African population is experiencing rapid urbanisation characterised by a double burden of disease in which NCD and infectious diseases become more prevalent (Vorster et al., 1999). Despite strong evidence for the seriousness of this burden, the preventability of its causes and the threat it poses to already insufficient health care systems, national and global actions have been inadequate (Beaglehole and Yach, 2003).

The key immediate causes of all types of disease (Figure 2.2) are mainly inadequate or inappropriate food and nutrition, including food insecurity, and for chronic diseases, use of tobacco and physical inactivity (UNICEF, 2004).

Infectious diseases constitute one of the major factors contributing to child malnutrition (DoH, INP, 2004). Conversely, malnutrition makes a child more susceptible to these infectious diseases. According to Bhaskaram (2002) micronutrient deficiencies and infectious diseases often coexist and exhibit complex interactions leading to the vicious cycle of malnutrition and infections

among underprivileged populations of the developing countries. The most common infectious diseases in South Africa affecting the growth of children are HIV and AIDS, measles, diarrhoea and acute respiratory infections. While the malnutrition-infection complex most commonly affects children, it is also significant where adult morbidity is concerned. Infections and diseases play a major role in loss of productivity through their impact on adult physical performance and work capacity (DoH, INP, 2004).

With excessive energy intake, the person may become obese and vulnerable to diseases associated with overnutrition such as heart disease and obesity (Lee and Nieman, 2003, p. 15). Despite the prevalence of undernutrition and weight loss, the prevalence of overweight and obesity in adults continues to rise dramatically. Obesity is out of control with more than 300 million overweight adults worldwide (Roberts, 2004). According to Sawaya et al. (2004) studies have shown an increase in the number of obese individuals in very poor urban communities. Low-income neighborhoods are far more likely to have only convenience stores, in which unhealthy food is typically more readily available than fresh fruits, vegetables, whole grains, and lean meats (Berg, 2005).

The prevalence of overweight is especially high among women, the poor and blacks (Lee and Nieman, 2003, p. 269). Furthermore, Faber and Kruger (2005) found that most women in their study were unconcerned about their weight. It seems that a significant percentage of rural women are unconcerned about their

weight and most overweight and obese women do not want to lose weight (Faber and Kruger, 2005). Obesity is so widespread and its prevalence is rising so rapidly that many refer to it as an epidemic. There are many factors involved, but food price and food availability are certainly two key factors (Berg, 2005).

Obesity, cardiovascular disease, and type II Diabetes Mellitus are now prevalent among adults living in developing countries (Sawaya et al., 2003). According to Tucker and Buranapin (2001), diets are becoming higher in fats, animal products, and refined foods, and lower in fiber, contributing to rapidly increasing prevalence of obesity and type 2 diabetes. According to Faber and Kruger (2005), most women in their study did not recognise the relationship between food consumed and degenerative diseases. More South African adults now die from obesity than from poverty (Power, 2004). However, it is clear that malnutrition and obesity can co-exist at the same time, as well as in the same country (Roberts, 2004). The number of people with diabetes in developing countries is projected to almost triple by the year 2025. Hypertension and vascular disease are also rapidly becoming more prevalent (Tucker and Buranapin, 2001). Hypertension, defined as the average of three separate blood pressure readings where the systolic blood pressure or diastolic blood pressure is $> 140/90$ mm Hg, is one of the major causes of death in developed and underdeveloped nations (Monyeki et al., 2005). These chronic diseases often affect socio-economically-disadvantaged adults living in impoverished families with undernourished children (Sawaya et al. 2003).

According to Sawaya et al. (2003), the combination of childhood undernutrition and adult chronic degenerative disease results in social and economic pressure for developing countries.

Malnutrition is multifactorial and poorly treated during the course of HIV. The HIV/AIDS epidemic has had a devastating impact on health, nutrition, food security and overall socioeconomic development in countries that have been greatly affected by the disease (WHO, 2003). All dimensions of food security: availability, stability, access and use of food, are affected where the prevalence of HIV/AIDS is high (De Klerk et al., 2004). Ironically, many people living with HIV/AIDS are unaware of their status. Based on the 16 548 blood samples tested in October 2000, it is estimated that nationally 24.5 percent of South African women who attended public health facilities (for the first time during pregnancy) were infected with HIV by the end of the year (NPA, 2001, p. 85). This is compared to 22.4 percent in 1999 and 22.8 percent in 1998. HIV prevalence in the Free State between 1998 and 2000 among antenatal clinic attendees, was 22.8 (1998), 27.9 (1999) and 27.9 (2000), respectively (NPA, 2001, p. 85). Infection by HIV is characterised by progressive destruction of the immune system, which leads to recurrent opportunistic infections and malignancies, progressive debilitation and death (Salomon et al., 2002).

According to research, many black women believe that if fat women lose weight, 'they are HIV-positive, not being supported by their husbands, or not as attractive

or fertile' (Power, 2004). Furthermore, many studies have clearly shown that HIV/AIDS contributes to a rise in poverty, and that poverty reduces the ability of the poor living with HIV/AIDS to cope with the disease (United Nations Development Programme, UNDP, 2003, p. 7). The size of households, local practices and customs relating to inheritance, the extent of the resource depletion and the employment possibilities are among the factors that influence people's decision-making. It is important to note that it is not movement *per se* that puts people at risk of HIV, but rather it is the conditions under which it occurs. Furthermore, it is troubling that there are so many child-headed households, also due to HIV/AIDS.

A very small increase in the risk of HIV transmission occurs during the first three months of life when exclusive breastfeeding is practiced (Botma and Grobler, 2004). Exclusive breastfeeding is a practice that maximizes infant health, growth and development. The majority of infants of HIV-positive mothers will not become infected as a result of breastfeeding. Therefore, depriving all infants born to HIV-positive mothers of the benefits of breastfeeding seems unwarranted, especially if breastfed infants receive some protective effects from breastmilk (Kent, 1999).

Other pandemics identified by the WHO include tuberculosis (TB), of which there were 12 000 reported child cases in 1998; malaria, with 27 000 cases a year and 60 percent of deaths occurring in children (NPA, 2001, p. 8). Of the nearly 11 million children who die each year, nearly two thirds die from a limited number of

preventable and treatable diseases including malaria, acute respiratory infections (ARI), diarrhea, measles, pertussis and neonatal tetanus (UNICEF, 2004). The underlying cause of over half of these deaths is malnutrition.

Diarrhea is characterised by frequent, loose, watery stools (Lee and Nieman, 2003, p. 87). Like vomiting, diarrhea can lead to considerable fluid and electrolyte losses. In developing countries, measles is a devastating infectious disease, killing as many as 2 million children each year (Lee and Nieman, 2003, p. 358). The severity of the illness often correlates with the degree of vitamin A deficiency and deaths are usually due to related infections such as pneumonia and severe diarrhea. In 2000, the WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality found that breastfeeding protects against diarrhea and acute respiratory infections (Coutsoudis et al., 2000, p. 1370).

The Demographic and Health Survey (DHS) reported that 50 percent of the 20 percent of children under five that had diarrhea, reported to have had a fever and/or cough in the last two weeks (USAID, 2003). TB is a highly contagious disease caused by the bacteria *Mycobacterium tuberculosis* (Balch and Balch, 1997). It is primarily a disease of the lungs, but it can affect any body organ, including the bones, kidneys, intestines, spleen, and liver. TB has a dramatic effect on nutritional status. Such malnutrition undoubtedly contributes to the morbidity of the disease and may also contribute to mortality, particularly in

resource-poor settings where nutritional status, even in the 'healthy', may be critical (Macallan, 1999).

Worldwide, the number of individuals who are co-infected with HIV and TB is increasing greatly (Van Lettow et al., 2003). The 'triple trouble' of HIV and TB infection and malnutrition may put those infected at greater risk than those with any of the three conditions alone. Tuberculosis is projected to continue rising by about 10% per year in the African countries most severely affected by HIV-1 (Corbett et al., 2002). It is one of the most frequent serious HIV-1 associated infections, and the commonest cause of death in HIV-1 positive Africans (Grant et al., 1997).

Osteoporosis is currently believed not to be a public health problem in black South Africans compared with their White counterparts (Vorster, 2000). Results from the Transition and Health during Urbanisation of South Africans (THUSA) study however showed that postmenopausal black women were osteopenic, with an increased risk of developing osteoporosis and fractures. With further urbanisation and the nutrition transition, osteoporosis could therefore be expected to become an increasing health problem (Vorster, 2000).

It is well established that proper nutrition is critical to the development of an effective immune system (Gershwin et al., 2000). On a population basis, the only rational approach to all types of disease is prevention, and most of all the

protection and creation of healthy environments, at household, community, municipal, state, national and global levels (UNICEF, 2004).

2.3.2 Underlying Causes

The underlying causes of malnutrition include inadequate education, insufficient household and food security, inadequate mother and childcare, as well as insufficient health services and an unhealthy environment.

2.3.2.1 Inadequate Education

Education and the lack of it, in the historical context of South Africa, were seen as a cause of unemployment, which in turn, led to inequality (NPA, 2001, p. 43). Many poor households spend a significant proportion of their income on the education of their children in the hope and belief that this will ensure them a better life (Statistics SA, 2001). However, under average performance in education is often a result of insufficient and unbalanced funding (NPA, 2001, p. 5). These, in turn, are related to human and material resources (e.g. school buildings, etc.), the socio-economic context and the process of teaching and learning. Socio-economic factors such as poor nutrition and housing and low levels of parental education also affect children's capacity to learn (NPA, 2001, p. 47). Furthermore,

it seems that girls and women that have given birth are less likely to be studying than those who had not given birth (Statistics SA, 2001). Relatively few children under 18 years are in the tertiary education system. However, education is not compulsory for the population aged 16 – 25 years (Statistics SA, 2001). In 1998 there were a total of 547 933 students at the 21 universities and 15 technikons in South Africa (Department of Education, DoE, 1999a). According to Labadarios (1999), one out of every ten mothers of children of all age groups had no formal education.

Children who do not attend pre-school programmes are not likely to enter primary school with basic reading skills (Taylor, 2001). These children are at risk of falling behind, and are more likely to drop out of school at high school level, which adversely impacts on their chances of success in the workforce. Also, according to Statistics SA (2001), for every year of age between six and 15 years, a higher proportion of urban than rural children were attending school.

Women have lower educational attainment rates than men. This factor has a negative impact on children whose well-being is more strongly associated with maternal than paternal education. Of South Africans with no schooling, 59 percent are woman (NPA, 2001, p. 57). Furthermore, the country's Bill of Rights states that no person may be discriminated against, either directly or indirectly, on the basis of pregnancy (Statistics SA, 2001). In the census, 2% between the ages of

12 – 15, 43% between the ages of 16 – 25 and 82% aged 26 years or more were reported to have given birth to at least one child.

The nutrition situation is exacerbated by a lack of nutritional information and knowledge (DoH, INP, 2004). Added to this are undesirable dietary habits and nutrition-related practices, attitudes, perceptions and socio-cultural influences that could adversely affect nutritional status. Education on nutrition and health can stimulate demand for more or different food, health services, or disease-prevention products, but the effect of education will be limited if individuals do not have the means and opportunities to act on that knowledge (O'Donnell, 2004). To attain good health and nutritional status, people need sufficient knowledge and skills to grow, purchase, process, prepare, eat and feed their families a variety of foods in the right quantities and combinations (DoH, INP, 2004).

2.3.2.2 Insufficient Household Food Security

Food security can be defined as the immediate availability of nutritional and safe foods, as well as the assurance to gain acceptable foods in socially acceptable manners (Keenan et al., 2001).

Household food security is defined as access to adequate, affordable, safe and nutritious food at the household level (Chopra and McCoy, 2000). It can also be

defined as sustainable access to safe food of sufficient quality and quantity, including energy, protein and micronutrients, to ensure adequate intake and a healthy life for all members of the family.

Over the past two decades, household food security has emerged as a significant social problem and serious public health concern (Tarasuk, 2001). In South Africa, as in many other developing countries, food security is a concern (Bonti-Ankoman, 2001). Among poor households, particularly in rural areas, a significant number may be considered resource poor and therefore food insecure, although South Africa is considered to be food self-sufficient. In addition, the 1994 Project for Statistics on Living Standards and Development estimated that 39% of the population is vulnerable to food insecurity (DoH, INP, 2004). According to the NFCS, only 25% of households appeared food secure at a national level. According to Schwabe (2004), new estimates of poverty show that the proportion of people living in poverty in South Africa had not changed significantly between 1996 and 2001. It is estimated that almost 57% of the South African population were living in poverty in 1996. About 48.5 per cent of the South African population (21.9 million people) currently falls below the national poverty line (UNDP, 2003, p. 5). The Constitution stipulates the need to reduce and, if possible, eliminate vulnerability to and the negative consequences of food insecurity within South Africa (De Klerk et al., 2004).

Household food insecurity is often the center point in the relationship between economic growth and nutritional status (UNICEF, 2004). According to Labadarios (1999), food insecurity was, on average, experienced nationally by two out of three high risk households, five out of ten individuals and four out of ten children. Poor households spend a large proportion of their income on food, but in the event of improvement in incomes extra money is not necessarily spent on improved energy intake. Nevertheless, in many countries increased income is synonymous with higher consumption of higher quality foods, rich in proteins and micronutrients.

Besides individual reasons for choosing food, many external influences control the supply, availability and choice of food (Morse et al., 1998, p. 97). These include economic factors (level of income and food prices), agricultural factors (availability of and, climate and weather), national food availability, cultural factors, as well as social factors. According to Watkinson and Makgetla (2002, p. 1), South Africa faces a crisis of rising food prices and food security. Food and maize meal price increases are devastating for the working class. Households being exposed to the adverse effects of price fluctuations can have a significant impact on household food security (De Klerk et al., 2004).

Clearly, many economic, social and cultural factors will influence household food security. According to NPA (2001, p. 69), food insecurity and insufficient nutrient

intake are closely associated with poverty and inadequate living conditions. In one out of every five high risk households the head of the high risk households was unemployed (NFCS, 1999). One third of the high risk household in the survey had a monthly income of between R 100.00 – R 500.00. According to information from the October Household Survey (OHS), there was an increase in the expanded unemployment rate from 34.4% to 36.2% between 1996 and 1999 (Bonti-Ankoman, 2001).

Poor families have few opportunities to build up sufficient stocks of food or to develop alternatives that would support them in times of struggle (UNICEF, 2004). A very significant percentage of the country's population still lives under adverse socio-economic conditions (Labadarios, 1999). While poor families may have adequate access to food for one month, what is essential is access that is consistent and sustainable (UNICEF, 2004). There are certain times when families are most at risk of hunger and undernutrition (King and Burgess, 1998, p. 354). Nutrition workers need to know these times so that they can watch over "at risk" families more closely during those times. These include before payday, at certain seasons such as pre-harvest season when stores of food will be low, when there is a disaster, e.g. food production and employment may decrease when there is drought, flooding, war, and an epidemic of an animal or plant disease. The 2001/2002 drought affected several countries and contributed to the incidence of poverty increasing (SARPN, 2005). Furthermore, the gap between economic

growth and employment growth is widening (UNDP, 2003, p. 6). Families can also be at risk when there are extra expenses and financial losses such as an accident or sickness of the family wage-earner or loss of the house by fire or flooding (King and Burgess, 1998, p. 354).

Women have a special role to play in maintaining household food security (UNICEF, 2004). In most societies, they are responsible for preparing, cooking, preserving and storing the family's food, and in many societies they have the primary responsibility of producing and purchasing it. For household food security to translate into good nutrition, this often overwhelming burden of work must be reduced so that needs, also related to nutrition, can be met (UNICEF, 2004).

In rural areas, household food security may depend on access to land and other agricultural resources to guarantee sufficient domestic production (UNICEF, 2004). However, according to Watkinson and Makgetla (2002, p. 12), the agricultural decline has been associated with growing differentiation within commercial farming, as less successful farmers suffer, while larger ones become more successful. Urbanised people are dependant upon market-supplied foodstuffs, which should be readily available, at affordable prices. Although there is slow improvement in some of these conditions, it is the long-term socio-economic upgrading of the population that is likely to ensure the improvement of the nutritional status of the community (Labadarios, 1999). Food aid as well as

support by families and friends provides alternative sources of sustenance (UNICEF, 2004).

2.3.2.3 Inadequate Maternal and Child Care

Care is manifested in the ways a child is fed, nurtured, taught and guided and is the responsibility of the entire family and the community (UNICEF, 1998). Maternal morbidity and mortality in childbirth is a matter of utmost importance in public health (D'Oliveira et al., 2002).

Children are a countries most precious asset, and their well-being reflects the future of the nation (Kibel and Wagstaff, 1995, p. 3). UNICEF (2004) has long recognised that improving the nutritional status of women and children can help overcome many of the major health challenges that developing countries face today. Eliminating malnutrition among expectant mothers, for example, would reduce disabilities among their infants by almost one third.

According to Golden et al., (2003) neglect is a major cause of inadequate childcare in all societies and should be differentiated from abuse. Malnutrition is often a prime example of neglect. According to some children, abuse is not always reported as they are threatened, paid to remain silent and stigmatized by the community (Botma and Grobler, 2004).

As bearers of children, women generally accept major responsibility for the home, often in addition to much other work (Kibel and Wagstaff, 1995, p. 97). In sub-Saharan Africa, maternal malnutrition is not improving in 70 percent of the countries (Standing Committee on Nutrition, 2004). According to Tinker (2000), malnutrition is a major contributory factor to women's poor health and preventable mortality. Human rights violations, including domestic violence; sexual abuse and female genital mutilation carry a severe physical and mental toll (NPA, 2001, p. 18). When violence against women is discussed, there are four types of violence (D'Oliveira et al., 2002). These include: Neglect; verbal violence, including rough treatment, threats, scolding, shouting and intentional humiliations; physical violence, including denial of pain-relief when technically indicated; and sexual violence. The *Declaration on the Elimination of Violence against Women* (1993) defines violence against women as “any act of gender-based violence that results in, or is likely to result in, physical, sexual or mental harm or suffering including threats of such acts, or deprivation of liberty, whether occurring in public or in private life” (WHO, 2002). These forms of violence are a serious violation of human rights and are related to poor quality and effectiveness of health care services (D'Oliveira et al., 2002).

There has been an increase in female-headed households, and there is an association between gender of the head of the household and poverty (NPA, 2001, p. 54). It would appear that women sacrifice the quality of their diets and limit the amount of food eaten by the adults in order to preserve the amount of

food available to their children (Labadarios, 1999). Many South African children are brought up with no paternal role-models. In 1995, 42 percent of South African children under seven years of age were living with their mother, compared with 1 percent living only with their father. Only 40 percent of African children were living with both parents (Nyman, 1999).

An adequate supply of nutrients is probably the single most important environmental factor affecting pregnancy outcome (King, 2003). During the first half of the 20th century, chronic energy undernutrition due to low dietary intake, repeated infections, and rapid succession of pregnancy result in adverse outcomes (Ramachandran, 2002). Adequate nutrition for mothers, before and after they give birth, is a vital part of nutrition strategies and helps reduce infant mortality, which often is directly attributable to maternal malnutrition (UNICEF, 2004).

Increasing birth intervals will benefit both the mother and children (Kibel and Wagstaff, 1995, p. 158). Family spacing is far more than just birth control. It is a way of life, the major objective of which is to improve the quality of life for everybody. The clear message emerging from these connections is related to improving women's nutritional status, by increasing their intake of micronutrients as well as their overall food consumption, and by taking steps to reduce their workload and improve their access to health care. Such steps may offer considerable, low-cost benefits in reducing maternal deaths. Despite this there is

still no international consensus on the benefits to be gained by supplementation during pregnancy with nutrients other than iron and folate (UNICEF, 2004).

Although women are targeted as the primary caregivers, recognition of men's roles in family health and nutrition is increasing (Kurz and Johnson-Welch, 2000).

2.3.2.4 Insufficient Health Services and Unhealthy Environment

The reasons for inadequate health infrastructure are many. Determination to develop a more equitable national health care system was central to the new government's health and welfare policies in the Reconstruction and Development Programme (Terreblanche, 2002). The democratic government in South Africa has paid much attention to improving access to health care for all, and reducing inequity in access to health care (Statistics SA, 2004). However, movement toward some sort of National Health Service that resembles health care systems in many developed countries, with equitable access to well-balanced primary, secondary, and tertiary care facilities, has been slow. South Africans without health insurance are dependent on public services (Benatar, 2004). Currently, inadequate facilities and shortages of personnel and basic medicines at new primary care centers reduce availability of tertiary care for the poor, and result in inefficient and ineffective interactions among hierarchical levels of public health

services. Per capita spending at district level on primary health care (PHC) ranges from R389 in richer districts to R42 in the poorest districts (Padarath, Health System Trust, HST, 2004). In other words, many districts are not able to afford PHC services, estimated at approximately R220 per capita per year. The critical shortage of human resources is the result of the freezing of posts, poor working conditions, and the migration of health care workers to the private sector and overseas. According to Sala et al. (2004), 85% of the world's children live in developing countries, where access to adequate care often is limited and prevalent infectious diseases and malnutrition frequently influence health status adversely. The public health sector is the main provider of PHC services in South Africa (Roberts et al., 2004). It is important that these services are provided in an equitable, effective and efficient manner.

Spending of donor funds is slowed by a weak health system and insufficient capacity of the government to use the money (Ndlovu, 2005). Increased government and donor allocations for HIV and AIDS without improved capacity to spend, challenges the overall strength of the health system.

An essential element of good health is access to affordable, good quality environmental services (UNICEF, 1998). Access to adequate health and other services such as clean, safe water, sanitation and refuse removal is a major determinant of nutritional status (Chopra and McCoy, 2000). The environment, absence of clean drinking water, irrigation, water and sanitation impact directly on

the well-being of children (NPA, 2001, p. 11). South Africa is a country with a highly developed infrastructure for supplying the water demands of commercial irrigation and industry, mining, coal fired electricity generation and the majority of urban domestic users (Hazelton, 2002). However, on the other hand, South Africa is a dry country where water is scarce (NPA, 2001, p. 95). Even in places with high rainfall and flowing rivers, the source of water is not always close to people's homes. An estimated 12 million South Africans do not have access to adequate sanitation facilities. Access differs for different populations groups (NPA, 2001, p. 95). Botma and Grobler (2004) found that in the Motheo District, the majority of households had safe water supplies by means of running water in the yard or communal taps. Access to water, energy, proper sanitation and waste removal, not only reduces health and environmental risks, but also is of utmost importance for development (UNDP, 2003, p. 9). Availability of toilet facilities has improved since 1996 as the number of pit latrines in South Africa increased from 13.7% to 32.18%, and the number of bucket latrines decreased from 33.6% to 21.87% (NPA, 2001, p. 95).

In some cases, a family's water supply is completely untreated and the water may have to be laboriously transported for long distances (Kibel and Wagstaff, 1995, p. 9). This task is generally delegated to women, requiring them to expend considerable time and energy and putting enormous time burdens on poor households (NPA, 2001, p. 34).

According to Kibel and Wagstaff (1995, p. 9), sewage disposal in the modern sense may be non-existent in many countries, and pollution of water by sewage is still the major source of contamination. Under these conditions water- and food-borne infections thrive. Episodes of diarrhoea are common in the young child and constitute a major cause of death in infancy (Kibel and Wagstaff, 1995, p. 9). Although often not immediately beneficial, when a municipality is planning any significant water treatment plant upgrade, it is good practice to examine the practicability of keeping the domestic sewage separate from industrial effluent (Hazelton, 2002).

Atmospheric pollution with smoke has been recognised as a health hazard ever since the beginning of the Industrial Revolution (Kibel and Wagstaff, 1995, p. 13). An estimated 8.4 million children under 15 years of age are exposed to pollutants from coal and inadequate and overcrowded housing has negative effects on mental and physical health (NPA, 2001, p. 11).

2.3.3 Basic Causes

Political, legal and cultural factors may defeat the best efforts of households to attain good nutrition (UNICEF, 1998). These include the laws pertaining to the protection of woman and children, the political and economic system that

determines how income and assets are distributed; and the ideologies and policies that govern the social sectors.

2.3.3.1 Economic Structure

According to Bonti-Ankoman (2001), there are several articles of the Universal Declaration of Human Rights. One important article emphasizes economic rights of many citizens of the world. Article 25.1 of the United Nation's Universal Declaration on Human Rights states that;

“Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing, medical care, the necessary social services and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control”.

This places a strong moral obligation on governments to act to eradicate hunger wherever it occurs.

Poverty is universally accepted as a fundamental cause of malnutrition (Chopra and McCoy, 2000). In South Africa it is associated with high unemployment,

inability to pay for food, health care and basic services, disintegration of families, vulnerability, risk of homelessness and discouragement (NPA, 2001, p. 26). Since employment is the bridge between economic growth, poverty and opportunities for human development, continued poverty reduction is not possible without persistent and rapid economic growth (UNDP, 2003, p. 6). Although economic growth must be understood as a frequent contributor to nutrition improvement, it is, however not a necessary condition for it (UNICEF, 1998).

Unemployment rates are generally high in South Africa, particularly for women, Africans and those in rural areas. In 1996, the unemployment rate among the economically active urban population was 20.3 percent compared with 26.8 percent in non-urban areas (Statistics SA, 1999).

Although economic development is the long-term solution to Africa's challenge of hunger and poverty, this will take time (Rukundi, 2002). There is still 1.3 billion of the population who go to bed hungry every day (Khush, 2001). Unemployment rates are high in South Africa, especially for women, and female-headed households are more likely to be poor (NPA, 2001, p. 2). Poor households have less access to essential services such as water and sanitation and have long distances to travel to health facilities. Children in poor families are also likely not to complete their schooling, and are more subject to crime and violence. Poverty can fragment family life and may force children onto the streets and into exploitative forms of child labour (NPA, 2001, p.2).

Children's well-being depends on the ability of families to provide for their needs (NPA, 2001, p. 6). Economic stress is a major contributor to family problems and breakdown. Children raised by a single parent often have no financial assistance from the other parent. Children living in rural areas are more likely to be poor than those in urban centers.

Malnutrition leads to reduced productivity, influencing economic growth and the effectiveness of investments in health and education, and increases poverty (UNICEF, 2004). Vitamin and mineral deficiencies are estimated to cost some countries the equivalent of more than 5 percent of their gross national product in lost lives, disability and productivity (UNICEF, 2004).

Good early nutrition is most likely to result where there is economic growth; when social services become affordable and accessible; and when adequate investment is made in human resources (UNICEF, 2004). Good nutrition in turn contributes to greater productivity and thus to economic growth.

While considerable effort has been made to determine the prevalence of malnutrition, much less attention has been given to prevention (Walsh et al., 2001). The importance of the distinct and extensive benefits derived from the prevention and/or treatment of malnutrition cannot be emphasized enough (DoH,

INP, 2004). Indeed, it has been estimated that approximately half of the economic growth achieved by, for example, the United Kingdom and other European countries between 1980 and 1990 were due to better nutrition as well as better health and sanitation conditions, which were made a century earlier. Correct nutrition does not only ensure healthier children, who grow into more productive adults, but is also associated with a better resistance against infections, improved pregnancy outcomes and economic growth through enhanced productivity (DoH, INP, 2004).

2.3.3.2 Political and Ideological Superstructure

Political and ideological factors, coupled with availability and access to potential resources, will also influence food security on a national as well as household level (Chopra and McCoy, 2000). In the past decade, the violence of war has become the dominant cause of starvation worldwide (Lee and Nieman, 2003, p. 681). In all of the countries that reported starvation in the 1990's, armed conflict and political unrest were the major causes. Farmers become warriors, their agricultural fields become battlegrounds, the citizens go hungry, and the warring factions often block starvation relief.

The world continues to struggle to find a middle ground between respecting the sovereignty of nations and insisting that all nations allow humanitarian assistance

to reach the people (Lee and Nieman, 2003, p. 681). Income distribution in South Africa is among the most unequal in the world (Bonti-Ankoman, 2001). As government budgets decline, basic social services and health services are hit particularly hard (UNICEF, 2004). Per capita incomes also decline, affecting people's ability to purchase food. Furthermore, workers typically spend more than a third of their income on food (Watkinson and Makgetla, 2002, p. 1).

There is substance to government claims about the contribution of the social wage to people's well-being (Meth and Dias, 2004). Examples include number of houses built, clinics constructed, water and electricity connections made and roads upgraded. However, there is still a large increase in numbers of those requiring assistance.

Political violence, intra-community violence and conflict about scarce resources, has been responsible for many deaths and displacement. About 11 000 people died in KwaZulu-Natal and Gauteng as a result of political violence from 1990 to 1993. The effects show that families have been displaced, property destroyed, children have been displaced and showed signs of post-traumatic stress syndrome (NPA, 2001, p. 18). It seems that the real focus for sustainable development in South Africa depends on confronting political challenges (UNDP, 2003, p. 5).

South Africa still faces challenges in addressing the rights and needs of her children (NPA, 2001, p. 18). Strategic political interventions should aim to focus on policies and support measures on achieving the goals of sustainable development (UNDP, 2003, p. 5).

According to NPA (2002, p. 26), the socio-economic imbalance between black and white, rural and urban South Africans caused by racist colonial and apartheid policies has resulted in the need to rebuild the economy, and create a programmatic response to meet the needs of children and families.

According to Watkinson and Makgetla (2002, p. 2), more than 600 000 households are involved in farming to produce the main source of food for their families. In general, this is an activity conducted after most other activities necessary for the functioning of a household have been completed (De Klerk et al. 2004). Vegetable and fruit gardens have a particularly important potential role in improving the flow and composition of nutrition. Increased agricultural production means more food enters the marketplace, reducing food prices. This is critical for people in low-income countries who spend an average of 55 percent of their expenditures on food, as compared to 16 percent in high-income countries (Regmi, 2001).

Since the advent of democratic rule in 1994, the South African Government has realigned the health system to cater to needs of the majority, child nutrition being a priority (UNICEF, 2004). The Reconstruction and Development Programme (RDP) identified in 1994 food security as a priority policy objective (Department of Agriculture, 2002). As a result, the Government reprioritized public spending to focus on improving the food security conditions of historically disadvantaged people.

2.4 Manifestations of Malnutrition

Figure 2.3 (adapted from Lee and Nieman, 2003, p. 17) demonstrates the stages in the development of a nutrient deficiency.

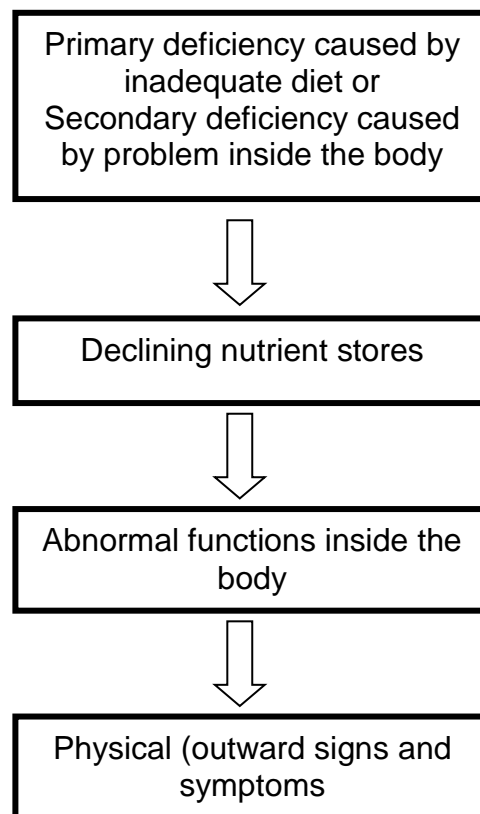


Figure 2.3: Stages in the development of a nutrient deficiency (Lee and Nieman, 2003, p. 17).

According to Pelletier and Frongillo (2003), considerable evidence suggests that malnutrition affects human performance, health and survival, including physical growth, morbidity, mortality, cognitive development, reproduction, physical work capacity and risks for several adult-onset chronic diseases.

Growth monitoring is useful if it provides information for assessment and analysis of the causes of growth faltering, followed by affordable actions appropriate for each of those causes. Growth faltering, one of the greatest manifestations of malnutrition, is defined as no change in weight or an actual decrease in weight between consecutive examinations, usually a month apart (DoH, 2004).

Growth directly reflects nutrient intake and is an important parameter in assessing the nutritional status of infants, and children (Lee and Nieman, 2003, p. 535). Health care professionals measure the heights and weights of infants and children at intervals and compare measures both with standard growth curves for gender and age and with previous measures of each child.

Poor growth due to PEM is easy overlooked because a small child may look quite normal, but is often much smaller than other children of the same age (Lee and Nieman, 2003, p. 185). Stunting is associated with a long-term reduction in dietary intake and is mostly related to repeated episodes of illness and poor-quality diets (UNICEF, 2004). It is particularly dangerous in the case of stunted woman as they

are more susceptible to obstructed labour and therefore have an increased chance of dying whilst giving birth. Malnourished children have a lower resistance to infection, are more likely to die from common ailments such as diarrhoeal diseases and respiratory infections, and survivors are locked in a cycle of recurring sickness which also affects their nutritional status. A study done by Penny et al. (2005) found that some socio-economic characteristics, such as housings, education level of parents, hygiene and birthweight, affected variation in growth outcomes in the population.

Considerable resources are spent to ensure that families have access to basic health services, yet malnourished children's low resistance to illness negates the effectiveness of these investments. The gradual and harmful effects on brain development and intellectual performance compromise investments by governments and institutions (UNICEF, 2004). Early nurturing and stimulation lay down the neurological pathways that promote improved learning, health and behaviour throughout life.

In particular, the influence of early stimulation on brain development includes impacts on the immune and stress regulation systems (UNICEF, 2004).

"A nation's 'human capital', literally, its stock of healthy, educated, competent, productive people, is a key determinant of its prospects for both economic growth and further human development. The process of developing human capital begins

with providing every child the best start in life: not only survival, but also the conditions needed for every child to thrive and to reach her or his full potential” (UNICEF, 2004). Early childhood is the most critical opportunity in human development to influence health, learning and behaviour throughout life. Brain development is at its most vital phase from birth to the age of three.

The brain has remarkable capacities for self-protection and recovery. But the loving care and nurture children receive in their first years, or the lack of these critical experiences, however, leave lasting imprints on young minds (UNICEF, 2004). Skills such as language acquisition, social competence, coping, the ability to think critically and the capacity to learn, all develop in the first years of life, before a child enters formal schooling. Consequently, what happens, or doesn't happen, in early childhood has a critical impact on prospects for child development, ability to learn in school, and to be healthy and productive in adulthood.

Human capital, and hence opportunities for nations to progress, is being squandered on an enormous scale because hundreds of millions of young children worldwide are not ensured the conditions needed to thrive and to reach their full potential.

In addition, large numbers of children are kept from developing to their full potential because of physical disabilities, learning impairment and poor preparedness for school. Inequity is reproduced from generation to generation because children from poorer families are disproportionately burdened by problems that take root in early childhood. Gender disadvantages are perpetuated because young girls are not given an equal start. Efforts to promote prosperity and development are impeded (UNICEF, 2004).

Some 2.2 million children die from diarrhoeal dehydration as a result of persistent diarrhea that is often aggravated by malnutrition (UNICEF, 2004). In infancy and early childhood, iron deficiency anaemia can delay psychomotor development and impair cognitive development, lowering IQ by about 9 points. Anaemic pre-schoolers have been found to have difficulty in maintaining attention and discriminating between visual stimuli. Poor school achievement among primary school and adolescent children has also been linked to iron deficiency. Iron deficiency is partly induced by plant-based diets containing low levels of poorly bio-available iron (Kesa and Oldewage-Theron, 2005). Anaemia has also been identified as a contributing factor, if not a principal cause, in 20 percent to 23 percent of all post-partum maternal deaths in Africa and Asia, an estimate many experts regard as conservative. Because the causes of iron and other micronutrient deficiencies are complex, including inadequate food intake, unsanitary conditions and inadequate health services, the solutions may also be

complex, requiring multisectoral and interdisciplinary approaches (Nantel and Tontisirin, 2002). Malnourished children, unlike their well-nourished peers, not only have lifetime disabilities and weakened immune systems, but they also lack the capacity for learning that their well-nourished peers have (UNICEF, 2004).

Normal activities in young children, play, curiosity, motivation and exploration are dulled by malnutrition (UNICEF, 2004). Lack of normal development follows the absence of these activities, and in turn impairs mental and cognitive development. This reduces the extent of interaction children have with the environment, and their care-providers. Varying degrees of mental retardation in infants can be produced by malnutrition in mothers, particularly mothers with iodine deficiency. Growth retardation in childhood has a number of consequences in later life including higher risk of mortality, increased risk of disease, as well as decreased chance of employment, productivity and promotion (UNICEF, 2004).

In the absence of the prospect of ever reaching their full mental and physical potential malnourished children face a bleak future (UNICEF, 2004). In adulthood they will have diminished abilities, normally associated with lack of employment and low productivity. They will suffer from chronic illness and disability, often in societies with little economic capacity for even basic health and therapeutic services.

2.5 Measurement of Growth

In the assessment of malnutrition, there is a need for assessment and analysis techniques that are low in cost, produce rapid results and are easy to use and understand (UNICEF, 2004).

2.5.1 Indicators and Cut-off Points

Anthropometric measurements are used to assess body size, proportions and composition (Chopra and McCoy, 2000). Measures obtained from anthropometry can be sensitive indicators of health, development, and growth in infants and children (Lee and Nieman, 2003, p. 164). Anthropometric measures can be used to evaluate nutritional status, whether it is obesity by overnutrition or wasting resulting from protein-energy malnutrition. They are valuable in monitoring the effects of nutritional intervention for disease, trauma, surgery, or malnutrition (Lee and Nieman, 2003, p. 164).

In a well-nourished population, there is a standard distribution of height and weight for children under the age of five years (UNICEF, 2004). Malnutrition in a population can be determined by comparing the growth of children to this standard distribution. The most common standard or reference population used is the

National Centre for Health Statistics (NCHS) standard, which is recommended for use by UNICEF and the WHO. Each of the four nutritional status indicators is expressed in standard deviation units (Z-scores) from the median of this reference population.

Malnutrition can be defined using three different indices and these are: height-for-age (H/A), weight-for-age (W/A) and weight-for-height (W/H).

2.5.2 Interpretation

Malnutrition in children can be assessed using anthropometry, biochemical indicators (e.g. a decrease in serum albumin levels) and clinical signs of malnutrition (e.g. edema, hair and skin changes) (WHO, 2005b).

There are three different systems by which a child or a group of children can be compared to the reference population: Z-scores (standard deviation scores), percentiles, and percent or median. For population-based assessment – including surveys and nutritional surveillance – the Z-scores are widely recognised as the best system for analysis and presentation of anthropometric data because of its

advantages compared to the other methods (WHO, 1995). At the individual level, however, although there is substantial recognition that Z-score is the most appropriate descriptor of malnutrition, health and nutrition centers (e.g. supplementary feeding programmes in refugee camps) have in practice been reluctant to adopt its use for individual assessment.

According to Lee and Nieman (2003, p. 184), children who are thin for their age (underweight) may be suffering from acute PEM (recent severe food deprivation), whereas children who are short for their age (stunted) have experienced chronic PEM (long-term food deprivation).

The Z-score system expresses the anthropometric value as a number of standard deviations or Z-scores below or above the reference mean or median value. A fixed Z-score interval implies a fixed height or weight difference for children of a given age. For population-based uses, a major advantage is that a group of Z-scores can be subjected to summary statistics such as the mean and standard deviation. The formula for calculating the Z-score (WHO, 1995):

$$\text{Z-score} = \frac{\text{Observed value} - \text{median value of the reference population}}{\text{standard deviation value of reference population}}$$

(or SD-score)

W/A, H/A and W/H below -2 SD from the NCHS median are used to measure underweight, stunting, and wasting respectively. Chronic malnutrition or stunting is a nutritional disorder that reflects deficits in linear growth both before and after birth due to the long-term collective consequences of insufficient nutrition and/or poor health. In contrast, severe acute malnutrition or wasting reflects disease as a result of poor hygiene, lack of clean water, and an inadequate immunisation strategy; or inadequate access to food as a consequence of poverty. Underweight is a nutritional disorder encompassing a component of both stunting and wasting since the W/A index is affected by weight and height of a child (WHO et al., 2002). It represents an effect of inadequate nutrition and/or health experienced by refugee or other communities in the situation where wasting is non-existent. Therefore, W/A might be a better as a tool for growth monitoring of children in communities rather than as a planning tool for decision-making.

Obesity is also a nutritional concern (UNICEF, 2004). Some of the leading causes of hunger and obesity are the lack of money to buy high-quality nutritious food (Berg, 2005). Children whose weight for height is more than two standard deviations above the NCHS mean are considered overweight and more than three standard deviations above the NCHS mean are considered to be obese.

Weight and height measurements of adults can be obtained to determine Body Mass Index (BMI) as seen in Table 2.1, as follows: W/H^2 , in which W is weight in kilograms and H is height in meters squared, with:

Table 2.1: Cut-off points of BMI (Laquatra, 2004, p. 1186).

BMI Categories	BMI Cut-off Points
Underweight BMI:	$< 18.5 \text{ kg/m}^2$
Lower normal weight BMI:	$18.5 \text{ kg/m}^2 - < 20.0 \text{ kg/m}^2$
Normal BMI:	$20.0 \text{ kg/m}^2 - < 25.0 \text{ kg/m}^2$
Overweight BMI:	$25.0 \text{ kg/m}^2 - < 30.0 \text{ kg/m}^2$
Obese BMI:	$\geq 30.0 \text{ kg/m}^2$

CHAPTER 3

EXPERIMENTAL PROCEDURE



CHAPTER 3

EXPERIMENTAL PROCEDURE

3.1 Introduction

The community of Mangaung is a rapidly urbanising community where the double burden of malnutrition and diseases of lifestyle occur simultaneously. Mangaung is an urban area situated in Bloemfontein where environmental factors are not always optimal and the prevalence of malnutrition is high. This makes Mangaung an ideal area to evaluate the causes of malnutrition. The causes of malnutrition are seen as deeply rooted in environmental factors, such as poverty and lack of education. In any attempt to improve nutritional status it is therefore important to assess the relationship between certain environmental factors and indicators of nutritional status.

Adequate information on the existing nutritional status and specific causes of nutritional problems in the community of Mangaung should be obtained in order to design better and more effective nutrition intervention programmes.

3.2 Pilot Study

A questionnaire (Appendix A) was compiled by the Department of Human Nutrition, University of the Free State (UFS), in 1999 and was used until 2002 as part of the training of the fourth year dietetic students in community nutrition to assess the nutrition situation of a household. This questionnaire is based on relevant literature regarding the causes of malnutrition. During the implementation of this questionnaire several adaptations and revisions were made. In 2003 a new and improved questionnaire was developed to be used for the current study based on the experience with the previous questionnaire.

A pilot study was undertaken to standardise anthropometric measurements. Anthropometric measurements were demonstrated to the field workers according to the recommendations of Lee and Nieman (2003, p. 167), to ensure that the techniques used were correctly applied. The researcher was present while anthropometric determinations were done to ensure correct methods were used.

3.3 Population and Sampling

3.3.1 Study design

A comparative cross-sectional community survey.

3.3.2 Study population

The selection of the study population was determined during consultation with Department Biostatistics, University of the Free State, using a township map of Mangaung obtained from the Greater Bloemfontein Municipality. Practical aspects (money, time etc.) were considered, as well as the study structure. The sample includes all the households from two areas, namely JB Mafora and Namibia. All households where someone (a person who could answer the questions in the questionnaire during an interview) was available during the day were included in the sample. According to the township maps, there were 1 835 households in JB Mafora and 1 740 in Namibia.

All the households in the community of JB Mafora as seen by the fourth year Dietetic students working in the community during household visits as part of their training, and the researcher, were included. Namibia also formed part of the study and is similar to JB Mafora as regards socio-economic status, facilities available and housing. All assessments done in Namibia were performed by the researcher. Although this study comprises the identification of causes of malnutrition in both these areas, future interventions are planned based on the results of this study, where JB Mafora will serve as an experimental area (where interventions will be implemented based on the results of this study) and Namibia as the control. For the purpose of this study the results of the two areas are combined.

Inclusion / exclusion criteria:

- All households in JB Mafora and Namibia where an adult (person \geq than 18 years) was present during the day were included. Households where no one was present during the day were excluded;
- Persons took part in the research study voluntarily;
- Persons that signed the informed consent form were included (Appendices B and C).

3.4 Operational Definitions

3.4.1 Household and socio-demographic information (Appendix A):

Household information refers to the following:

- State of the environment;
- Composition of the household;
- Socio-demographic information (head of household, room density, type of income, smoking, water, vegetable garden);
- Prevalence of disease; and
- Clinic attendance and efficacy (Primary School Nutrition Programme, PSNP, and PEM).

3.4.2 Weight and height status (Appendix A):

For the purpose of this study, the following anthropometric parameters were included:

- Weight and height measurements of caregivers to determine BMI, as follows:

W/H^2 , in which W is weight in kilograms and H is height in meters squared, with:

Underweight BMI: $<18.5 \text{ kg/m}^2$,

Normal BMI: 18.5 kg/m^2 , - $<25.0 \text{ kg/m}^2$;

Overweight BMI: 25.0 kg/m^2 , - $<30.0 \text{ kg/m}^2$;

Obese BMI: $\geq 30.0 \text{ kg/m}^2$ (Laquatra, 2004, p. 1186).

- Weight and height measurements of children under the age of six years.

The NCHS medians for weight-for-age, height-for-age and weight-for-height were used as reference. The -2 SD refers to the Z-score cut-off which is two SDs below the reference median and compares with the values of the third percentile (WHO, 2002). Weight for age (W/A), height for age (H/A) and weight for height (W/H) are classified as moderately depleted (<-2 SD) and mildly depleted (-2 SD to <-1 SD), normal ($+1$ SD) and excessive (>2 SD). Criteria applied for Z-scores <-2 SD includes W/A <-2 SD as underweight, W/H <-2 SD as wasting and H/A as stunting (WHO, 2002).

3.4.3 Dietary intake (Appendix A):

Refers to:

- The habitual intake of food and drinks by adults and children in the households, expressed as frequency of usual intake, as well as
- Meal pattern and meal composition of babies (\leq six months), children ($>$ six months and $<$ than six years) and adults ($>$ 18 years).

3.5 Apparatus and Techniques

The following apparatus and techniques were applied for the study:

3.5.1 Questionnaire (Appendix A)

Household information and socio-demographic status were determined by means of a questionnaire. Household information and socio-demographic status was obtained from the caregiver during a personal interview with the researcher at the household using a standardised questionnaire. Interpreters (Community health workers) were used where Afrikaans and English could not be understood.

3.5.2 Weight and height status (Appendix A):

Weight and height status of the caregivers and children younger than six years was determined by means of the following anthropometric measurements:

Body weight was obtained using an electronic scale (Lee and Nieman, 2003, p. 167). Scales were placed on a flat, hard surface. The zero weight on the scale's horizontal beam was checked periodically and after the scale was moved. Children and adults who could stand without assistance were weighed on a platform electronic scale that is accurate to 0.1 kg. The subject stood still in the middle of the scale's platform without touching anything and with the body weight equally distributed on both feet (Lee and Nieman, 2003, p. 167).

Length of infants was obtained with the subject lying down and generally is reserved for children less than 24 months of age or children between 24 and 36 months of age who could not stand erectly without assistance (Lee and Nieman, 2003, p. 165). Measurements of recumbent length required a special measuring device with a stationary headboard and moveable footboard that are perpendicular to the backboard. The device's measuring scale (in millimeters) had its zero end at the edge of the headboard and allowed the child's length to be read from the footboard. Height for children and adults was measured by means of a stadiometer with a vertical scale of 2 meters and a sliding headpiece, to the nearest 0.1 cm, while

standing barefoot on the platform, the heels touching the stadiometer, legs straight, shoulders relaxed, and looking straight ahead (Lee and Nieman, 2003, p. 225). The stadiometer was transported to each household.

3.5.3 Dietary intake (Appendix A):

Dietary intake was determined by a questionnaire during an interview. The questionnaire contained questions to determine a brief diet history and a short food frequency list was also completed. Intake of adults and older children was categorised as adequate or inadequate according to the inclusion of the three food groups in each meal as well as by the frequency of intake of foods. Frequencies were obtained by completing the appropriate column showing ranges per day, week, month or year (Monsen, 1992 p. 179).

3.6 Reliability and Validity

Reliability: Reproducibility is the ability of the dietary method to produce the same information with the same persons on two or more occasions (Monsen, 1992, p. 188). Measurements and techniques used are repeatable and pre-cautions are taken to ensure that results are reliable e.g. to ensure that the scale being used is calibrated.

Validity: Validity is the ability of an instrument to measure what it is supposed to measure, such as the intake of a particular meal or day, or the usual diet consumed during the past year (Monsen, 1992, p. 186).

3.6.1 Questionnaire

A Questionnaire completed by means of a personal interview results in a high response rate, because the interviewer can motivate the respondent to participate. This technique can also be successfully applied for uneducated respondents.

Validity of the questionnaire (Appendix A) is based on the fact that relevant literature regarding the causes of malnutrition (UNICEF, 2004), was consulted in the design of the questionnaire.

To ensure reliability and a standard way of gathering data, the fieldworkers were trained on how to conduct the interview, and how to complete the questionnaire. The reliability was further enhanced by repeating ten percent of the questionnaires. Where answers to questions asked in the initial survey and the reliability survey differed with more than 10%, the data is not considered reliable and results are not reported.

3.6.2 Anthropometric measurements

Fourth year dietetic students and the researcher applied standardised techniques as recommended by Lee and Niemann (2003, p. 165, 167, 225). The scale was calibrated and the stadiometer was accurate. This was determined by using standard weights to determine reliability. Measurements were only taken once.

3.6.3 Dietary Intake

To ensure reliability, only one person, namely the researcher, interpreted the coding of dietary intake (information). Ten percent of the questionnaires were repeated in order to determine reliability of results obtained in the initial survey.

3.7 Statistical Analysis

The following analyses were done by the Department of Biostatistics, Faculty of Health Sciences, University of the Free State.

3.7.1 Household information:

Frequencies and percentages were used to describe categorical data, medians and percentiles to describe continuous data.

3.7.2 Anthropometry:

The data for anthropometric measurements were categorised into two groups: caregivers; and children under the age of six years. Body Mass Index (weight / height m²), weight for age (W/A), height for age (H/A) and weight for height (W/H), were categorised according to the cut-off points discussed under 3.4 under Operational definitions. The Epi-Info Computer Version 5 was used to analyse the weight and height data for children. For each group, the categorised variables were described by frequencies and percentages.

3.7.3 Dietary intake:

The data for dietary intake was categorised into three groups: adults, children older than one year and younger than six years, as well as babies younger than one year. Adequacy of the diets of adults and children older than one year were evaluated by

the presence of the three food groups in each meal. Adequacy of the diets of babies younger than one year was evaluated by evaluating exclusivity of breastfeeding and the introduction of other foods and solid foods. Adequacy of food intake and frequency of food intake of adults were described by means of frequencies and percentages.

3.7.4 Associations between variables

Continuous variables were compared by means of 95% confidence intervals for the median differences. The association between household information and adequacy of food intake was calculated and described by means of 95% confidence intervals.

3.8 The role of the researcher:

For the purpose of this study, the researcher was responsible for the following:

- Compilation of consent form;
- Revision of household information and socio-demographic status, questionnaire;
- Training of field workers (students and community health workers)
- Supervision of fourth year dietetic students;
- Completion of questionnaire in Namibia with community health workers

(interpreters);

- Weight and height measurements; and
- Assessment of dietary intake.

3.9 Study Procedures

A schematic representation of the study procedures is given in figure 3.1. The study was approved by the Ethics committee of the Faculty of Health Sciences, University of the Free State, (ETOVS 39/04). Prior to the study, the Community leader of the two selected areas, JB Mafora and Namibia, Mr. Masoabi, gave consent to perform the research study. A letter explaining the extent and purpose of the study was written to the Community leader of Namibia (Appendix D). In addition, one community health worker who participated in the project addressed community meetings in the control group, Namibia, to explain the purpose and procedures of the study. Permission for implementation of the study in JB Mafora had already been obtained in the past for the final year dietetic students as part of their training.

All the households in JB Mafora and Namibia were visited. Only households where an adult or caregiver was present were included. Households with no children were also included. About 5-10 households were visited every day (08/03/2004 – 01/06/2004). The researcher and community health workers introduced themselves

and explained the purpose and details of the research study. In Namibia, written informed consent was obtained (Appendices B and C).

During the visit, the questionnaire (Appendix A) was completed in an interview in order to obtain socio-demographic information, as well as dietary intake. Children under the age of six years and their caregivers were weighed and measured. Dietary intake was determined by a brief diet history and food frequency questionnaire (FFQ). Appendix E was used as criteria by the two community health workers during the completion of the questionnaire.

Study Procedures:

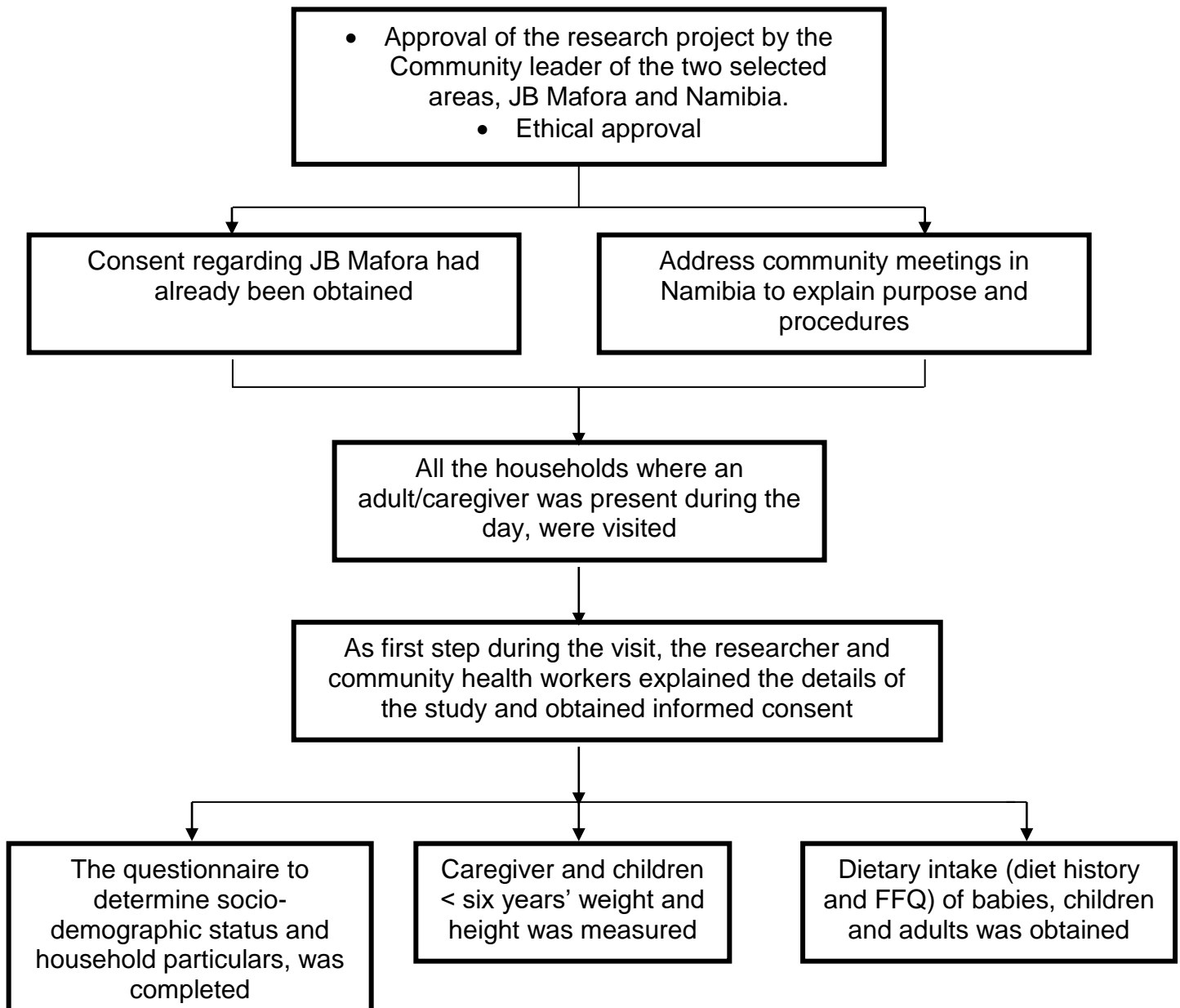


Figure 3.1: A schematic representation of the study procedures

CHAPTER 4

RESULTS

CHAPTER 4

RESULTS

4.1 Introduction

The results of the study are presented under the following headings: demographic profile of respondents, household and socio-demographic information, anthropometry, dietary intake and associations between the above.

4.2 Demographic profile of respondents

The age, gender, educational level and type of household member answering the questionnaire were determined as part of the demographic profile. The demographic and household information had to be collected in order to describe the communities and respondents adequately. The response rate of the study was good as none of the households refused to take part in the study. Households where no one was present were excluded.

As part of the demographic profile, the age, level of education as well as amount of people contributing to the income was categorised for all household members older than 18 years. The demographic profile of household respondents is tabulated in table 4.1.

Table 4.1: Demographic profile

Parameter		
Education	N = 937 (> 18 years)	%
None	102	10.9
Grade 1 to 12	760	81.0
Tertiary	22	2.4
Still at school	53	5.7
Median grade	8	
Type of household member	N = 1950	%
Father	308	15.79
Mother	415	21.28
Grandmother	55	2.82
Grandfather	15	0.78
Child ≤ 6 years	890	45.64
Other	267	13.69
Age (years)	N = 1785	%
Mean age	23.87	
Minimum age	0.008	
Maximum age	92.8	
Sex	N = 1987	%
Male	907	45.65
Female	1080	54.35

Five hundred and eleven households were included in the survey. The total number of household members in these households was 2002. Of these, 937 were over the age of 18 years.

The mean level of education of household members over the age of 18 years ranged from no education to tertiary education. The majority (81.0%) had grade 1 to 12, with a median of grade 8. Only 2.4% of household members received education on tertiary level, while 10.9% had no schooling.

Of the 2002 household members, the data regarding type of household members was collected for 1950 household members. A large percentage of the household members were children younger than six years (45.64%). Fourteen percent of the participants

were described as 'other', that included uncles, aunts and persons not related to the respondent. The mean age of household members included in this study was 24 years, with the youngest respondent 8 days old and the oldest person 93 years. The percentages of male and female household members were more or less equal.

4.3 Household and socio-demographic information

Household information included questions pertaining to the state of the environment, composition of the household and socio-demographic information (head of household, room density, type of income, smoking, water, vegetable garden). Respondents were asked questions pertaining to reported health, including prevalence of disease, clinic attendance for children and adults and efficacy of food aid programmes (PSNP and PEM). Household and health information is tabulated in tables 4.2 and 4.3 respectively.

Table 4.2: Household information

Parameter		
Type of house	N = 511	%
Build-up area	321	62.82
Informal settlement	190	37.18
State of environment	N = 510	%
Good	179	35.10
Average	300	58.82
Poor	31	6.08
Head of the household	N = 511	%
Father	324	63.40
Mother	159	31.12
Grandmother	16	3.13
Grandfather	7	1.37
Child < 16	3	0.59
Other	2	0.39

Table 4.2: Continued

Who provides the most money?	N = 504	%
No one	67	13.29
Father	237	47.02
Mother	161	31.95
Grandmother	24	4.76
Grandfather	6	1.19
Child > 16	5	0.99
Other	4	0.80
How many people contribute to the income?	N = 1052 (> 18 years)	%
No one	87	8.3
One	628	59.7
Two	261	24.8
Three	63	6.0
Four	13	1.2
Median standard	1	
Number of rooms per house (without the bathroom)	N = 511	%
One	108	21.1
Two	80	15.7
Three	106	20.7
Four	207	40.5
More than four	10	2
Median standard	3	
Room density	N = 511	%
≥ 2.5 (over-crowded)	108	21.14
< 2.5 (not overcrowded)	403	78.86
Median standard	1.33	
Main type of income	N = 507	%
None	11	2.2
Pension	134	26.4
Permanent job	152	30.0
Piece job	167	32.9
Grant	22	4.3
External source	21	4.2
Access to water	N = 510	%
Yes	510	100
No	0	0
Kind of tap	N = 510	%
Inside house	226	44.4
Own tap, outside house	278	54.6
Communal tap	5	1.0
Vegetable garden most of the year?	N = 511	%
Yes	231	45.2
No	280	54.8
No vegetable garden	N = 290	%
No seed	5	50
Sick, No help, Don't have space	5	50

The largest percentage (62.82%) of the houses included in the study were in a built-up area, while 37.18% were situated in an informal settlement. Most of the houses and their environment (58.82%) can be described as average, indicating that basic services (i.e. access to water and sanitation and standard housing facilities) are not lacking (Appendix E). The state of 35.10% of the household's can be described as good (permanent access to quality water and sanitation, good waste management and easy cooking and refrigerating facilities), and only 6.08% can be classified as poor, indicating poor water and sanitation facilities, poor solid waste management, as well as industrial pollutants and environmental tobacco smoke.

In the majority of households (63.40%) the father was the head of the household, while in 31.12% of the households the mother was described as the head of the household. In a large percentage (47.02%) the father contributes the most money, while 31.95% of mothers provide the most money in households. Thirteen percent of households had no income. In most households (59.7%) only one person contributed to income, where at least 8.3% stated that no one is a breadwinner. However, in some households more than one person contributed to the income and therefore the total (1052) exceeded 511. Although a large proportion of breadwinners in the study areas were employed, a large proportion of household members were either unemployed or received a pension. This included an old age pension (26.4%), permanent job (30.0%), piece job (32.9%), child allowance (4.3%) or other external source (4.2%). It has been found that there is a relatively low coverage of child support grant, indicating that the poverty-alleviating effects of grants are limiting.

The median number of rooms per household was 3 including the kitchen and excluding the bathroom. The majority of the households (78.86%) were classified as not being overcrowded (less than 2.5 persons per room), but 21.14% of the households had a room density of more than or equal to 2.5 persons per room and were thus overcrowded. The median for room density was 1.33 persons per room.

All households had access to water, the majority having an own tap situated outside the house (54.6%). Forty-four percent of the households had a tap inside the house and 1.0% had to use a communal tap. Although a large proportion of households reported having a vegetable garden most of the year (45.2%), more than half (54.8%) did not have an established vegetable garden. The reasons for this were mainly because of no seed, no help, and not enough space, or simply due to feeling too weak or ill to maintain a garden.

The results of the reliability survey indicated that when respondents were asked if they take children to the clinic, more than 10% of the respondents gave conflicting answers in the main study and the reliability survey. The results of the reliability survey also indicated that when respondents were asked if they had growth charts for children, more than 10% of the respondents did not respond in the same way as in the previous survey. For this reason the results have been omitted.

Information regarding health and food aid is tabulated in table 4.3.

Table 4.3: Health information

Parameter		
Clinic attendance (baby / children)	N = 511	%
Yes	-	-
No	-	-
Not applicable	-	-
If yes, why?	N = 508	%
When ill	11	4.64
To immunize	7	2.95
For all the above reasons	219	92.41
If not, why?	N = 508	%
Go to doctor	7	100.00
Other		
Do the children have a growth chart?	N = 252	%
Yes, all of them	-	-
Yes, some of them	-	-
No	-	-
If yes, is the growth chart completed?	N = 222	%
Yes, for all the children	198	89.19
Yes, for some of the children	11	4.95
No	13	5.86
Clinic attendance, adults	N = 507	%
Yes, always	413	81.46
Sometimes	50	9.86
No	44	8.68
If not, why	N = 35	%
Go to doctor	35	100.00
Other		
Do women use family planning	N = 462	%
Yes, all of them	182	39.39
Yes, some of them	63	13.64
No	217	46.97
Food aid (PSNP and/or PEM)	N = 511	%
No	487	95.30
PSNP	14	2.74
PEM	7	1.37
PSNP and PEM	3	0.59
Anyone in the household smoke/snuff	N = 511	%
Yes	358	70.05
No	153	29.95

Table 4.3: Continued

Medical Conditions	N = 511	%
Hypertension	207	40.51
Diabetes	25	4.89
TB	55	10.76
Heart disease	54	10.57
Overweight / Obesity	56	10.96
Epilepsy	26	5.09
Diarrhea	28	5.48
Peptic ulcer	50	9.78
Constipation	59	11.55
Loss of appetite	106	20.74
Weight Loss	141	27.59
Other	3	0.06

The percentage of respondents who ever attended clinics, were 81.46%. In a large proportion (46.97%) of households, none of the women used any family planning; in 13.64% some did and in 39.39% all women used family planning. Only 2.74% of the children included in the study participated in the PSNP scheme and 1.37% of respondents received supplementation from the PEM scheme. Seventy percent of participants did smoke or snuff.

Regarding medical conditions, a large proportion (40.51%) of the respondents reported being diagnosed with hypertension. The percentage of respondents indicating they have TB was 10.76%. More or less 10.57% reported heart disease, while 10.96% of respondents indicated overweight or obesity. The percentage of respondents reporting constipation was 11.55%. In this study, 20.74% of respondents experienced loss of appetite, while recent weight loss was reported in 27.59% of respondents. This information suggests that some of the population may present these symptoms due to underlying diseases, such as HIV or AIDS.

4.4 Anthropometry

Results of weight and height status of caregivers and children follow in tables 4.4 – 4.7.

4.4.1 Weight and height status of the caregiver

Table 4.4: Weight and height status of caregiver

Body mass index categories	N = 154	%
Underweight BMI: <18.5 kg/m ²	14	9.09
Normal weight BMI: 18.5 kg/m ² - <25.0 kg/m ²	68	44.15
Overweight BMI: 25.0 kg/m ² - <30.0 kg/m ²	37	24.03
Obese BMI: ≥30.0 kg/m ²	35	22.73
Median BMI (kg/m ²)	24.28	

The BMI of caregivers is indicated in Table 4.4. One hundred and fifty four of the respondents interviewed (511) were caregivers of children younger than six years. Therefore, weight and height measurements were taken when there was a child younger than six years present in the household. Less than half of the caregivers had a normal BMI (44.15%). Nine percent of the caregivers had a BMI < 18.5 kg/m², indicating underweight, while 24.0% of the respondents fell in the overweight category and 22.73% had a BMI ≥ 30 kg/m², indicating obesity. The median BMI of caregivers was 24.28 kg/m².

4.4.2 Weight and height status of children < 6 years

Weight-for-age, height-for-age and weight-for-height are indicators of anthropometric status and the data for children < 6 years is categorized as the number of standard deviations below or above the NCHS median.

Table 4.5 Weight-for-age

Standard Deviation (SD)	N = 153	%
<-3	5	3.3
-3<-2	21	13.7
-2<-1	40	26.1
-1<1	70	45.8
1<2	9	5.9
2<3	2	1.3
3+	6	3.9
75%	0.24	
50% Median	-0.66	
25%	-1.57	

Weight-for-age was determined in 153 children who were at home at the time of the interview. In table 4.5 the weight-for-age results of the children included in the survey are given. The percentage of children with a weight-for-age below -2 SD was 17%. The percentage of children with a weight-for age between -1 SD and 1 SD was high (45.8%). Median weight-for-age of the whole sample of children was -0.66 SD.

Table 4.6 Height-for-age

Standard Deviation (SD)	N = 119	%
<-3	17	14.3
-3<-2	19	16.0
-2<-1	32	26.9
-1<1	35	29.4
1<2	8	6.7
2<3	3	2.5
3+	5	4.2
75%	-0.02	
50% Median	-1.37	
25%	-2.14	

Height-for-age was determined in 119 children. The percentage of stunted children between birth and six years with a height-for-age below -2 SD was 30.3%. About 27% had a height-for-age -2 SD < -1 SD and 29.4% had a height-for-age between -1 SD < 1 SD. Median height-for-age fell between -2 SD and < -1 SD at -1.37 SD.

Table 4.7: Weight-for-height

Standard Deviation (SD)	N = 119	%
<-3	5	4.2
$-3<-2$	6	5.0
$-2<-1$	19	16.0
$-1<1$	66	55.5
$1<2$	12	10.1
$2<3$	4	3.3
$3+$	7	5.9
75%	0.81	
50% Median	0.00	
25%	-1.03	

Weight-for-height was determined in 119 children. The percentage of wasted children between birth and six years with a weight-for-height below -2 SD was 9.2%. Sixteen percent had a weight-for-height -2 SD < -1 SD and of concern is the large percentage (55.5%) of boys and girls that have a weight-for-height between -1 SD and 1 SD.

4.5 Dietary intake

The household questionnaire was divided into the meal pattern and meal composition of babies ($< one year$), children ($> one year$ and $< than six years$) and respondents ($> 18 years$) (Table 4.8), as well as the habitual intake of food and drinks by adult respondents and children in the households, expressed as frequency of usual intake (tables 4.9 – 4.16).

Table 4.8: Adequate Dietary Intake

Parameter		
Adults	N = 511	%
Breakfast and mid-morning		
Yes	42	8.22
No	469	91.78
Lunch and mid afternoon		
Yes	115	22.50
No	396	77.50
Supper and late night		
Yes	167	32.68
No	343	67.32
Children	N = 218	%
Breakfast and mid-morning		
Yes	33	15.14
No	185	84.86
Lunch and mid afternoon		
Yes	73	33.49
No	145	66.51
Supper and late night		
Yes	84	38.53
No	134	61.47
Is the dietary intake for babies adequate?	N = 55	%
Yes (Exclusive breastfeeding)	44	80
No	11	20
Is there always food available?	N = 511	%
Yes	367	71.82
No	144	28.18

Table 4.8 shows the dietary intake results as obtained by means of the questionnaire (Appendix A). Intake of adults (n=511) and older children was categorised as adequate or inadequate according to the inclusion of the three food groups (building foods, energy foods and protective foods) in each meal. A relatively large proportion of the respondents did not consume foods from all three groups during each meal. In the case of adult respondents, 91.78% did not include all three food groups for breakfast, 77.50% did not include all three food groups for lunch and 67.32% did not have a balanced supper. In the case of children (n=218), a high percentage did not eat a

balanced diet. This included 84.86% that did not consume all three food groups for breakfast, 66.51% for lunch and 61.47% for supper.

In the case of babies (between birth and six months), results showed that approximately 80.0% of babies received a well balanced diet throughout the day (n=55). This is due to the high percentage of mothers who exclusively breastfed their babies.

Frequency of food intake, depicting intake per day, week, month or year, is categorised according to frequency of intake of snacks, tea and coffee, milk, meat, meat products, starches, fats, fruit and vegetables, as well as other foods.

Table 4.9: Food Frequency – Snacks

Food	N = 511	%
Sweets/Chocolates		
- Never	92	18.00
- Not everyday	333	65.17
- Everyday	86	16.83
Chips (crisps)		
- Never	81	15.85
- Not everyday	290	56.75
- Everyday	140	27.40
Cake/biscuits		
- Never	69	13.50
- Not everyday	308	60.28
- Everyday	134	26.22
Cooldrinks		
- Never	61	11.93
- Not everyday	332	64.97
- Everyday	118	23.1

Frequency of snack consumption, which included foods such as sweets, chocolates, chips, cake, biscuits and cooldrinks, is tabulated in table 4.9. The respondents that consumed sweets/chocolates every day were 16.83% of the sample. Eighteen percent did not consume these foods at all, while 65.17% ate them sometimes. About sixteen

percent of respondents never consumed chips, while 27.40% consumed chips everyday. Twenty six percent of the respondents consumed cake/biscuits each day, while 23.1% consumed cooldrinks everyday.

Table 4.10: Food Frequency – Tea and Coffee

Food		N = 511	%
Coffee creamer (Cremora)			
-	Never	312	61.06
-	Not everyday	76	14.87
-	Everyday	123	24.07
Coffee			
-	Never	270	52.83
-	Not everyday	61	11.94
-	Everyday	180	35.23
Tea			
-	Never	17	3.33
-	Not everyday	32	6.26
-	Everyday	-	-
Sugar			
-	Never	17	3.32
-	Not everyday	23	4.51
-	Everyday	471	92.17

Sixty one percent of the respondents never used a coffee creamer, while 24.07% used coffee creamer at least once per day. Thirty five percent of the respondents drank coffee at least once per day, while 90.41% consumed tea everyday. The results of the reliability survey indicate that when respondents were asked about the intake of tea per day, more than 10% of the respondents gave conflicting answers. The percentage of respondents that used sugar in tea and coffee was high (92.17%).

Table 4.11: Food Frequency – Milk

Food		N = 511	%
Full-cream milk			
-	Never	71	13.89
-	Not everyday	143	27.99
-	Everyday	297	58.12
Low-fat/skim milk			
-	Never	477	93.34
-	Not everyday	15	2.94
-	Everyday	19	3.72

The percentage of respondents that used full cream milk was high (58.12%). In contrast, only 3.72% used low-fat or skim milk every day.

Table 4.12 Food Frequency – Meat and meat products

Food		N = 511	%
Eggs			
-	Never	50	9.78
-	Not everyday	-	-
-	Everyday	74	14.48
Peanut butter			
-	Never	250	48.92
-	Not everyday	149	29.15
-	Everyday	112	21.93
Soya mince/legumes			
-	Never	155	30.33
-	Not everyday	327	64.00
-	Everyday	29	5.67
Chicken/meat/fish			
-	Never	17	3.33
-	Not everyday	317	62.03
-	Everyday	177	34.64

Regarding eggs, 75.74% of respondents reported that they sometimes eat eggs. The results of the reliability survey indicate that when respondents were asked about the intake of eggs on a regular basis, more than 10% of the respondents gave a different response compared to the previous survey.

Fourty nine percent of the respondents never consumed peanut butter, while 30.33% never included soya mince/legumes in their eating plan. The percentage of respondents that sometimes consumed chicken, meat or fish was 62.03%, but only 34.64% consumed chicken, meat or fish on a daily basis.

Table 4.13 Food Frequency – Starches

Food		N = 511	%
Bread			
-	Never	27	5.28
-	Not everyday	191	37.38
-	Everyday	293	57.34
Porridge			
-	Never	3	0.58
-	Not everyday	23	4.50
-	Everyday	485	94.92
Samp/mealie rice			
-	Never	92	18.00
-	Not everyday	393	76.91
-	Everyday	26	5.09

The percentage of respondents who ate bread on a daily basis was 57.34%. The majority (94.92%) of the respondents ate porridge every day. Although 76.91% ate stamp/mealie rice sometimes, only 5.09% ate these starches every day.

Table 4.14: Food Frequency – Fats

Food		N = 511	%
Margarine/oil/fat			
-	Never	-	-
-	Not everyday	-	-
-	Everyday	-	-

The results of the reliability survey indicate that when respondents were asked about fat intake, more than 10% of the respondents gave conflicting answers in the initial survey and the reliability survey and thus the results have been omitted (Table 4:14).

Table 4.15: Food Frequency – Fruits and vegetables

Food		N = 511	%
Fruit			
-	Never	28	5.48
-	Not everyday	279	54.60
-	Everyday	204	39.92
Vegetables			
-	Never	9	1.76
-	Not everyday	140	27.39
-	Everyday	362	70.85

Regarding the intake of fruits and vegetables, only 39.92% reported eating fruits every day, while 70.85% reported consuming vegetables on a daily basis.

Table 4.16: Food Frequency – Other

Food		N = 511	%
Salt/stock/Royco			
-	Never	13	2.54
-	Not everyday	22	4.31
-	Everyday	476	93.15
Alcohol			
-	Never	255	49.90
-	Not everyday	217	42.47
-	Everyday	39	7.63
Water			
-	Never	37	7.24
-	Not everyday	7	1.37
-	Everyday	467	91.39

A high proportion (93.15%) of respondents consumed salt, stock or Royco on a daily basis. Forty three percent reported that alcohol is consumed sometimes, but only 7.63% reported using it every day. Regarding water intake, 91.39% of respondents consumed water as such on a daily basis.

4.6 Associations

Associations between the following variables were determined:

- BMI of caregivers and household and socio-demographic information
- BMI of caregivers and dietary intake
- Z-scores and household and socio-demographic information
- Z-scores and dietary intake

The three different categories for BMI of caregivers compared to a certain household or dietary practice indicator. To determine whether BMI of caregivers is associated with certain household and socio-demographic information, a 2 x 2 table of categorised BMI-values and categorised household and socio-demographic information was constructed.

The association between BMI of caregivers and household and socio-demographic information is presented in tables 4.17 – 4.21.

4.6.1 BMI of caregivers and household information

Table 4.17: Association between BMI of caregivers and household information

Household Information	BMI < 18.5 kg/m ²				BMI ≥ 18.5 - < 25 kg/m ²				BMI ≥ 25 kg/m ²			
	N	25%	Med	75%	N	25%	Med	75%	N	25%	Med	75%
People contribute to income	14	1	1	1	68	2	1	1	71	2	1	1
How many rooms in the house	14	3	2.5	2	68	4	3	2	72	4	3	2
Room density	14	1.5	2.5	2.5	68	1.1	1.7	2.3	72	1.3	1.7	2.6

Fourteen caregivers had a BMI < 18.5 kg/m²; 68 had a normal BMI and 72 were either overweight or obese. In all BMI categories, the median number of people that

contributed to the income was 1, indicating that BMI was not associated with the number of people contributing to income.

In contrast, the median number of rooms in households with underweight caregivers was 2.5 rooms, compared to a median of 3 rooms per household of caregivers with a normal or overweight BMI. This difference was, however, not significant, possibly due to the small number (n=14) of underweight caregivers.

4.6.2 BMI of caregivers and socio-demographic information

The associations between BMI of caregivers and the head of the household, main type of income, kind of tap, vegetable garden as well as reasons for no vegetable garden, are presented in Table 4.18.

Where information about the head of the household was obtained, of the 153 households, 81 (6 + 38 + 37) fell in group 1 that indicated the father was the head of the household. In those 81 households, 6 caregivers were underweight, 38 had a normal BMI and 37 were overweight.

In households where someone had a permanent job, 45.07% of caregivers were overweight, while 42.86% of caregivers in households where someone had a piece job were underweight.

No association between the kind of tap of the household and the BMI of caregivers was found.

More than half of caregivers (64.29%) that did not have an established vegetable garden were underweight. Half (50%) of the underweight caregivers indicated that no seed was available, while some (25%) were too sick or did not have any help or space in order to establish a vegetable garden.

Table 4.18: Association between BMI of caregivers and household information

Head of the Household	BMI < 18.5 kg/m ²		BMI ≥ 18.5 - < 25 kg/m ²		BMI ≥ 25 kg/m ²	
	N= 13	% of total group	N= 68	% of total group	N= 72	% of total group
Father	6	46.16	38	55.88	37	51.39
Mother	2	15.38	12	17.65	21	29.17
Other	5	38.46	18	26.47	14	19.44
Main type of income						
	N= 14	% of total group	N= 67	% of total group	N= 71	% of total group
None	0	0.00	0	0.00	1	1.41
Pension	4	28.57	17	25.37	13	18.31
Permanent job	2	14.29	27	40.30	32	45.07
Piece job	6	42.86	19	28.36	20	28.17
Grant	2	14.28	3	4.48	4	5.63
Someone else gives money	0	0.00	1	1.49	1	1.41

Table 4.18: Continued

What kind of tap						
	N= 14	% of total group	N= 68	% of total group	N= 72	% of total group
Inside house	5	35.71	28	41.18	27	37.50
Own tap, outside house	9	64.29	40	58.82	43	59.72
Communal tap	0	0.00	0	0.00	2	2.78
Established vegetable garden						
	N= 14	% of total group	N= 68	% of total group	N= 72	% of total group
Yes	5	35.71	32	47.06	25	34.72
No	9	64.29	36	52.94	47	65.28
Reasons for no vegetable garden						
	N= 8	% of total group	N= 36	% of total group	N= 46	% of total group
No seed	4	50.00	12	33.33	8	17.39
Do not want to	1	12.50	6	16.67	8	17.39
Season, hard ground, chickens	1	12.50	6	16.67	9	19.57
Sick, no help, no space	2	25.00	4	11.11	9	19.57
Do not know how to	0	0.00	5	13.88	6	13.04
No time/property	0	0.00	3	8.34	6	13.04

4.6.3 BMI of caregivers and medical conditions

The association between BMI of the caregivers and medical conditions is presented in Table 19. It should be noted that these values are calculated per condition and for caregivers (n=154) only. For this reason the n-values in the associations (n=154) and those in the more general tables (n=511) are not the same.

Reported prevalence of hypertension was high in all BMI categories, ranging from 25.29% in the normal weight category, to 37.5% in the overweight and obese category.

Interesting, reported prevalence of Diabetes was highest in the underweight group at 7.14%.

Prevalence of TB was unrelated to BMI, with the highest prevalence occurring in the normal weight category. The same was true for heart disease, with 14.29% of underweight caregivers reporting heart disease.

As expected, reported prevalence of overweight and obesity was highest (23.61%) in the overweight and obese BMI category, but it was interesting to note that the remainder (76.39%) of the confirmed overweight or obese caregivers did not consider themselves overweight. In addition, 7.14% of underweight and 4.41% of normal weight caregivers considered themselves to be overweight.

Only six caregivers reported epilepsy and of those, two were underweight (14.29%).

More underweight caregivers reported suffering from diarrhea (14.29%) than normal weight (5.88%) and overweight caregivers (5.56%).

A high percentage of all respondents reported having a peptic ulcer, ranging from 8.82% in the normal weight BMI category to 21.43% in the underweight BMI category. Although this may seem like a high prevalence, it only included three respondents.

Prevalence of constipation was not associated with BMI, with 14.7% of caregivers in the normal BMI category reporting constipation.

Although loss of appetite occurred in a relatively large percentage of caregivers (ranging from 19.44% in the overweight BMI category to 28.57% in the underweight BMI category), loss of appetite was not associated with BMI.

In contrast to the other medical conditions, a significantly higher percentage of weight loss in caregivers were noted in the underweight BMI categories [6.8% ; 54.2%], as well as when comparing the underweight and normal BMI categories with the overweight BMI category (23.61%), with 95% CI [-32.7% ; -4.1%].

Table 4.19: Association between BMI of caregivers and medical conditions

Medical conditions	BMI < 18.5 kg/m ²		BMI ≥ 18.5 - < 25 kg/m ²		BMI ≥ 25 kg/m ²	
	N= 14	% of total group	N= 68	% of total group	N= 72	% of total group
Hypertension	5	35.71	24	25.29	27	37.50
Diabetes	1	7.14	2	2.94	3	4.17
TB	1	7.14	11	16.18	6	8.33
Heart disease	2	14.29	6	8.82	7	9.72
Overweight/ Obesity	1	7.14	3	4.41	17	23.61
Epilepsy	2	14.29	1	1.47	3	4.17
Diarrhea	2	14.29	4	5.88	4	5.56
Peptic ulcer	3	21.43	6	8.82	10	13.89
Constipation	1	7.14	10	14.71	7	9.72
Loss of appetite	4	28.57	19	27.94	14	19.44
Weight loss *	9	64.29	26	38.24	17	23.61
Other	2 (N=13)	15.38	10 (N=67)	14.93	7 (N=71)	9.86

4.6.4 BMI of caregivers and clinic attendance and efficacy (PSNP and PEM)

The association between BMI of caregivers and completed growth charts is presented in Table 4.20. When comparing BMI < 18.5 kg/m² (group 1) with BMI ≥ 18.5+ kg/m², (group 2 and 3), a significant difference was found in whether growth charts were completed or not, [4.6%; 52.3%]. A significant difference was also found when comparing BMI ≥ 25 kg/m² (group 3) with BMI < 25 kg/m² (group 1 and 2), [-19.7%; -0.6%]. Thus, significantly fewer children of underweight caregivers had a completed

growth chart (63.64%) compared to children of caregivers with a normal BMI (84.62%) and overweight and obese caregivers (95.24%).

Table 4.20: Association between BMI of caregivers and clinic attendance and efficacy

Clinic	BMI < 18.5 kg/m ²		BMI ≥ 18.5 - < 25 kg/m ²		BMI ≥ 25 kg/m ²	
attendance						
and efficacy						
Completed						
growth charts						
	N= 11	% of total group	N= 52	% of total group	N= 63	% of total group
Yes *	7	63.64	44	84.62	60	95.24
Do adults						
attend clinics						
	N= 14	% of total group	N= 68	% of total group	N= 71	% of total group
Yes	13	92.86	55	80.88	55	77.46
Do women use						
family						
planning						
	N = 13	% of total group	N = 65	% of total group	N = 72	% of total group
No	7	53.85	26	40.00	25	34.72
Food aid						
	N= 14	% of total group	N= 68	% of total group	N= 72	% of total group
No	14	100.00	66	97.06	67	93.05
Yes	0	0.00	2	2.94	5	6.95

It seems that almost all underweight caregivers (92.86%) attended clinics, while only 77.46% of overweight or obese caregivers visited clinics.

It is of concern that 100% of the underweight caregivers did not receive any food aid, while almost 7% of overweight caregivers indicated that their households had received food aid of some kind. Most of the household members (97.06%) with caregivers of normal weight, did not receive any food aid.

4.6.5 BMI of caregivers and dietary intake of adults, children and babies

The association between BMI of caregivers and inadequate dietary intake of adults and children is presented in Table 4.21. Of the 154 caregivers, 14 fell in the underweight category. Of these, almost all (n=13) of them had an inadequate breakfast and mid-morning snack, as well as lunch and mid-afternoon snack. Similarly, almost all caregivers with either a normal BMI or overweight or obese BMI indicated that they ate an inadequate breakfast and mid-morning snack. Significantly more underweight respondents (92.86%) and normal weight respondents (79.41%) ate an inadequate lunch and mid-afternoon snack when compared to overweight caregivers (66.67%) with 95% CI [-28.4% ; -1.2%]. Regarding supper and late night snack, between 60 and 71 percent of the participants did not have an adequate intake, irrespectively of their BMI value.

As far as adequacy of the diets of children are concerned, a large percentage of all children did not eat adequate meals. As in the adults, significantly more children of caregivers with an overweight BMI ate an adequate lunch and mid-afternoon snack

compared to children of caregivers with either a normal or underweight BMI, with 95% CI [-33.3% ; -0.9%]. Of the five babies that did not have an adequate dietary intake, none of the caregivers were underweight. Two babies of these had caregivers with a BMI ≥ 25 kg/m².

Table 4.21: Association between BMI of caregivers and inadequate dietary intake of adults and children.

Inadequate dietary intake	BMI < 18.5 kg/m²		BMI ≥ 18.5 - < 25 kg/m²		BMI ≥ 25 kg/m²	
Adults						
	N= 14	% of total group	N= 68	% of total group	N= 72	% of total group
Breakfast and mid-morning	13	92.86	65	95.59	68	94.44
Lunch and mid-afternoon *	13	92.86	54	79.41	48	66.67
Supper and late night	10	71.43	41	60.29	46	63.89
Children						
	N= 8	% of total group	N= 50	% of total group	N= 64	% of total group
Breakfast and mid-morning	6	75.00	45	90.00	54	84.38
Lunch and mid-afternoon *	6	75.00	37	74.00	36	56.25
Supper and late night	6	75.00	31	62.00	39	60.94
Babies						
	N = 14	% of total group	N = 68	% of total group	N = 71	% of total group
Inadequate dietary intake	0	0.00	3	4.41	2	2.82

4.6.6 Z-scores and household information

The three different categories for Z-Scores were compared to a certain household or dietary practice indicator. To determine whether the Z-scores of children are associated with certain household and socio-demographic information, a 2 x 2 table of categorised Z-scores and categorised household and socio-demographic information was constructed.

The associations between Z-scores and household and socio-demographic information are presented in tables 4.22 – 4.36.

Table 4.22 Association between weight-for-age and household information

Household Information	Z-Score < -2 SD				Z-Score ≥ -2 < -1 SD				Z-Score ≥ -1 SD			
	N	25%	Med	75%	N	25%	Med	75%	N	25%	Med	75%
People contribute to income	34	1	1	2	52	1	1	2	116	1	1	1.5
How many rooms in the house	34	2	3	4	52	2	3	4	116	2	3	4
Room density	124	1.3	2.0	2.3	173	1.3	2.0	2.7	486	1.3	1.5	2.5

Thirty four children were underweight; 52 children were at risk of becoming underweight and 116 were normal weight. In all Z-Score categories, the median number of people that contributed to the income was 1, indicating that weight-for-age was not associated

with the number of people contributing to income. Similarly, the median number of rooms in households for all weight-for-age categories was the same, namely 3 rooms per household. Underweight children and children at risk of becoming underweight had a higher room density (2) when compared to children of normal weight (1.5).

Table 4.23 Association between height-for-age and household information

Household Information	Z-Score < -2 SD				Z-Score \geq -2 < -1 SD				Z-Score \geq -1 SD			
	N	25%	Med	75%	N	25%	Med	75%	N	25%	Med	75%
People contribute to income	46	1	1	2	43	1	1	2	70	1	1	2
How many rooms in the house	46	2	3	4	43	2	3	4	70	2	3	4
Room density *	174	1.3	2.0	2.3	139	1.0	1.3	2.3	284	1.3	1.6	2.3

Of the 46 children with a height-for-age < -2 SD, a median of one person contributed to household income. The same applied to children at risk of becoming stunted and normal height children. In all Z-Score categories, the median number of rooms per house was three. Room density improved as children's height-for-age improved. Stunted children had a significantly higher room density (2) when compared to children at risk of becoming stunted (1.3), with 95% CI [0.17% ; 0.5%].

Table 4.24: Association between weight-for-height and household information

Household Information	Z-Score < -2 SD				Z-Score \geq -2 < -1 SD				Z-Score \geq -1 SD			
	N	25%	Med	75%	N	25%	Med	75%	N	25%	Med	75%
People contribute to income	14	1	1.5	2	26	1	1	2	119	1	1	2
How many rooms in the house	14	3	4	4	26	2	3	4	119	2	3	4
Room density	55	1.0	2.0	2.3	86	1.5	2.0	3.0	456	1.3	1.5	2.3

Fourteen children were wasted; 26 children were at risk of becoming wasted. Wasted children had a median number of 1.5 people that contributed to the income. With children at risk of becoming wasted and children with a normal weight and height status, the median number of people that contributed to the income was 1. The median number of rooms in households for wasted children was 4 rooms per house, while there were 3 rooms per household for the other Z-Score categories. Wasted children and children at risk of becoming wasted had a higher room density (2) when compared to children of normal weight and height status (1.5).

4.6.7 Z-Scores and socio-demographic information

In the case of weight-for-age, the association between Z-Scores and the head of the household, main type of income, kind of tap, vegetable garden as well as reasons for no vegetable garden, is presented in Table 4.25.

Table 4.25: Association between weight-for-age and household information

Head of the Household	Z-Score < -2 SD		Z-Score \geq -2 < -1 SD		Z-Score \geq -1 SD	
	N= 32	% of total group	N= 50	% of total group	N= 112	% of total group
Father	23	71.88	26	52.00	52	46.43
Mother	3	9.37	9	18.00	34	30.36
Other	6	18.75	15	30.00	26	23.21
Main type of income						
	N= 26	% of total group	N= 39	% of total group	N= 85	% of total group
None	0	0.00	1	2.56	0	0.00
Pension	11	42.31	12	30.77	21	24.70
Permanent job	7	26.92	7	17.95	42	49.41
Piece job	6	23.08	15	38.47	18	21.18
Grant	2	7.69	3	7.69	3	3.53
Someone else gives money	0	0.00	1	2.56	1	1.18
What kind of tap						
	N= 26	% of total group	N= 40	% of total group	N= 87	% of total group
Inside house	18	69.23	13	32.50	26	29.89
Own tap, outside house *	8	30.77	27	67.50	60	68.96
Communal tap	0	0.00	0	0.00	1	1.15
Established vegetable garden						
	N= 26	% of total group	N= 40	% of total group	N= 87	% of total group
Yes	12	46.15	21	52.50	30	34.48
No	14	53.85	19	47.50	57	65.52

Table 4.25: Continued

Reasons for no vegetable garden						
	N= 14	% of total group	N= 18	% of total group	N= 56	% of total group
No seed	2	14.29	9	50.00	14	25.00
Do not want to	3	21.43	0	0.00	10	17.86
Season, hard ground, chickens	5	35.71	2	11.11	9	16.07
Sick, no help, no space	1	7.14	2	11.11	8	14.28
Do not know how to	1	7.14	2	11.11	9	16.07
No time/property	2	14.29	3	16.67	6	10.72

Where information about the head of the household was obtained, of the 194 households, 101 fell in group 1 that indicated the father was the head of the household. In those 101 households, 23 children were underweight, 26 were at risk of becoming underweight and 52 were normal weight. It was found that in the majority of households with underweight children, fathers were more often the head of the household.

In households where someone had a permanent job, 49.41% of children had a normal weight, while 42.31% of children in households where someone had a pension were underweight. In the case of underweight children, more caregivers received pension, followed by permanent job and then piece job.

Regarding the prevalence of own tap on the premises, a significant difference for weight-for-age was found when comparing < -2 SD with ≥ -2 SD, [-53.84% ; -16.7%]. No association between established vegetable gardens and weight-for-age of children was found.

Table 4.26: Association between height-for-age and household information

Head of the Household	Z-Score < -2 SD		Z-Score $\geq -2 < -1$ SD		Z-Score ≥ -1 SD	
	N= 44	% of total group	N= 42	% of total group	N= 67	% of total group
Father	25	56.82	21	50.00	34	50.75
Mother	9	20.45	11	26.19	17	25.37
Other	10	22.73	10	23.81	16	23.88

Main type of income	N= 36		N= 31		N= 50	
		% of total group		% of total group		% of total group
None	0	0.00	0	0.00	1	2.00
Pension	12	33.34	12	38.71	6	12.00
Permanent job	8	22.22	12	38.71	26	52.00
Piece job	13	36.11	5	16.12	14	28.00
Grant	3	8.33	1	3.23	3	6.00
Someone else gives money	0	0.00	1	3.23	0	0.00

What kind of tap	N= 36		N= 32		N= 51	
		% of total group		% of total group		% of total group
Inside house	19	52.78	12	37.50	14	27.45
Own tap, outside house *	17	47.22	20	62.50	36	70.59
Communal tap	0	0.00	0	0.00	1	1.96

Table 4.26: Continued

Established						
vegetable						
garden						
	N= 36	% of total group	N= 32	% of total group	N= 51	% of total group
Yes	18	50.00	12	37.50	19	37.25
No	18	50.00	20	62.50	32	62.75
Reasons for no						
vegetable						
garden						
	N= 18	% of total group	N= 19	% of total group	N= 32	% of total group
No seed	6	33.33	4	21.05	6	18.75
Do not want to	4	22.22	3	15.79	4	12.50
Season, hard	4	22.22	4	21.05	5	15.63
ground,						
chickens						
Sick, no help,	1	5.56	2	10.53	6	18.75
no space						
Do not know	2	11.11	4	21.05	5	15.62
how to						
No	1	5.56	2	10.53	6	18.75
time/property						

With regards to the head of the household, of the 153 households, 80 fell in group 1. In those 80 households, 25 children were stunted, 21 were at risk of becoming stunted and 34 fell in the ≥ -1 SD category.

In households where someone had a permanent job, 52% of children had a normal height, while 33.34% of children in households where someone had a pension were

stunted. In the case of stunted children, more caregivers had piece job, followed by pension and then permanent job.

Regarding the prevalence of own tap on the premises, a significant difference for height-for-age was found when comparing < -2 SD with ≥ -2 SD, $[-38.0\% ; -1.2\%]$. No association between established vegetable gardens and height-for-age of children was found.

Table 4.27: Association between weight-for-height and household information

Head of the Household	Z-Score < -2 SD		Z-Score $\geq -2 < -1$ SD		Z-Score ≥ -1 SD	
	N= 14	% of total group	N= 23	% of total group	N= 116	% of total group
Father	11	78.58	14	60.87	55	47.41
Mother	2	14.29	2	8.70	33	28.45
Other	1	7.15	7	30.43	28	24.14
Main type of income						
	N= 11	% of total group	N= 19	% of total group	N= 87	% of total group
None	1	9.09	0	0.00	0	0.00
Pension	3	27.27	6	31.58	21	24.14
Permanent job	3	27.27	7	36.84	36	41.37
Piece job	4	36.37	5	26.32	23	26.44
Grant	0	0.00	1	5.26	6	6.90
Someone else gives money	0	0.00	0	0.00	1	1.15
What kind of tap						

Table 4.27: Continued

	N= 11	% of total group	N= 19	% of total group	N= 89	% of total group
Inside house	7	63.64	10	52.63	28	31.46
Own tap, outside house	4	36.36	9	47.37	60	67.42
Communal tap	0	0.00	0	0.00	1	1.12
Established vegetable garden						
	N= 11	% of total group	N= 19	% of total group	N= 89	% of total group
Yes	5	45.45	8	42.11	36	40.45
No	6	54.55	11	57.89	53	59.55
Reasons for no vegetable garden						
	N= 6	% of total group	N= 11	% of total group	N= 52	% of total group
No seed	0	0.00	3	27.27	13	25.00
Do not want to	2	33.33	2	18.18	7	13.46
Season, hard ground, chickens	1	16.67	4	36.37	8	15.38
Sick, no help, no space	0	0.00	0	0.00	9	17.31
Do not know how to	0	0.00	1	9.09	10	19.23
No time/property	3	50.00	1	9.09	5	9.62

Regarding head of the household, of the 153 households, 80 fell in group 1. In those 80 households, 11 children were wasted, 14 were at risk of becoming wasted and 55 fell in

the ≥ -1 SD category. It was found that in the majority of households with wasted children, fathers were more often the head of the household.

In households where someone had a permanent job, 41.37% of children were at no risk of becoming wasted, while 36.37% of children in households where someone had a piece job, indicated wasting. In the case of wasted children, more caregivers had a piece job. With regards to children not at risk of becoming wasted, more households had permanent jobs and less piece jobs.

Regarding the prevalence of own tap on the premises, no association was found with wasting. No association between established vegetable gardens and height-for-age of children was found. More than half (54.55%) of the households with wasted children did not have an established vegetable garden.

4.6.8 Z-Scores and medical conditions

The associations between Z-Scores of children and medical conditions is presented in Tables 28 – 30.

Table 4.28: Association between weight-for-age and medical conditions

Medical conditions	Z-Score < -2 SD		Z-Score ≥ -2 < -1 SD		Z-Score ≥ -1 SD	
	N= 26	% of total group	N= 40	% of total group	N= 87	% of total group
Hypertension	11	42.31	19	47.50	27	31.03
Diabetes	0	0.00	0	0.00	4	4.60
TB	3	11.54	8	20.00	9	10.34
Heart disease	7	26.92	4	10.00	14	16.09
Overweight/ Obesity	4	15.38	4	10.00	10	11.49
Epilepsy	0	0.00	1	2.50	4	4.60
Diarrhea *	3	11.54	5	12.50	1	1.15
Peptic ulcer	3	11.54	7	17.50	9	10.34
Constipation *	3	11.54	7	17.50	4	4.60
Loss of appetite *	9	34.62	14	35.00	12	13.79
Weight loss *	11	42.31	21	52.50	19	21.84
Other	2 (N=23)	8.70	7 (N=40)	17.50	6 (N=86)	6.98

Reported prevalence of hypertension was high in all weight-for-age categories, ranging from 42.31% in the underweight category, to 31.03% in the normal weight category.

Prevalence of TB was unrelated to weight-for-age, with the highest prevalence occurring in the at risk of becoming underweight category.

Reported prevalence of overweight and obesity of caregivers was highest (15.38%) in the households with the highest prevalence of underweight in children.

Prevalence of epilepsy in caregivers was not associated with weight-for-age of children. Only five respondents reported epilepsy and of those, none of the children were underweight.

Regarding the prevalence of diarrhea of caregivers, significantly more caregivers with underweight children and children at risk of becoming underweight reported diarrhea with 95% CI [0.2% ; 22.7%]. The same was found for constipation with 95% CI [0.7% ; 26.1%], loss of appetite [1.2% ; 33.1%] and prevalence of weight loss [8.6% ; 42.2%].

Nineteen respondents reported having a peptic ulcer, ranging from 11.54% in the underweight category to 10.34% in the normal weight category.

Table 4.29: Association between height-for-age and medical conditions

Medical conditions	Z-Score < -2 SD		Z-Score \geq -2 < -1 SD		Z-Score \geq -1 SD	
	N= 36	% of total group	N= 32	% of total group	N= 51	% of total group
Hypertension	16	44.44	16	50.00	18	35.29
Diabetes	0	0.00	1	3.13	2	3.92
TB	5	13.89	5	15.63	7	13.73
Heart disease *	7	19.44	9	28.13	3	5.88
Overweight/ Obesity	7	19.44	4	12.50	4	7.84
Epilepsy	1	2.78	1	3.13	3	5.88
Diarrhea	4	11.11	4	12.50	1	1.96
Peptic ulcer	4	11.11	3	9.38	8	15.69
Constipation *	4	11.11	7	21.88	2	3.92
Loss of appetite	13	36.11	10	31.25	8	15.69
Weight loss	16	44.44	15	46.88	12	23.53
Other	4 (N=32)	12.50 (N=32)	4	12.50	5 (N=51)	9.80

With regards to prevalence of hypertension, percentages were high in all height-for-age categories, ranging from 44.44% in the stunted category, to 35.29% in the normal height category.

Prevalence of TB was unrelated to height-for-age, with the highest prevalence occurring in the at risk of becoming stunted category.

Of the total of 19 participants with reported heart disease in their households, 19.44% had children that were stunted and a significant difference was found in prevalence of heart disease between height-for-age of at risk of becoming stunted with stunted and

normal height children (≥ -1 SD) [-1.5% ; 34.6%], with caregivers with normal height children, having the lowest reported prevalence of heart disease.

Reported prevalence of overweight and obesity in caregivers was highest (19.44%) in caregivers with children in at risk of becoming stunted category.

Prevalence of epilepsy was not associated with weight-for-age. Only five respondents reported epilepsy and of those, with one stunted child. Prevalence of diarrhea was not associated with height-for-age.

Fifteen respondents reported having a peptic ulcer, ranging from 11.11% in the stunted category to 15.69% in the normal height category.

Regarding the prevalence of constipation, a significant difference was also found when comparing height-for-age of at risk of becoming stunted children with stunted and normal height children [1.9% ; 32.2%]. Thus caregivers with normal height children had the lowest reported prevalence of constipation.

Prevalence of loss of appetite was unrelated to height-for-age. Similarly, no associations were found with regards to weight loss.

Table 4.30: Association between weight-for-height and medical conditions

Medical conditions	Z-Score < -2 SD		Z-Score \geq -2 < -1 SD		Z-Score \geq -1 SD	
	N= 11	% of total group	N= 19	% of total group	N= 89	% of total group
Hypertension	6	54.56	11	57.89	33	37.08
Diabetes	0	0.00	0	0.00	3	3.37
TB	2	18.18	2	10.53	13	14.61
Heart disease	3	27.27	4	21.05	12	13.48
Overweight/ Obesity	1	9.09	2	10.53	12	13.48
Epilepsy	0	0.00	0	0.00	5	5.62
Diarrhea	0	0.00	2	10.53	7	7.87
Peptic ulcer	4	36.36	1	5.26	10	11.24
Constipation	1	9.09	2	10.53	10	11.24
Loss of appetite	4	36.36	6	31.58	21	23.60
Weight loss	4	36.36	8	42.11	31	34.83
Other	0 (N=10)	0.00	0 (N=18)	0.00	0 (N=87)	0.00

Reported prevalence of hypertension was also high in all weight-for-height categories, ranging from 54.56% in the wasted category, to 37.08% in the \geq -1 SD category.

Prevalence of TB was unrelated to weight-for-height, with the highest prevalence occurring in the wasted category.

Reported prevalence of overweight and obesity was highest (13.48%) in caregivers with children in the \geq -1 SD category. Prevalence of epilepsy, diarrhea, peptic ulcer and constipation was unrelated to weight-for-height. Similarly, no associations with weight-for-height were found regarding loss of appetite and weight loss

4.6.9 Z-Scores and clinic attendance and efficacy (PSNP and PEM)

The association between weight-for-age and completed growth charts is presented in Table 4.31.

Table 4.31: Association between weight-for-age and clinic attendance and efficacy

Clinic attendance and efficacy	Z-Score < -2 SD		Z-Score \geq -2 < -1 SD		Z-Score \geq -1 SD	
Completed growth charts	N= 24	% of total group	N= 31	% of total group	N= 79	% of total group
Yes	22	91.67	23	74.19	69	87.34
Do adults attend clinics	N= 26	% of total group	N= 40	% of total group	N= 87	% of total group
Yes	25	96.15	31	77.50	73	83.91
Do women use family planning	N = 25	% of total group	N = 38	% of total group	N = 87	% of total group
No	10	40.00	19	50.00	25	28.74
Food aid	N= 26	% of total group	N= 40	% of total group	N= 87	% of total group
No *	20	76.92	37	92.50	81	93.10
Yes	6	23.08	3	7.50	6	6.90

When comparing Z-Score < -2 SD (group 1) with Z-Score ≥ -1 SD (group 3), more or less the same amount of children had completed growth charts.

It seems that almost all underweight children (96.15%) attended clinics, while 83.91% of normal weight children visited clinics.

With regards to the prevalence of no family planning, a significant difference was found when comparing weight-for-age of at risk of becoming underweight children (50%) with underweight (40%) and normal weight children (28.74%), with 95% CI [1.1% ; 35.8%]. Thus, significantly fewer women of underweight and normal weight children used family planning compared to women with children at risk of becoming underweight.

Regarding the prevalence of food aid, a significant difference was found when comparing underweight children with normal weight children [-35.3% ; -2.6%]. Thus, significantly fewer normal weight children received food aid.

Table 4.32: Association between height-for-age and clinic attendance and efficacy

Clinic	Z-Score < -2 SD		Z-Score \geq -2 < -1 SD		Z-Score \geq -1 SD	
attendance						
and efficacy						
Completed						
growth charts						
	N= 30	% of total group	N= 27	% of total group	N= 47	% of total group
Yes	23	76.67	21	77.78	40	85.11
Do adults						
attend clinics						
	N= 36	% of total group	N= 32	% of total group	N= 51	% of total group
Yes	32	88.89	26	81.25	43	84.31
Do women use						
family						
planning						
	N = 34	% of total group	N = 31	% of total group	N = 51	% of total group
No	13	38.24	11	35.48	18	35.29
Food aid						
	N= 36	% of total group	N= 32	% of total group	N= 51	% of total group
No	32	88.89	29	90.63	48	94.12
Yes	4	11.12	3	9.39	3	5.88

Regarding height-for-age, only 76.67% of stunted children attended clinics, while 85.11% of normal height children visited clinics.

Family planning was unrelated to height-for-age. It is of concern that 88.89% of the stunted children did not receive any food aid.

Table 4.33: Association between weight-for-height and clinic attendance and efficacy

Clinic	Z-Score < -2 SD		Z-Score \geq -2 < -1 SD		Z-Score \geq -1 SD	
attendance						
and efficacy						
Completed						
growth charts						
	N= 10	% of total group	N= 18	% of total group	N= 76	% of total group
Yes	10	100.00	15	83.33	59	77.63
Do adults						
attend clinics						
	N= 11	% of total group	N= 19	% of total group	N= 89	% of total group
Yes	11	100.00	17	89.47	73	82.02
Do women use						
family						
planning						
	N = 11	% of total group	N = 18	% of total group	N = 87	% of total group
No	4	36.36	8	44.44	30	34.48
Food aid						
	N= 11	% of total group	N= 19	% of total group	N= 89	% of total group
No	10	90.91	15	78.95	84	94.38
Yes	1	9.09	4	21.05	5	5.53

When comparing Z-Score < -2 SD (group 1) with Z-Score \geq -1 SD (group 3), more wasted children (100%) had completed growth charts, then children not at risk of becoming wasted (77.63%). All wasted children (100%) attended clinics, while 82.02% of children with a normal weight and height visited clinics. Prevalence of family planning of caregivers was unrelated to weight-for-height status of children. Similarly to weight-for-age and height-for-age categories, the majority of wasted children (90.91%) did not receive any food aid.

4.6.10 Z-Scores and dietary intake of adults, children and babies

The association between weight-for-age and inadequate dietary intake of adults, children and babies is presented in Table 4.34.

Table 4.34: Association between weight-for-age and inadequate dietary intake of adults, children and babies.

Inadequate dietary intake	Z-Score < -2 SD		Z-Score ≥ -2 < -1 SD		Z-Score ≥ -1 SD	
Adults						
	N= 26	% of total group	N= 40	% of total group	N= 87	% of total group
Breakfast and mid-morning	23	88.46	38	95.00	82	94.25
Lunch and mid-afternoon	21	80.77	33	82.50	66	75.86
Supper and late night	19	73.08	25	62.50	60	68.97
Children						
	N= 23	% of total group	N= 35	% of total group	N= 74	% of total group
Breakfast and mid-morning	20	86.96	31	88.57	63	85.14
Lunch and mid-afternoon	17	73.91	26	74.29	51	68.92
Supper and late night	19	82.61	23	65.71	49	66.22
Babies						
	N = 26	% of total group	N = 40	% of total group	N = 86	% of total group
Inadequate dietary intake	0	0.00	2	5.00	1	1.16

Of the 153 adults, 26 fell in the underweight category. Of these, almost all (n=23) had an inadequate breakfast and mid-morning snack, as well as lunch and mid-afternoon snack (n=21). Similarly, almost all adults with either at risk of becoming underweight children or normal weight children indicated that they ate an inadequate breakfast and mid-morning snack. Regarding supper and late night snack, between 68.97% and 73.08% the participants did not have an adequate intake, irrespective of their weight-for-age value.

As far as the adequacy of the diets of children are concerned, a large percentage of all children did not eat adequate meals. In the households with babies that did not have an adequate dietary intake (n=3), none of the children were underweight.

The association between height-for-age and inadequate dietary intake of adults, children and babies is presented in Table 4.35.

Of the 119 adults interviewed, 36 had children that fell in the stunted category. In these households almost all adults (n=33) of them had an inadequate breakfast and mid-morning snack, while 72.77% had an inadequate lunch and mid-afternoon snack. Similarly, almost all adults with either at risk of becoming stunted children or normal height children indicated that they ate an inadequate breakfast and mid-morning snack. Interesting, more adults had in inadequate lunch and mid-afternoon snack in the normal height category than the 72.77% in the stunted category. Regarding supper and late

night snack, between 66.67% and 68.63% the participants did not have an adequate intake, irrespective of their height-for-age value.

Table 4.35: Association between height-for-age and inadequate dietary intake of adults, children and babies.

Inadequate dietary intake	Z-Score < -2 SD		Z-Score ≥ -2 < -1 SD		Z-Score ≥ -1 SD	
Adults						
	N= 36	% of total group	N= 32	% of total group	N= 51	% of total group
Breakfast and mid-morning	33	91.67	31	96.88	47	92.16
Lunch and mid-afternoon	26	72.77	26	81.25	43	84.31
Supper and late night	24	66.67	21	65.63	35	68.63
Children						
	N= 32	% of total group	N= 28	% of total group	N= 44	% of total group
Breakfast and mid-morning	27	84.38	27	96.43	38	86.36
Lunch and mid-afternoon	20	62.50	22	78.57	34	77.27
Supper and late night	23	71.88	19	67.86	31	70.45
Babies						
	N = 36	% of total group	N = 32	% of total group	N = 51	% of total group
Inadequate dietary intake	1	2.78	0	0.00	1	1.96

As far as adequacy of the diets of children are concerned, a large percentage of all children did not eat adequate meals. In the two households with babies that did not have an adequate dietary intake, one child fell in the stunted category.

Table 4.36: Association between weight-for-height and inadequate dietary intake of adults, children and babies.

Inadequate dietary intake	Z-Score < -2 SD		Z-Score ≥ -2 < -1 SD		Z-Score ≥ -1 SD	
Adults						
	N= 11	% of total group	N= 19	% of total group	N= 89	% of total group
Breakfast and mid-morning	9	81.82	17	89.47	85	95.51
Lunch and mid-afternoon	10	90.91	15	78.95	70	78.65
Supper and late night	9	81.82	13	68.42	58	65.17
Children						
	N= 9	% of total group	N= 18	% of total group	N= 77	% of total group
Breakfast and mid-morning	8	88.89	16	88.89	68	88.31
Lunch and mid-afternoon	8	88.89	13	72.22	55	71.43
Supper and late night	8	88.89	13	72.22	52	67.53
Babies						
	N = 11	% of total group	N = 19	% of total group	N = 89	% of total group
Inadequate dietary intake	1	9.09	0	0.00	1	1.12

The association between weight-for-height and inadequate dietary intake of adults, children and babies is presented in Table 4.36.

Of the 119 adults interviewed, 11 had children that fell in the wasted category. Of these, almost all (n=9) ate an inadequate breakfast and mid-morning snack, as well as lunch and mid-afternoon snack (n=10). Interesting, more adults (95.51%) had in inadequate breakfast and mid-morning snack with children in the normal weight and height category than the 81.82% of the wasted category. Almost all adults (90.91%) with children in the wasted category indicated that they ate an inadequate lunch and mid-afternoon snack. Regarding supper and late night snack, between 65.17% and 81.82% of the participants did not have an adequate intake, irrespective of the weight-for-height value of their children.

As for the adequacy of the diets of children are concerned, a large percentage of all children did not eat adequate meals.

CHAPTER 5

DISCUSSION OF RESULTS

CHAPTER 5

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5.1 Introduction

The main objective of the study was to provide baseline data on causes of malnutrition in Mangaung.

Firstly, the results obtained regarding demographic profile of respondents, as well as household and socio-economic information will be discussed. Thereafter, anthropometric measurements of caregivers and children (< 6 years) and adequacy and frequency of dietary intake will be discussed. Throughout the discussion the trends and differences that were observed will be highlighted in order to interpret the findings and identify the possible reasons thereof. Limitations of the study are pointed out and the effect that they could have had on the results are discussed. Where possible, the results obtained in this study are compared to the results of other relevant studies of a similar nature, as reported in the available literature.

5.2 Limitations of the study

5.2.1 Study population

For practical reasons households where members were not present during the day (at work and/or school), were excluded from the study. The sample thus only represents a certain part of the community and results will be interpreted with this in mind. Therefore households where someone (a person who could answer the questions in the questionnaire in an interview), were included.

There are missing values for certain questions, for example birthdates that were not available. For this reason, W/A and H/A values for all children are not available. In addition, some of the children refused to be weighed and/or measured and a large percentage of children were not at home (e.g. at crèche) when the interview was done. Anthropometric data was thus not available for all children.

5.2.2 Survey limitations

The Hawthorne effect refers to the influence of a survey itself on the answers given during an interview or survey (Anderson and Olsen, 2002). It is possible that a desire to impress the interviewer can lead to untrue answers being given by respondents. To limit the Hawthorne effect, the respondents were informed that the questionnaire was not a test and there were no correct or incorrect answers. It was explained to them that

the data was gathered in order to help the community and therefore honesty was important.

5.2.3 Dietary intake

To date, no single dietary assessment method has been described as the best method (Lee and Nieman, 2003, p. 52; Dwyer, 1998, p. 937). All dietary assessment methods, including the FFQ, have limitations.

According to literature, the successful administering of the FFQ depends on the ability of the subject to describe his/her diet (Lee and Nieman, 2003, p. 107). In this study, trained interviewers, together with Sotho interpreters were used to complete the FFQ in an interview with each respondent.

One of the disadvantages of the FFQ is that not all foods are included in the lists. This makes it difficult to obtain the total food consumption of respondents (Dwyer, 1998, p. 943), especially where traditional or unknown foods are eaten.

The problem of under- and overestimation of foods consumed by respondents may occur with most dietary assessment methods (Dwyer, 1998, p. 943), including the FFQ that was used in this study. Reported frequency of food intake obtained by FFQ has however been shown to be reasonably accurate and valid in other studies (Lee and Nieman, 2003, p. 106). Additionally, the FFQ is a relatively inexpensive method to use

with large sample sizes (Lee and Nieman, 2003, p. 107; Dwyer, 1998, p. 943). FFQ's are good to use for describing food and nutrient intake of groups rather than for individuals (Dwyer, 1998, p. 945). Because adequacy of diets was described by the inclusion of the three food groups in the meals consumed every day, and not by nutrient intake, the FFQ used in this study was considered adequate. In-depth evaluation of nutrient intake was not a main objective of this study. A general evaluation of the adequacy of daily intake by means of evaluating the composition of meals using the three food groups was considered appropriate to obtain qualitative information on dietary intake.

5.3 Validity and reliability of questionnaire (Appendix A)

5.3.1 Reliability

Reliability is the degree to which measures are free from error and, therefore, yield consistent results (Lee and Nieman, 2003, p. 97). Results showed that the answers to most questions differed with less than 10% between the study and the follow-up reliability test and were thus considered reliable.

Mean percentage differences for whether children were taken to clinics or not, as well as whether children had growth charts or not, exceeded 10%. Answers to these questions were thus eliminated. Studies have indicated that a second questionnaire

may yield better results due to a learning effect resulting in the second questionnaire being completed in more detail which may be the reason for differences seen in the two surveys (Romieu et al., 1997, Larkin et al., 1989).

When the FFQ used in the two surveys was compared, it was found that the reliability FFQ (second FFQ) did differ for some foods. It was found that the answers to the questions in the second FFQ differed with regard to the amount of tea consumed per day (15%), eggs consumed per week (20%), and eggs consumed per month (15%).

Answers to questions about frequency of the intake of margarine, oil and fat differed by 15% in the two surveys. As found in other South African studies (Hattingh, 2002), the FFQ completed for a second time as part of the reliability, included more detailed information on fats added during food preparation (oil, margarine and butter).

5.3.2 Validity

Validity is the ability of an instrument to actually measure what it is intended to measure (Lee and Nieman, 2003, p. 92). In contrast to reliability, many researchers agree that validation of an instrument used to determine dietary intake is not accurately possible (Larkin et al., 1989). Validity of the questionnaire (Appendix A) is based on the fact that relevant literature regarding the causes of malnutrition was consulted in the design of the questionnaire (UNICEF, 2004).

5.4 Demographic profile of respondents

The specifications of the age, sex, social status of the individual and their family members helps identify why they may be more vulnerable to food insecurity and/or malnutrition (Table 4.1).

Inadequate physical, mental and social development of people will lead to chronic ill health, decreased incentives, low productivity and lack of education (Chopra and McCoy, 2000).

For members older than 18 years, a large percentage of household members had some education, varying from grade 1 to 12.

Regarding respondents older than 18 years, a concerning 10.9% did not have any education. However, the majority of respondents (81.0%) did have education ranging between grade 1 and 12 (Table 4.1). The number of household members attending tertiary education was also low (2.4%). It is possible that this might be due to reasons such as lack of money, lack of interest and far distances to travel. The median grade for educational level for respondents > 18 years, was grade 8. South African law currently provides for nine years of compulsory schooling (Statistics SA, 2001). This effectively means that all South Africans should complete at least grade 7. Factors that can also contribute to this might be difficulty passing subjects, teenage girls falling pregnant or children who have to earn money and therefore stop attending school.

From the results about household composition, children < 6 years formed the largest percentage of household members. There were more or less the same number of fathers and mothers in households. However, it cannot be assumed that this was necessarily the child's own father or mother. In some households, there were also grandmothers and/or grandfathers, but only a few. A noticeable percentage of other members were also present, varying from relatives to people renting rooms in the households.

The median age of the household members was 24 years, and there were more or less the same amount of males and females.

5.5 Household and socio-demographic information

The living conditions in a household and the environment in which people live, contribute to, or negatively affect health status (Statistics SA, 2001). UNICEF has indicated that urban poverty is primarily found in squatter settlements (Oldewage-Theron et al., 2005). At present, 13.5% of all South African households live in informal settlements.

In South Africa urbanisation is occurring at an exceptionally high rate and informal (shack) settlement areas (shanty towns) have increased on the outskirts of cities and towns (Dannhauser et al., 2000). More than half of the households included in this

study were situated in built-up areas that were brick houses (Table 4.2). Most of these houses are the product of the Reconstruction and Development Programme (RDP) of the South African Government. The recent housing development has thus provided affordable brick homes to residents who previously lived in an informal settlement. However, a significant amount of households were still living in informal settlements. The environment of people living in informal areas was perceived as being worse than that of individuals in built-up areas. Thus, although the RDP has brought about improvement in the lives of many, these have not been sufficient to bring households anywhere near to an acceptable standard of living (Meth and Dias, 2004).

Regarding the state of the environment, the largest percentage of households can be described as average (Table 4.2). Field workers were given guidelines (Appendix E) to evaluate the state of the environment and “average” was considered as having basic services (i.e. access to water and sanitation and standard housing facilities). For most communities, poverty is reflected in the condition of a house and also the state of the environment that the house is situated in (South African Regional Poverty Network, SARPN, 2003, p. 37).

In the majority of the households, the father was seen as the head of the household, followed by the mother (Table 4.2). The head of the household is the person that the household regards as such, and is usually the person who assumes responsibility for decision-making in the household (Statistics SA, 2001). As found in the SARPN (2003, p. 37) study in Angola, the social relations are apparently the most solid in communities

where families have economic resources. As indicated in Table 4.3, the majority of primary caregivers are still parents. In other households, the head will be the person who brings the highest income into the household (Statistics SA, 2001). Next to parents being primary caregivers, the person that earns the most is most likely to be considered as the caregiver. This was also found by Botma and Grobler (2004) in a study evaluating household and community practices with regards to health care of children in Mangaung.

In the majority of households, either the father or mother or both are contributing to the income (Table 4.2). Employed people are those who were working at the time of the survey, whether for pay or profit. However, there were households where no income was noted. As found in other studies that have investigated the socio-economic profile of low-income families (Botma and Grobler, 2004; Meth and Dias, 2004), the percentage of unemployed persons was alarming. Another concern was that a significant number of households depended on grandmothers or grandfathers for income, which probably consisted of a pension in most cases.

In the majority of households, only one person contributed to the income. In more than 13% of the households, no one was responsible for income, thus making these households dependent on other resources for income. As in the case of Angola (SARPN, 2003, p. 37), the level of local economy development does not allow a supply of major job opportunities. According to Statistics SA (2001), 69 880 people in

Mangaung earn between R1 – R800 per month. The total population of Mangaung consists of more than 539 345 people with 59 867 children.

The median number of rooms per household was 3 including the kitchen and excluding the bathroom. The majority of the households (78.86%) were classified as not being overcrowded (less than 2.5 persons per room), but 21.14% of the households had a room density of more than or equal to 2.5 persons per room and were thus overcrowded. The median standard for room density was 1.33 persons per room. Overcrowding is a socio-economic factor that is associated with poverty. It can have a negative impact on a variety of factors related to nutritional status, including growth retardation, food shortages and disease, all of which contribute to the development of malnutrition.

From the results it is clear that there are households who do not have any source of income. This survey compared favourably with the National Food Consumption Survey (Labadarios, 1999), which found that a very significant percentage of the country's population still lives under adverse socio-economic conditions. Only about 30% of households had one or more members with a permanent job. It is often found that poverty and lack of education are the effects of underdevelopment and are the primary causes of hunger and undernutrition (WHO, 1992). This highlights the persisting problem of unemployment. More than 30% of households indicated that one or more of the members had a piece job, relieving extreme household food insecurity. In some cases, grant money was utilized as the household's source of income. Child support

grants are paid for eligible children under the age of seven years (Meth and Dias, 2004). As found in other studies (Meth and Dias, 2004), the poverty-alleviating effects of grants are limiting. Raising the age limit will help, but not as much as would a basic income. Another concern is the dependency of some households on external sources, which are not always consistent. If the access to social infrastructure improves, the communities will become less vulnerable. Education, sanitary and nutritional development, particularly in the young generations, is strongly dependent on a good functioning of social infrastructures (SARPN, 2003, p. 37). It can be accepted that poverty and lack of basic resources for nutritional well-being form the background for the development of undernutrition (Dannhauser et al., 2000).

All households had safe water supplies in the form of running water in the house or yard (Table 4.2). According to this survey, most households have access to piped water. These results were similar to the NFCS (1999; Dannhauser et al. 2002), where the majority of households had running water and only one out of four households had to collect water from a communal tap. Safe drinking water promotes good health by reducing water-borne diseases (Statistics SA, 2001). In spite of 100% of households having access to water, only 45.2% had food gardens. Various reasons for not having a vegetable garden were noted; with “no seed” being one of the main reasons. Another contributing factor is that some respondents were physically not able to make a vegetable garden. They were either too weak or sick or did not know how to and did not have any assistance. The low prevalence of vegetable gardens can also be the consequence of unfavourable conditions, such as poor quality of soil. Food gardening

should be encouraged, and strategies to address the above-mentioned reasons for gardening should be developed (Botma and Grobler, 2004).

According to a survey done in 1999, 62.7% of South African households had a clinic within 2 km, while 37.3% of the households had a clinic further than 2 km from the place in which they lived (Statistics SA, 2004). Almost all the infants and children included in this study were taken to the nearest clinic, and usually for various reasons (immunization, when ill etc.). In South Africa, the provision of free primary health care services at public clinic facilities, firstly to children under 6 years and pregnant women, and then to all clients, has dramatically increased access and utilization of primary health care services by poor communities, in particular women and children (Robinson, 2003). Effective health care services are the backbone of health interventions, and have the potential to have a dramatic impact of health (WHO, 2002). Road to Health charts are used by the health system to record immunisations and other health details. To promotion of the growth chart and its advantages through health education can do much to improve infant and childhood health. All respondents were asked to bring the children's growth charts (if it was available) for the field workers to evaluate.

It seems that the majority of adults also visited the nearest clinic. This may be because of easy accessibility and low medical costs involved. A very small percentage made use of a private doctor, possibly because of financial constraints.

A low percentage of the community had access to food aid (Table 4.3). It seems that food aid is often not provided at the right time, the right place, or in sufficient quantities. Food aid is of the utmost importance to improve the nutritional status of poor children, because income, i.e. grants, is not always used to buy food. The study of Botma and Grobler (2004) found that the community felt that food should be given rather than money, specifically because of the above mentioned reason.

Less than half of women used family planning. According to Swartz (2002), the South African government began to provide strong support for family planning in the 1960s. However, the reproductive rights of the majority of South African women are still being questioned. Some of the women's husbands or partners do not give consent to use family planning. Not all women are free to discuss reproductive issues, including contraceptive use, with their husbands or partners. As found in the study of Swartz (2002), many African women have to make their own decisions about family maintenance and reproduction because her husband or partner is working far away or has left the family. A more recent study performed in Kwazulu Natal, indicated however that a substantial proportion of men and women reported using some form of contraception (Maharaj and Cleland, 2005).

The high percentage of household members smoking or snuffing is alarming (70.05%). In developing countries each year, there are around 2.9 million deaths from tobacco-related diseases (WHO, 2002).

Regarding illness or health related problems, a large proportion (40.51%) of the respondents reported being diagnosed with hypertension (Table 4.3). This might be the consequence of tobacco consumption. The WHO (2005a) found that one in nine deaths in South Africa is related to tobacco use. More than two thirds of the population in this study smoked or snuffed.

The percentage of respondents reporting that they have TB, heart disease, overweight or obesity and constipation, was more or less 10% for each condition. Many local health care facilities do not have the necessary resources (committed health care workers), essential drugs and proper infrastructure (transport) to address a range of medical conditions. A significant number of respondents (20.74%) experienced loss of appetite, while recent weight loss was reported in 27.59% of respondents. This information suggests that some of the population may present these symptoms due to underlying diseases, such as HIV or AIDS. It is concerning that health systems and services are probably too weak to support the prevalence of HIV/AIDS in South Africa.

5.6 Anthropometry

Although anthropometric measurements serve as an indicator of various factors, (such as neglect and disease) anthropometric data is most commonly an indication of dietary practices (Walsh et al., 2001). BMI of caregivers and Z-Scores of children will be discussed in the following sections.

5.6.1 Weight and height status of the caregiver

The prevalence of overweight and obesity in the studied group of household members was an outstanding anthropometric feature, with 24.0% having a BMI higher than 25 kg/m² and about 23% having a BMI higher than 30 kg/m² (Table 4.4). The THUSA study, found that measures of obesity are associated with the risk for non communicable diseases in black South African women, in which a high rate of obesity has been found (Kruger et al., 2001). These results were very similar to those found in other studies done in Mangaung (Hattingh, 2002), where 53.3% and 51.7% of younger (25 - 34 years) and older (35 - 44 years) women respectively, had a BMI higher than 25 kg/m². A study performed in Kwazulu Natal by Faber et al. (2001) indicated that 40% and 26% respectively, were overweight and obese, respectively. THUSA found that 28.6% of the subjects were obese (Kruger et al., 2001). The results from this study correlate well with all of above mentioned.

Although figures for women falling in the overweight class were lower, the percentage of women falling in the overweight category should also be a matter of concern, as overweight may eventually lead to obesity. Obesity has created a double burden of disease in parts of Africa still struggling to overcome malnutrition (Roberts, 2004).

5.6.2 Weight and height status of children < 6 years

As found in other studies undertaken in Mangaung (Dannhauser et al., 2000), the results of this study indicated that the number of well-nourished children in this study was small. In interpreting the results obtained by the three chosen indicators, it is important to note that an acute food shortage will most probably produce thin children irrespective of their height and age. However, a chronic lack of food results in underweight children that also have a reduced stature, which remains even after food intake has increased to normal, and individuals are no longer underweight (Lee and Nieman, 2003, p. 184).

5.6.2.1 Weight-for-age

As previously mentioned, a W/A below -2 SD is indicative of underweight, which usually occurs after a period of recent food shortage. The percentage of underweight children was 17%, with 26.1% of children being at risk of becoming seriously underweight (W/A between $\geq -2 < -1$) (Table 4.5). Prevalence of underweight in this study was higher when compared with the NFCS (1999) where one out of ten children aged 1 – 9 years was underweight. However, results were slightly less than a similar study done by Dannhauser et al. (2000), where a median of 19.2% of the children were underweight. Low weight-for-age is difficult to interpret, as it cannot discriminate between temporary and permanent malnutrition (Zere and McIntyre, 2003). For this reason height-for-age and weight-for-height status of children was also determined.

5.6.2.2 Height-for-age

An H/A below -2 SD is an indication of stunting which usually occurs after a period of chronic malnutrition (Lee and Nieman, 2003, p. 184) and is a major problem in South Africa (SAVACG 1996; Zere and McIntyre, 2003). A large percentage (30.3%) of children were stunted (Table 4.6), more or less similar to stunting rates in Joe Slovo (another informal settlement in Mangaung) (29.0%) as shown by Dannhauser et al. (2000). Slightly lower rates of stunting were found in similar studies performed in South Africa (Walsh et al., 2001; Chopra, 2003), where more or less 26% of children were stunted. This also compared well with the prevalence of stunting found during Labadarios (1999) and a Kwazulu Natal study by Faber et al. (2001), where more or less one in five children were stunted.

As with weight-for-age, a large percentage of children had a height-for-age between -2 SD and -1 SD. In this regard, however, it should be noted that the present survey has captured a significantly smaller percentage of households than the NFCS. Stunting is a condition that occurs as a result of prolonged malnutrition over a longer period of time. It should also be noted that 26.9% of children were at risk of becoming stunted (H/A between $\geq -2 < -1$). Stunting begins early in life and has irreversible consequences. Stunted children grow up to become stunted adults (USAID, 2003), with an increased risk of developing obesity and chronic diseases of lifestyle. In this community it was

clear that the double burden of obesity and undernutrition co-exist in many households, as indicated by the BMI of caregivers and Z-scores of children.

5.6.2.3 Weight-for-height

A W/H below -2 SD is an indication of wasting that usually occurs after a period of recent and severe malnutrition (Lee and Nieman, 2003, p. 184).

As expected, a much smaller percentage of children (9.2%) in the study had a reduced weight-for-height than a weight-for-age or height-for-age (Table 4.7). Sixteen percent of children were however, at risk of becoming wasted ($W/H \geq -2 < -1$). Children who are wasted have a significantly increased risk of death (USAID, 2003). Wasting typically reflects the inadequacy of the diet. Furthermore, wasting is also useful in evaluating the benefits of nutrition intervention programmes, as it is sensitive to short-term changes (unlike stunting that does not respond quickly) (Skoufias, 1998).

As found by Dannhauser et al. (2000), very few children were overweight or had excessive values for any of the anthropometric measurements.

5.7 Dietary intake

Adult dietary habits and feeding practices for young children play a particularly important role in food security and nutritional well-being in South Africa (USAID, 2003). A questionnaire was used to obtain information about dietary practices of adults, children (< 6 years), as well as babies (birth – 6 months). The three food group approach was used to determine if dietary intake for adults and children, was adequate.

5.7.1 Adequate dietary intake

The three food groups were used in order to determine adequacy of dietary intakes due to the fact that the data collected by means of the questionnaire was not comprehensive enough to allow for the determination of nutrient values. The three categories include energy foods, building foods and protective foods. Thus, each group represents a set of nutrients that differs from the nutrients supplied by the other group (Whitney and Rolfes, 2002, p. 35). Selecting foods from each group of these three groups, is a quick and easy way of evaluating the adequacy of the diet. The percentage of respondents that ate three adequate meals per day was low. In general terms, the majority of adults did not consume adequate meals for breakfast, lunch and supper (Table 4.8).

The dietary practices of children were also poor in terms of adequacy. Similar results were found in Labadarios (1999) where the majority of children consumed a diet deficient in energy and of poor nutrient density to meet their micronutrient

requirements. Childfeeding practices are key behavioural variables that help explain the variations in nutritional status of young children (Shashikala et al., 2005). Poor infant and child feeding practices are often due to lack of education in mothers and caregivers who are not informed about what and how often to feed their children.

Exclusive breastfeeding means that the child ingests only breastmilk, and no additional food, water or other fluid (which the exception of medicines and vitamins needed) (Botma and Grobler, 2004). Data from this survey indicates that 80% of mothers in the study breastfed their children. Similar results were found in another study undertaken in Mangaung (Botma and Grobler, 2004) where 86.83% of mothers breastfed their children. Twenty percent of mothers did not, however, breastfeed their babies. In the African culture interference by loved ones is seen as one of the strongest reasons mothers do not succeed with exclusive breastfeeding (Bobat et al., 1997). Inadequate weaning practices are well recognized as an important cause of morbidity and mortality in young children (WHO, 1992). Although a high percentage of infants were breastfed, prevalence of underweight and stunting was high. Thus, it is more likely, that inadequate dietary intake, and although not specifically investigated, inadequate weaning practices were present in these children.

Only 30% of respondents always had food available, similar to Labadarios (1999), where only one in four households (25%) appeared food secure. Labadarios (1999) found that for South African children overall, one in two households (52%) experienced hunger and one in four (23%) were at risk of hunger. Food insecurity rates will probably

be higher with decreasing income, low educational levels and increased household size.

5.7.2 Frequency of food intake

Labadarios (1999) found that at national level, the five most commonly eaten foods included maize, white sugar, tea, whole milk and brown bread. With a few exceptions, this pattern, rather than the actual frequency, appears to be fairly consistent in all provinces. Although exact intake of foods was not determined in this study, maize, white sugar, tea, fats and vegetables were eaten most frequently (Tables 4.13, 4.10, 4.14, 4.15).

5.7.2.1 Frequency of snack intake

Snacks, i.e. sweets, chocolates, chips, cake, biscuits and cooldrinks, were consumed frequently (Table 4.9). As found in the study by Dannhauser et al. (2000), sugar and snacks, including sweets, cold drinks, potato chips, pudding, cakes and biscuits were eaten once daily by most of the children. High sugar consumption is associated with certain chronic diseases, such as dental caries and obesity. The argument that people should limit intake of sugar added to food is based on evidence that a high intake of sugar increases the risk of certain chronic diseases, particularly dental caries and

obesity (Steyn et al., 2003). Unfortunately, tooth decay is widespread in most South African populations. Furthermore, a diet high in added sugars (more than 10% of total energy) is suggested to dilute micronutrients and displace nutrient-dense foods (Steyn et al., 2003), especially in children living in lower socio-economic areas.

5.7.2.2 Frequency of tea and coffee intake

In some households there were general preferences for non-dairy coffee creamers, which do not need refrigerated storage (Table 4.10). The same results were found in a study done by Hattingh (2002) in Mangaung. Tea seemed to be a favourite beverage for the households included in this study. These findings were similar to results from the THUSA study performed in the North West Province (Kruger et al., 2001), where tea was amongst the three foods consumed in the largest amounts per person per day.

5.7.2.3 Frequency of milk intake

Milk was one of the most frequently consumed foods reported. Full cream milk was used most frequently, while only a small percentage of respondents used low-fat or skim milk every day (Table 4.11). Despite the fact that milk was one of the most frequently consumed foods, the amounts ingested (not determined in this qualitative survey) might not be sufficient. This trend has been confirmed by other South African

studies (Hattingh, 2002, Vorster et al., 1997), in which the assessment methods including FFQ were used. Other studies showed that it is evident that many South Africans consume milk, but not in sufficient quantities (Hattingh, 2002). A calcium depleted diet may further be ascribed to low milk intakes reported for Africans, caused by cultural habits and taboos regarding milk consumption, lactose intolerance, which is high in Africans, as well as the high cost of dairy products (Hattingh, 2002, Vorster et al., 1997).

5.7.2.4 Frequency of meat and meat product intake

Vorster et al. (1997) reported from South African studies, that the intakes of total protein of adult Whites, Africans, Coloureds and Indians, were found to either meet, or exceed recommended intakes. This trend of high total protein intake may be ascribed to the fact that urbanisation is accompanied by the increased intake of animal protein typical of a more Western diet (Vorster et al., 1997). However, the frequency of meat and meat product intake in this survey was not that high (Table 4.12). This is probably because the majority of the respondents had low economic profiles and cannot afford to buy high protein foods. The free availability of cheaper cuts of red meat, offal, sausage, chicken and chicken offal, could contribute to the intake of protein on a regular basis, though. Unfortunately, these cheaper options are usually high in fat and therefore the intake of lean meat should be promoted to form part of the diet. The consumption of cheaper vegetable proteins, including bean-and-samp combination typical of an African

diet, was higher than that of meat, chicken or fish. The inclusion of the traditional samp-and-bean combination in the diet should be further encouraged as a substitute for costly animal-derived and fatty foods (Vorster and Nell, 2001).

5.7.2.5 Frequency of starch intake

The consumption of starches, specifically porridge, was high (Table 4.13). As found in a study by USAID in Zambia (2003), maize is the predominant staple and for most people eating a meal means consuming porridge. The South African NFCS found that the most commonly consumed food item in South Africa was maize (Labadarios, 1999). The consumption of porridge is desired because it creates a feeling of fullness after eating. However, it lacks the range of proteins, vitamins and minerals required for a balanced diet (USAID, 2003, p. 10). Unrefined or minimally processed cereals and grains should be recommended where possible, as well as fortified cereals and grains when available (Hattingh, 2002). The impact of food fortification includes preventing or correcting a demonstrated deficiency of one or more nutrients.

5.7.2.6 Frequency of fruit and vegetable intake

The daily intake of vegetables was relatively high (Table 4.15). Leafy vegetables such as spinach and cabbage are both popular food choices amongst Africans. Fruits, however, were not consumed regularly and the main reason given for this was that

fruits were thought to be expensive. Similar studies found more or less the same trend where less than two to four servings per day were consumed from the fruit and vegetable group (Charlton et al., 2001; Peltzer and Promtussananon, 2004). Vegetables and fruits are however freely available at reasonably low prices when in season. The insufficient intake of fruits is a concern and nutrition interventions should focus on the inclusion of adequate fruit intake per day.

5.7.2.7 Frequency of other foods intake

When the FFQ was administered, the respondents were queried on the use of table salt, and the amount of salt added during food preparation (Table 4.16). It seems that table salt, stock or Royco, were added to meals on a daily basis by the majority of households. Although table salt in South Africa is iodised, high salt intakes are associated with hypertension.

Reported intake of alcohol indicated that more than half of the households did consume alcohol. Due to the fact that this was a qualitative survey, information on the amount consumed was not collected. Alcohol use and abuse can have devastating effects on adult health, teratogenic effects on the unborn and negative social and economic effects (Van Heerden and Parry, 2001).

5.8 Discussion of associations

Associations between BMI of caregivers and Z-Scores of children with other indicators of malnutrition will be discussed in the following section.

5.8.1 Associations between BMI of caregivers and household and socio-demographic information

A study performed in the Netherlands indicated that low-income countries could use information on BMI for assessing differences in standards of living (Nube et al., 1998). In this study, very few statistically significant associations were found between BMI of caregivers and household and socio-demographic information. The relatively small number of caregivers with a BMI < 18.5 kg/m² could have contributed to this finding. It is still, however, useful to discuss the trends observed in this regard.

BMI of caregivers was not associated with the number of people contributing to the household income. BMI did, however, seem to increase as the number of rooms in the house increased.

The prevalence of overweight was high in the permanent job group (45.07%), while the prevalence of underweight was higher in the group with a piece job (42.86%) (Table

4.18). This can probably be ascribed to more money available to buy food in households where a permanent income was assured.

Another finding was that underweight caregivers were less likely to have a vegetable garden (Table 4.18). Reasons include, no seed available (50%), as well as sickness and no help to establish a vegetable garden.

The associations between BMI of caregivers and medical conditions were determined per condition. Compared to underweight and normal weight, overweight and obese respondents had a significantly higher prevalence of self-reported high blood pressure. These findings are similar to a study performed in Kwazulu Natal by Faber and Kruger (2005). A study done in Ellisras by Monyeki et al. (2005) also found a significant association between high diastolic blood pressure and high BMI, where respondents with low BMI values were less likely to be hypertensive.

From the information on prevalence of self-reported medical conditions, very few significant associations with BMI could be found (Table 4.19). One would expect the prevalence of diabetes and heart disease to be higher in the overweight group, but it was not. Also, one would expect the prevalence of TB to be higher in underweight caregivers, but it was not. As expected, diarrhea, loss of appetite and weight loss was

generally more prevalent in underweight caregivers, but differences were not statistically significant.

More interesting was the fact that only 23.61% of confirmed overweight and obese caregivers reported being overweight and obese, while 7.14% of confirmed underweight caregivers considered themselves overweight or obese (Table 4.19). This finding indicates that reported prevalence of disease is probably not a valid measure of actual prevalence of disease.

Although not statistically significant, fewer children of underweight caregivers tended to have a completed growth chart compared to children of normal weight or overweight caregivers (Table 4.20). It is possible that underweight caregivers did not have the energy to take children to a clinic for growth monitoring due to weakness or illness. Despite this, underweight caregivers were more likely to visit clinics themselves, perhaps to seek help for their own medical symptoms.

5.8.2 Associations between BMI of caregivers and dietary intake

The association between BMI of caregivers and inadequate dietary intake of adults and children is presented in Table 4.21. Adults in all BMI categories had an inadequate intake of the three food groups in most meals. One exception was lunch and mid-

afternoon snack that tended to be adequate in a large percentage of normal weight or overweight caregivers as well as in children of caregivers in the normal weight or overweight categories. Thus, caregivers with a lower BMI were more likely to have children who consumed an inadequate lunch and mid-afternoon snack. Underweight caregivers were probably less likely to provide the necessary care and feeding of children due to their own unsatisfactory health status.

5.8.3 Associations between Z-scores and household and socio-demographic information

Income is the most commonly used measure of socio-economic status. As in the case of BMI however, Z-scores of children were generally not associated with the median number of people contributing to the income or the number of rooms in the house (Tables 4.22 – 4.24). A study performed by Zere and McIntyre (2003), found that stunting was the highest in areas with the highest prevalence of poverty and/or poor socio-economic conditions. Room density in this study was higher in underweight and at risk of becoming underweight children (2) compared to normal weight children (1.5). The same trend was observed for height-for-age. As for weight-for-height is concerned, however, only 14 children had a weight-for-height below -2 SD, making comparisons between categories difficult.

A study performed in the United States found that low-income families with food insufficiency had children who differed from high-income families in several nutrition and anthropometric measures (Casey et al. 2001). Although not statistically significant, it was interesting to note that underweight children were more often likely to have a father as the head of the household (71.88%) compared to children with a normal weight (46.43%) (Table 4.25). The same was true for weight-for-height (Table 4.27).

Regarding own tap on premises, a significant difference for weight-for-age was found when comparing underweight (< -2 SD) with less underweight children (≥ -2 SD). The same applied to height-for-age. However, almost all respondents (99.3%) had water available on the premises, whether it was inside the house or on the premises.

From the information on prevalence of self-reported medical conditions, very few significant associations with Z-Scores could be found (Table 4.28 - 30). Regarding the prevalence of diarrhea, a significant difference was found when comparing weight-for-age. Significant differences were found in children at risk of becoming underweight come from households where the caregiver had the highest prevalence of diarrhea, constipation, loss of appetite and weight loss. Malnutrition might be caused by a lack of food in the home or not having enough time to prepare food (Bonti-Ankoman. 2001). Inadequate dietary intake and infection form a vicious cycle that accounts for much of the high morbidity and mortality seen in developing countries. When people don't eat enough, their immune system is compromised, resulting in greater incidence, severity

and duration of disease. Disease speeds nutrient loss and suppresses appetite, so sick people tend not to eat and the cycle continues (UNICEF, 2004).

Regarding height-for-age, children at risk of becoming stunted also had caregivers with a higher prevalence of heart disease (Table 4.29). The prevalence of constipation in caregivers of children at risk of becoming stunted was significantly higher. The prevalence of constipation was higher in the category of children at risk of becoming stunted compared to stunted children and children with normal height.

Children at risk of becoming wasted (89.47%) as well as children already wasted (100%) showed high rates of regular clinic attendance (Table 4.33). Regardless of accessing clinics (i.e. long waiting periods, being turned away, transport difficulties), effort is being made to attend primary health care services. The reasons for attending clinics, may include short distances to primary health care settings and free services rendered within these facilities. Furthermore, caregivers might be more aware of the burden of HIV and AIDS and therefore access health care services more regularly.

With regards to the prevalence of family planning, the household members of most children at risk of becoming underweight did not use any family planning. According to Maharaj and Cleland (2005), the wife's fertility preference was found to be a key determinant of use. Woman with early or closely spaced pregnancies are at increased risk of entering a reproductive cycle with reduced reserves. Maternal nutrient depletion may contribute to the increased incidence of preterm births and fetal growth retardation

among these women as well as the increased risk of maternal mortality and morbidity (King, 2003).

Regarding the prevalence of food aid, most of the underweight children did not receive any food aid. According to Zere and McIntyre (2003), government efforts such as the Primary School Nutrition Programme (PSNP) targeted at school children can offer palliative measures to relieve the problems associated with school child malnutrition, but they cannot have a sustained impact on addressing the deep-rooted causes of malnutrition. As found by Hendricks et al. (2003), there are certain problems related the PEM Programme in South Africa, making it difficult to obtain the best results from this programme. These problems include: lack of training, inappropriate targeting of certain groups, incorrect application, especially of discharge criteria for pregnant and lactating women, inadequate assessment for nutrition-related disease, inadequate nutrition counseling and no standard monitoring.

5.8.4 Associations between Z-Scores and dietary intake

The association between Z-Scores and inadequate dietary intake of adults, children and babies is presented in Tables 4.34 – 4.36. caregivers of children in all Z-Score categories had an inadequate intake of the three food groups in most meals. Interesting was the fact that lunch and mid-afternoon snack of adults and children tended to be more adequate in a large percentage of stunted children compared to children of

normal height. Thus, adults and children in the stunted category were more likely to consume an adequate lunch and mid-afternoon snack. Similarly, breakfast and mid-morning snack of adults tended to be more adequate in a large percentage of wasted children compared to children of normal weight and height status.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

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6.1 Introduction

The main objective of this study was to perform a baseline study in order to identify the causes of malnutrition in Mangaung that can serve as a community diagnosis and the motivation for the development of a relevant nutrition intervention.

6.2 Conclusions

The following conclusions evolved from the study.

6.2.1 Immediate causes of malnutrition in Mangaung

Malnutrition is caused by inadequate dietary intake and disease, either alone or in combination.

Dietary Intake:

- The dietary intake of both adults and children was inadequate, with the majority consuming an inadequate breakfast, lunch and supper.

- The majority of babies had an adequate dietary intake due to the fact that most babies were breastfed.
- Frequency of food intake:
- Snacks, i.e. sweets, chocolates, chips, cake, biscuits and cooldrinks, were consumed frequently.
- Tea seemed to be a favourite beverage for the households included in this study.
- Milk was one of the most frequently consumed foods reported, with full cream milk used most frequently, but the quantity consumed was not determined.
- The frequency of meat and meat product intake in this survey was not high.
- The frequency of consumption of starches, specifically porridge, was high.
- The daily intake of vegetables was relatively high. Fruits, however, were not consumed regularly and the main reason given for this was that fruits were thought to be expensive.
- Table salt, stock or Royco, were added to meals on a daily basis by the majority of households.

Disease:

Disease can result in malnutrition even if food is available within the household. Illness can suppress appetite and reduce absorption of nutrients.

- The prevalence of overweight and obesity in adults was an outstanding anthropometric feature.

- Interesting was the fact that only 23.61% of confirmed overweight and obese caregivers reported being overweight and obese, while 7.14% of confirmed underweight caregivers considered themselves overweight or obese.
- In contrast to the other medical conditions, a significantly higher percentage of weight loss in caregivers were noted in the underweight BMI categories, as well as when comparing the underweight and normal BMI categories with the overweight BMI category (23.61%).
- A matter that needs to be addressed urgently, is the total number of children who were underweight, stunted or wasted and at risk of becoming underweight, stunted or wasted.
- The double burden of obesity in adults and malnutrition in children was evident in a large number of households.
- Adults in all BMI categories had an inadequate intake of the three food groups in most meals.
- One exception was lunch and mid-afternoon snack that tended to be adequate in a large percentage of normal weight or overweight caregivers as well as in children of caregivers in the normal weight or overweight categories.
- A large proportion (40.51%) of the respondents reported being diagnosed with hypertension.
- The percentage of respondents reporting that they have TB, heart disease, overweight or obesity and constipation, was more or less 10% for each condition.
- A significant amount of household members indicated loss of appetite and weight loss that might reflect the prevalence of HIV and AIDS.

- Compared to underweight and normal weight, overweight and obese respondents had a significantly higher prevalence of self-reported high blood pressure.
- Significant differences were found in children at risk of becoming underweight that had the highest prevalence of diarrhea, constipation, loss of appetite and weight loss.
- Regarding height-for-age, children at risk of becoming stunted also had caregivers with a higher prevalence of heart disease and constipation.

6.2.2 Underlying causes of malnutrition in Mangaung

Underlying causes of malnutrition include household food security, mother and child care, inadequate environment, health services and lack of education.

Household food security:

- It is concerning that 28.18% of households did not have food available on a daily basis.

Mother and child care:

- In the majority of the households, the father was seen as the head of the household, followed by the mother.
- Less than half of women used family planning. Household members of most children at risk of becoming underweight did not use any family planning.

- In households where the father was the head of the household more children were underweight and stunted.

Inadequate environment:

- More than half of the households included in this study were situated in built-up areas that were brick houses.
- Regarding the state of the environment, the largest percentage of households can be described as average, indicating that basic services (i.e. access to water and sanitation and standard housing facilities) are not lacking.
- The majority of the households (78.86%) were classified as not being overcrowded (less than 2.5 persons per room), but a large percentage were overcrowded (21.14%).
- Room density improved as children's height-for-age improved. Stunted children had a significantly higher room density (2) when compared to children at risk of becoming stunted (1.3).
- All households had safe water supplies in the form of running water in the house or yard.
- In spite of 100% of households having access to water, only 45.2% had food gardens.

Health services:

- Almost all the infants and children included in this study were taken to the nearest clinic, and usually for various reasons (immunization, when ill etc.).

- Significantly fewer children of underweight caregivers had a completed growth chart (63.64%) compared to children of caregivers with a normal BMI (84.62%) and overweight and obese caregivers (95.24%).

Lack of education:

- A concerning 10.9% of adults > 18 years did not have any education. However, the majority of adults (81.0%) did have education ranging between grade 1 and 12.
- The amount of household members attending tertiary education was also low (2.4%).

6.2.3 Basic causes of malnutrition in Mangaung

Economic growth is a frequent contributor to nutrition improvement.

- In the majority of households, only one person contributed to the income.
- A low percentage of the community had access to food aid.
- In more than 13% of the households, no one had an income.

6.3 Recommendations

The following recommendations are recommended to address immediate, underlying and basic causes of malnutrition.

6.3.1 Immediate causes

- The need to improve the dietary intake of both adults and children should be addressed within the current framework of the INP. Increasing dietary diversification is the most important factor in providing a wide range of micronutrients, and to achieve this objective in a development context, an adequate supply, access and consumption of a variety of foods is required (Tontisirin et al., 2002).
- Counselling regarding food and fluid choices needs to be improved. Newspapers, radio and television can be used more effectively in communicating and educating the community on healthy food choices and the importance of a balanced diet. Nutrition education messages can be given through schools to reach vulnerable children (Tontisirin et al., 2002).
- Exclusive breastfeeding should be encouraged and promoted. Breastmilk combines the three fundamentals of sound nutrition, namely food, health and care (UNICEF,

2004). Therefore, mothers should be able to establish and sustain exclusive breastfeeding for six months WHO and UNICEF recommend:

- Initiation of breastfeeding within the first hour of life;
 - Exclusive breastfeeding;
 - Breastfeeding on demand;
 - No use of bottles, teats and pacifiers
-
- Complementary foods are often of lesser nutritional quality than breastmilk (Daelmans et al., 2003). Therefore, the introduction of complementary feeding together with breastfeeding for up to two years should be promoted.
-
- The correct management of diseases should form an integral part of any education programme. The key immediate causes of all types of disease that should be addressed are mainly inadequate or inappropriate food and nutrition, including food insecurity, and for chronic diseases, use of tobacco and physical inactivity (UNICEF, 2004). Creative strategies should be used to carry to message of HIV/AIDS to the communities. On a population basis, the only rational approach to all types of disease is prevention, and most of all the protection and creation of healthy environments, at household, community, municipal, state, national and global levels (UNICEF, 2004).

6.3.2 Underlying causes

- Opportunities should be provided whereby education on nutrition and health can stimulate demand for more or different food, health services, or disease-prevention strategies (O'Donnell, 2004). Furthermore, the content of any educational material used must be sensitive to the low level of education of the primary target group (Labadarios, 1999).
- If households are not exposed to the adverse effects of price fluctuations, it can have a significant impact on household food security (De Klerk et al., 2004). Nutrition workers also need to know warning signs regarding household food insecurity so that they can watch over “at risk” families more closely during those times. Furthermore, the gap between economic growth and employment growth should stop expanding (UNDP, 2003, p. 6). Additionally, ways of improving household food insecurity must be considered. Possible interventions include:
 - School feeding schemes;
 - Improved mechanisms are needed for monitoring the distribution of food aid;
 - Easier accessibility to grants and pensions; and
 - Access to and participation in income generating programmes
- Primary health care services and non-governmental organisations (NGO's) can provide seed, information and assistance on how to initiate and maintain a

vegetable garden. Involvement of household members in the establishment of vegetable garden, will contribute to local knowledge and practical experience. Established vegetable gardens contribute to the long-term socio-economic upgrading of the population that is likely to ensure the improvement of the nutritional status of the community (Labadarios, 1999).

- Establishing support groups for women, as well as for community health workers, are of utmost importance. There has been an increase in female-headed households, and there is an association between gender of the head of the household and poverty (NPA, 2001, p. 54). Furthermore, social security programmes aimed at female-headed households should be developed, which should incorporate development (Labadarios, 1999). Particular emphasis should be placed on the education and empowerment of women.
- Household members should be educated on the importance of regular clinic visits to ensure that their children grow adequately. The public health sector is the main provider of PHC services in South Africa and therefore it is important that these services are provided in an equitable, effective and efficient manner (Roberts et al., 2004).

6.3.3 Basic causes

- The most important step toward food security remains the provision of productive employment opportunities through job programmes and reorganization of the economy (Watkinson and Makgetla, 2002, p. 13).
- Decision-makers, administrators and politicians need to be involved in a number of alternative strategies. This includes: advocacy, regulation (food labeling, supplementation), organizational change (health promoting schools) and legislation. (Labadarios, 1999).

LIST OF REFERENCES

Alberts, J.F., Sanderman, R., Eimers, M.J. Van Den Heuvel, W.J.A. 1997. Socio-economic inequity in health care: A study of service utilization in Curaçao. Social Science and Medicine, vol. 45, pp, 213 – 220.

Anderson, N. and Olsen, J. 2002. Do interviewer's health beliefs and habits modify responses to sensitive questions? A study using data collected from pregnant women by means of computer-assisted telephone interviewers. American Journal of Epidemiology, vol. 155, nr. 1, pp. 95 – 100.

Balch, J.F. and Balch, P.A. 1997. Effectiveness of BCG vaccination against TB meningitis. Indian Pediatrics, vol. 36, no. 5, pp. 455 – 460.

Beaglehole, R. and Yach, D. 2003. Globalisation and the prevention and control of non-communicable disease: the neglected chronic diseases of adults. The Lancet, vol. 362, no. 9387, pp. 903 – 908.

Benatar, S.R. 2004. Health Care reform and the crisis of HIV and AIDS in South Africa. New England Journal of Medicine, vol. 351, no. 1, pp. 81 – 82.

Berg, J. 2005. Reporting on the link between hunger and obesity. <http://www.nyccag.org> [Accessed: August, 12th, 2005].

Bhaskaram, P. 2002. Micronutrient malnutrition, infection and immunity: an overview. Nutrition Reviews, vol. 60, no. 5 Pt 2, pp. S40 – S45.

Bobat, R., Moodley, D., Coutsoodis, A. and Coovadia, H. 1997. Breastfeeding by HIV-1 infected women and outcome in their infants: a cohort study from Durban South Africa. AIDS, vol. 11, nr. 3, pp. 1627 – 1633.

Bonti-Ankomah. S. 2001. Addressing food insecurity in South Africa. The National Institute for economic policy. <http://www.sarpn.org.za/eventpapers/land> [Accessed: October, 27th, 2005].

Botma, Y. and Grobler, C. 2004. Report on participatory situational analysis on household and community practices with regards to health care of children under 5 years in the Motheo District, Free State, South Africa, 2003 – 2004. School of Nursing: University of the Free State, pp. 1 – 76.

Caballero, B. 2002. Global patterns of child health: the role of nutrition. Annals of Nutrition and Metabolism, vol. 46, Suppl. 1, pp. 3 - 7.

Casey, P.H., Szeto, K., Lensing, S., Bogle, M. and Weber, J. 2001. Children in food-insufficient, low-income families: prevalence, health and nutrition status. Archives of Pediatrics and Adolescent Medicine, vol. 155, no. 4, pp. 508 – 514.

Chakravarty, I. and Sinha, R.K. 2002. Prevalence of micronutrient deficiency based on results obtained from the national pilot program on control of micronutrient malnutrition. Nutrition Reviews, vol. 60, no. 5 Pt 2, pp. S53 - S58.

Charlton, K.E., Bourne, L.T., Steyn, K. and Laubscher, J.A. 2001. Poor nutritional status in older black South Africans. Asia Pacific Journal of Clinical Nutrition, vol. 10, no. 1, pp. 31 – 38.

Charlton, K.E. and Rose, D. 2001. Nutrition among older adults in Africa: the situation at the beginning of the millennium. Journal of Nutrition, vol. 131, no. 9, pp. S2424 - S2428.

Chopra, M. 2003. Risk factors for undernutrition of young children in a rural area of South Africa. Public Health, vol. 6, no. 7, pp. 645 – 652.

Chopra, M. and McCoy, D. 2000. How to conduct a rapid nutrition situation assessment. Health System Trust (HST), no. 57, p. 1-47.

Corbett, E. L., Steketee, R.W., O ter Kuile, F., Latif, A., Kamali, A. and Hayes. R.J. 2002. HIV-1/AIDS and the control of other infectious diseases in Africa. The Lancet, vol. 359, no. 9324, pp. 2177 – 2187.

Coutsoudis, A., Pillay, K., Kuhn, L., Spooner, E., Tsai, W.Y. and Coovadia, H.M. 2001. Method of feeding and transmission of HIV-1 from mothers to children by 15 months of age: prospective cohort study from Durban South Africa. AIDS, vol. 15, no. 3, pp. 379 – 387.

Cowan, D.T., Roberts, J.D., Fitzpatrick, J.M., While A.E. and Baldwin, J. 2004. Nutritional status of older people in long term care settings: current status and future directions. International Journal of Nursing Studies, vol. 41, no. 3, pp. 225 – 237.

D'Oliveira, A.F.P., Diniz, S.G. and Schraiber, L.B. 2002. Violence against women in health-care institutions: an emerging problem. The Lancet, vol. 359, no. 9318, pp. 1681 – 1685.

Daelmans, B., Martines, J. and Saadeh, R. 2003. Conclusions of the global consultation on complementary feeding. Food and Nutrition Bulletin, vol., 24, no. 1, pp. 126 – 127.

Dannhauser, A., Bester, C.J., Joubert, G., Badenhorst, P.N., Slabber, M., Badenhorst, A.M., Du Toit, E., Barnard, H.C., Botha, P. and Nogabe, L. 2000. Nutritional status of preschool children in informal settlement areas near Bloemfontein, South Africa. Public Health Nutrition, vol. 3, no. 3, pp. 303 – 312.

Darnton-Hill, I. 1997. Developing industrial-governmental-academic partnerships to address micronutrient malnutrition. Nutrition Reviews, no. 55, pp. 76 – 81.

De Klerk, M. Drimie, S., Aliber, M., Mini, S., Mokoena, R., Randela, R., Modiselle, S. and Roberts, B. 2004. Food security in South Africa: key policy issues for the medium term. Integrated Rural and Regional Development. Human Sciences Research Council. Pretoria: University of Pretoria.

Department of Agriculture. 2002. The Integrated Food Security Strategy for South Africa. Pretoria.

Department of Education (DoE). 1999a. Annual Report 1998. Pretoria.

Department of Health (DoH). 2004. Integrated Nutrition Programme (INP). Pretoria.

Dilley, M. and Boudreau, T.E. 2001. Coming to terms with vulnerability – a critique of the food security definitions. Food Policy, vol. 26, pp. 229 – 247.

Dwyer, J.T 1998. Dietary Assessment. In: Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. Modern Nutrition in Health and Disease. 9th Edition. Philadelphia: Lea and Febiger, p. 943.

Dwyer, J.T. 1994. Dietary assessment. In: Shils, M.E.; Olson, J.A.; and Shike, M. Modern Nutrition in Health and Disease. 8th Edition. Philadelphia: Lea and Febiger, p. 844.

Eastland, R. 2005. Epilepsy in South Africa. Acta Neurologica Scandinavica Supplement, vol. 181, pp. 8 – 11.

Faber, M., Jogessar, V.B. and Benade, A.J. 2001. Nutritional status and dietary intakes of children aged 2 – 5 years and their caregivers in a rural South African community. International Journal of Food Science Nutrition, vol. 52, no. 5, pp. 401 – 411.

Faber, M. and Kruger, H.S. 2005. Dietary intake, perceptions regarding body weight, and attitudes toward weight control of normal weight, overweight, and obese Black females in a rural village in South Africa. Ethnicity and Disease, vol. 15, no. 2, pp. 238 – 245.

Felblinger, D.M. 2003. Malnutrition, infection, and sepsis in acute and chronic illness. Critical Care Nursing Clinics of North America, vol. 15, no. 1, pp. 71 - 78.

Filteau, S.M. 2000. Role of breastfeeding in managing malnutrition and infectious disease. Proceedings of the Nutrition Society, vol. 59, no. 4, pp. 565 - 572.

Gershwin, M.E.; Borchers, A.T. and Keen, C.L. 2000. Phenotypic and functional considerations in the evaluation of immunity in nutritionally comprised hosts. Journal of Infection Diseases, vol. 182, Suppl. 1, pp. S108 - S114.

Golden, M.H., Samuels, M.P. and Southall, D.P. 2003. How to distinguish between neglect and deprivational abuse. Archives of Disease in Childhood, vol. 88, no. 2, pp. 105 – 107.

Grant, A.D., Djomand, G., De Cock, K.M. 1997. Natural history and spectrum of disease in adults with HIV/AIDS in Africa. AIDS, vol. 11, Suppl B, pp. S43 – S54
In: Corbett, E. L., Steketee, R.W., O ter Kuile, F., Latif, A., Kamali, A. and Hayes. R.J. 2002. HIV-1/AIDS and the control of other infectious diseases in Africa. The Lancet, vol. 359, no. 9324, pp. 2177 – 2187.

Haddad, L. and Martorell, R. 2002. Feeding the world in the coming decades requires improvements in investments, technology and institutions. Journal of Nutrition, vol. 132, no. 11, pp. S3435 - S3436.

Halsted, C.H. 1999. The relevance of clinical nutrition education and role models to the practice of medicine. European Journal of Clinical Nutrition, vol. 53, no. 2, pp. S29 – S34.

Hattingh, Z. 2002. The Relationship between Anthropometry, Dietary Intake and Type 2 Diabetes Mellitus in Women (25-44 years) in Mangaung. MSc thesis. Bloemfontein, University of the Free State, pp. 1 – 224.

Hazelton, D. 2002. Overcoming constraints to the implementation of water demand management in Southern Africa. Water Demand Management Programme. Johannesburg: SARPN.

Hendricks, M.K., Roux, M.L., Fernandes, M. and Irlam, J. 2003. Evaluation of a nutrition supplementation programme in the Northern Cape Province in South Africa. Public Health Nutrition, vol. 6, no. 5, pp. 431 – 437.

Keenan, D.P., Olson, C., Hersley, J.C. and Parmers, S.M. 2001. Measures of food insecurity/security. Journal of Nutrition Education, vol. 33, no. 1, pp. S49 – S57.

Kent, G. 1999. HIV and Breastfeeding. <http://www.virusmyth.net/aids/data/> [Accessed November, 2nd, 2005].

Kesa, H. and Oldewage-Theron, W. 2005. Anthropometric indications and nutritional intake of women in the Vaal Triangle, South Africa. Public Health, vol. 119, no. 4, pp. 294 – 300.

Keush, G.T. 2003. The history of nutrition: malnutrition, infection and immunity. Journal of Nutrition, vol. 133, no. 1, pp. S336 – S340.

Khush, G.S. 2001. Challenges for meeting the global food and nutrient needs in the new millennium. Proceedings of the Nutrition Society, vol. 60, no. 1, pp. 15 - 26.

Kibel, M.A. and Wagstaff, L.A. 1995. Child Health for all: A Manual for Southern Africa, 2nd Edition. Oxford University Press: Cape Town.

King, J.C. 2003. The risk of maternal nutritional depletion and poor outcomes increases in early or closely spaced pregnancies. Journal of Nutrition, vol. 133, no. 5, suppl. 2, pp. S1732 - S1736.

King, S.F. and Burgess, A. 1998. Nutrition for developing countries. 2nd Edition. New York: Raven Press.

Kruger, H.S., Venter, C.S. and Vorster, H.H. 2001. Obesity in African women in the North West Province, South Africa is associated with an increased risk of non-communicable diseases: the THUSA study. Transition and Health during Urbanisation of South Africans. British Journal of Nutrition, vol. 86, no. 6, pp. 733 – 740.

Kurz, K. and Johnson-Welsh, C. 2001. Enhancing women's contributions to improving family food consumption and nutrition. Food and Nutrition Bulletin, vol. 22, nr. 4, pp. 443 – 453.

Labadarios, D. 1999. National Food Consumption Study (NFCS): Children aged 1-9 years, South Africa, 1999. South Africa. Public Health Nutrition, 2005, vol. 8, no. 5, pp. 533 – 543.

Laquatra, I. 2004. Nutrition for Weight Management. In: Mahan, L.K. and Escott-Stump, S. (ed.). Krause's Food, Nutrition and Diet Therapy. 10th Edition. Philadelphia: W.B Saunders Company, p. 1186.

Larkin, F.A., Metzner, H.L., Thompson, F.E., Flegal, K.M. and Guire, K.E. 1989. Comparison of estimated nutrient intakes by food frequency and dietary records in adults. Journal of the American Dietetic Association, vol. 89, no. 2, pp. 215 – 223.

Lee, R.D. and Nieman, D.C. 2003. Nutritional Assessment. 3rd Edition. McGraw Hill Company: New York.

Macallan, D.C. 1999. Malnutrition in tuberculosis. Diagnostic Microbiology and Infectious Disease, vol. 34, no. 2, pp. 153 – 157.

Maharaj, P. and Cleland, J. 2005. Women on top: the relative influence of wives and husbands on contraceptive use in Kwazulu-Natal. Women Health, vol. 41, no. 2, pp. 31 – 41.

Makonnen, B., Venter, A. and Joubert, G. 2003. A randomized controlled study of the impact of dietary zinc supplementation in the management of children with protein-energy malnutrition in Lesotho. Journal of Tropical Pediatrics, vol. 49, no. 6, pp. 340 – 352.

McCullum, C. 2004. Using Sustainable Agriculture to improve Human Nutrition and Health. Journal of Community Nutrition, vol. 6, nr. 1, pp. 18 – 25.

Meth, C. and Dias, R. 2004. Increases in Poverty in South Africa, 1999 – 2002. Development Southern Africa, vol. 21, no. 1, pp. 1 – 82.

Monsen, E.R. 1992. Research: Successful Approaches. The American Dietetic Association: Second Edition. Mexico.

Monyeki, K.D., Kemper, H.C. and Makgae, P.J. 2005. The association of fat patterning with blood pressure in rural South Africa children: the Ellisras longitudinal growth and health study. International Journal of Epidemiology.

Morris, S.S.; Flores, R. and Zuniga, M. 2000. Geographic targeting of nutrition programmes can substantially affect the severity of stunting in Honduras. Journal of Nutrition, vol. 130, no. 10, pp. 2514 - 2519.

Morrow, A.L., Guerrero, M.L., Shults, J., Calva, J., Lutter, C., Bravo, J., Ruiz-Palacios, G., Morrow, R.C. and Butterfoss, F.D. 1999. Efficacy of home-based peer counseling to promote exclusive breastfeeding: a randomised controlled trail. The Lancet, vol. 353, no 9160, pp. 1226 – 1231.

Morse, E., Rivers, J. and Heughan, A. 1998. The Family Guide to Food and Health. London: Barrie and Jenkins.

Nantel, G. and Tontisirin, K. 2002. Policy and sustainability issues. Journal of Nutrition, vol. 132, no. 4, pp. S839 – S844.

National Programme of Action (NPA) for Children in South Africa. 2001. Children in 2001: A Report on the state of the nation's children.

Ndlovu, N. 2005. An exploratory analysis of HIV and AIDS donor funding in South Africa. IDASA, Budget Brief No 155, pp. 1 – 16.

Norgan, N.G. 2000. Long-term physiological and economic consequences of growth retardation in children and adolescents. Proceedings of the Nutrition Society, vol. 59, no. 2, pp. 245 - 256.

Nube, M., Asenso-Okyere, W.K. and Van Den Boom, G.J. 1998. Body mass index as indicator of standard of living in developing countries. European Journal of Clinical Nutrition, vol. 52, no. 2, pp.136 – 144

Nyman, R. 1999. The tender years in a harsh society. Rights Now, vol. 1, nr. 6, pp. 4-5.

O'Donnell, M. 2004. Food Security, Livelihoods and HIV/AIDS: A Guide to the Linkages, Measurements and Programming Implications. London: Save the Children.

Oldewage-Theron, W.H., Dicks, E.G., Napier, C.E. and Rutengwe, R. 2005. A community-based integrated nutrition research programme to alleviate poverty: baseline survey. Public Health, vol. 119, no. 4, pp. 312 – 320.

Onyango, A.W., Esrey, S.A. and Kramer, M.S. 1999. Continued breastfeeding and child growth in the second year of life: a prospective cohort study in western Kenya. The Lancet, vol. 354, no. 9177, pp. 2041 – 2045.

Padarath, A. 2004. Press Release. South African Health Review 2003/04 and National Primary Health Care Facilities Survey. Health System Trust (HST), 2004/08/10.

Parry, C.D., Pluddemann, A., Steyn, K., Bradshaw, D., Norman, R. and Laubscher, R. 2005. Alcohol use in South Africa: findings from the first demographic and health survey (1998). Journal of Studies on Alcohol, vol. 66, nr. 1, pp. 91 – 97.

Pelletier, D.L. and Frongillo, E.A. 2002. Changes in child survival are strongly associated with changes in malnutrition in developing countries. The Journal of Nutrition, vol. 133, no. 1, pp. 107 - 119.

Peltzer, K. and Promptussananon, S. 2004. Knowledge, barriers and benefits of fruit and vegetable consumption and lay conceptions of nutrition among rural and semi-urban Black South Africans. Psychological Reports, vol. 94, 3 Pt 1, pp. 976 – 982.

Peltzer, K., Seoka, P. and Mashego, T.A. 2004. Prevalence of alcohol use in a rural South African community. Psychological Reports, vol. 95, no. 2, pp. 705 – 706.

Picciano, M.F. 2001. Nutrient composition of human milk. The Evidence for Breastfeeding, vol. 48, no. 1, p. 53.

Penny, M.E., Creed-Kanashiro, H.H., Robert, R.C., Narro, M.R., Caulfield, L.E. and Black, R.E. 2002. Effectiveness of an educational intervention delivered through the health services to improve nutrition in young children: a cluster-randomised controlled trial. The Lancet, vol., 365, no. 9474, pp. 1863 – 1872.

Popkin, B.M. 1994. The nutrition transition in low-income countries: an emerging crisis. Nutrition Reviews, vol. 52, no. 9, pp. 285 – 298.

Power, M. 2004. More South African adults now die from obesity than from poverty. Health System Trust (HST), 2004/10/08.

Prentice, A.M. and Paul, A.A. 2000. Fat and energy needs of children in developing countries. American Journal of Clinical Nutrition, vol. 72, no. 5, pp. S1253 – S1265.

Puoane, T, Steyn K. and Bradshaw, D. 2001. Obesity in South Africa: The South African demographic and health survey. Obesity Research, vol. 10, pp. 1038 – 1048.

Puone, T., Sanders, D., Chopra, M., Ashworth, A., Strasser, S., McCoy, D., Zulu, B., Matinise, N. and Mdingazwe, N. 2001. Evaluating the clinical management of severely malnourished children – a study of two rural district hospitals. South African Medical Journal, vol. 91, no. 2, pp. 137 – 141.

Ramachandran, P. 2002. Maternal nutrition - effect on fetal growth and outcome of pregnancy. Nutrition Reviews, vol. 60, no. 5 Pt 2, pp. S26 - S34.

Ramakrishnan, U. 2002. Prevalence of micronutrient malnutrition worldwide. Nutrition Reviews, vol. 60, no. 5 Pt 2, pp. S46 - S52.

Regmi, A. 2001. Changing structure of global food consumption and trade. Market and trade economics division. Economic Research Service: Agriculture and Trade Report. Washington, DC: United States Department of Agriculture.

Rivera, J.A., Barquara, S., Gonzalez-Cossio, T, Olaiz, G. and Sepulveda, J. 2004. Nutrition transition in Mexico and in other Latin America countries. Nutrition Reviews, vol. 62, nr 7 Pt 2, pp. S149 – S157.

Roberts, G. 2004. Obesity out of Control, Conference says. Health System Trust (HST), 2004/11/04.

Roberts, J., Engelbrecht, M., Karasaridis, A., Naicker, S., Steyn F., Vermaak, K., and Zauyamakando, T. 2004. National Primary Health Care Facilities Survey – Provincial. Health System Trust (HST), 2004/08/10.

Robinson, S. 2003. Detailed Review of five National PRSP's in the Southern Africa Region. Save the Children: Sweden.

Romieu, I., Hernandez-Avila, M., Rivera, J.A., Ruel, M.T. and Para, S. 1997. Dietary studies in countries experiencing a health transition: Mexico and Central America. American Journal of Clinical Nutrition, vol. 65, no. 4, Suppl: 1159S – 1165S.

Rosegrant, M.W. and Meijer, S. 2002. Appropriate food policies and investments could reduce child malnutrition by 43% in 2020. Journal of Nutrition, vol. 132, no. 11, pp. S3437 - S3437.

Rukundi, M. 2002. Africa: addressing growing threats to food security. The Journal of Nutrition, vol. 132, no. 11, pp. S3443 - S3448.

Sala, A., Pencharz, P. and Barr, R.D. 2004. Children, cancer and nutrition – a dynamic triangle in review. Cancer, vol. 100, no. 4, pp. 677 – 687.

Salomon, J.; De, T.P. and Melchior, J.C. 2002. Nutrition and HIV infection. The British Journal of Nutrition, vol. 87, Suppl. 1, S111 - S119.

Sawaya, A.L., Martins, P.A., Grillo, L.P. and Florancio, T.T. 2004. Long-term effects of early malnutrition on body weight regulation. Nutrition Reviews, vol. 62, no. 7 Pt 2, pp. S127 – S133.

Sawaya, A.L.; Martins, P.; Hoffman, D. and Roberts, S.B. 2003. The link between childhood undernutrition and risk of chronic diseases in adulthood: a case study of Brazil. Nutrition Reviews, vol. 61, no. 5 Pt 1, pp. 168 - 175.

Schwabe, C. 2004. Poverty in South Africa. Human Research Council.

Shashikala, S., Kandiah, M., Zalilah, G.L. 2005. Nutritional status of 1 to 3-year old children and maternal care behaviours in the Orang Asli of Malaysia. South African Journal of Clinical Nutrition, vol. 18, nr. 2, pp. 173 – 180).

Skoufias, E. 1998. Determinants of child health during the economic transition in Romania. World Development, vol. 26, pp. 2045 – 2056.

South African Regional Poverty Network (SARPN). 2003. Strategy for combating Poverty: Social Reinsertion, Rehabilitation and Reconstruction and Economics

Stabilisation. <http://www.sarpn.org.za/documents/> [Accessed October, 31st, 2005].

South African Regional Poverty Network (SARPN). 2005. Civil society experiences of monitoring food security issues in Southern Africa. <http://www.sarpn.org.za/documents/> [Accessed November, 3rd, 2005].

South African Vitamin A Consultative Group (SAVACG). 1996. Anthropometric, vitamin A, iron and immunisation coverage status in children aged 6 – 71 months in South Africa, 1994. South African Medical Journal, nr. 84, no. 4, pp. 354 – 357.

Standing Committee on Nutrition. 2004. 5th Report on the World Nutrition Situation. Geneva: Standing Committee on Nutrition.

Statistics South Africa. 1999. The People of South Africa Population Census. 1996. Pretoria: Unknown.

Statistics South Africa. 1999b. Labour force survey. February 2002. Pretoria (Statistical release P0210).

Statistics South Africa. 2004. Perceived health and other health indicators in South Africa. Pretoria.

Statistics South Africa. Census 2001. Pretoria.

Steyn, N.P., Myburgh, N.G. and Nel, J.H. 2003. Evidence to support a food-based dietary guideline on sugar consumption in South Africa. Bulletin of the World Health Organisation, vol. 81, no. 8, pp. 599 – 608.

Swartz, L. 2002. Expert Group Meeting on Completing the Fertility Transition. Department of Social Development: Pretoria, pp. 1 – 17.

Tarasuk, V. 2001. Health Education and Behaviour the official Publication of the Society for Public Health Education: A critical examination of community-based responses to household food security in Canada, vol. 28, no. 4, pp. 487 – 499.

Taylor, S. 2001. Teaching kids early in investigating in future. <http://www.tve.org.ho.doc/> [Accessed: November, 1st, 2005].

Terreblance, S.J. 2002. A History of Inequality in South Africa, 1652 – 2002. Pietermaritzburg, South Africa: University of Natal Press.

Tinanoff, N. and Palmer, C.A. 2000. Dietary determinant of dental caries and dietary recommendations for preschool children. Journal of Public Health Dentistry, vol. 60, no. 3, pp. 197 – 206.

Tinker, A. 2000. Women's Health: The unfinished agenda. International Journal of Gynaecology and Obstetrics, vol. 70, no. 1, pp. 149 - 158.

Tomkins, A and Watson, F. 1989. Malnutrition and Infection, Administrative Committee on Coordination/Subcommittee on Nutrition ACC/SCN State of the Art Science Nutrition Policy Discussion, Paper No 5. ACC/SCN, Geneva.

Tomkins, A. 2000. Malnutrition, morbidity and mortality in children and their mothers. Proceedings of the Nutrition Society, vol. 59, no. 1, pp. 135 - 146.

Tontisirin, K.; Nantel, G. and Bhattacharjee, L. 2002. Food-based strategies to meet the challenges of micronutrient malnutrition in the developing world. Proceedings of the Nutrition Society, vol. 61, no. 2, pp. 242 -250.

Tucker, K.L. and Buranapin, S. 2001. Nutrition and aging in developing countries. Journal of Nutrition, vol. 131, no. 9, pp. S2417 - S2423.

United Nations Children's Education Fund (UNICEF). 1992. Strategy for Improved Nutrition of Children and Women in Developing Countries. A UNICEF Policy Review. New York, USA.

United Nations Children's Education Fund (UNICEF). 1998. The State of the World's Children. A UNICEF report – Malnutrition: Causes, Consequences, and Solutions. Nutrition Reviews, vol. 56, pp. 115 – 123.

United Nations Children's Education Fund (UNICEF). 1999. Nutrition Essentials: A Guide for Health Managers (BASICS).

United Nations Children's Education Fund (UNICEF). 2001. The State of the World's Children. A UNICEF Policy Review. New York, USA.

United Nations Children's Education Fund (UNICEF). 2004a. A UNICEF Policy Review. New York, USA.

United Nations Children's Education Fund (UNICEF). 2004b. Strategy for Improved Nutrition of Children and Women in Developing Countries. A UNICEF Policy Review. New York, USA.

United Nations Development Programme (UNDP). 2003. South Africa Human Development Report 2003. First edition. Oxford University Press: Cape Town.

United States Agency for International Development (USAID). 2003. Analysis of Food Security, Health and Nutrition in Zambia. Joint USAID: Zambia.

Van Heerden, I.V. and Parry, C.D.H. 2001. If you drink alcohol, drink sensibly. South African Journal of Clinical Nutrition, vol. 14, no. 3: Suppl: S71 – 77.

Van Lettow, M.; Fawzi, W.W. and Semba, R.D. 2003. Triple trouble: The role of malnutrition in Tuberculosis and Human Immunodeficiency virus co-infection. Nutrition Reviews, vol. 61, no. 3, pp. 81 - 90.

Vorster, H.H. junior, 2000. The effect of urbanisation on bone turnover in black postmenopausal South African women. MSc thesis. Potchefstroom, PU for CHE, pp. 1 – 165.

Vorster, H.H., and Nell, T.A. 2001. Make starchy foods the basis of most meals. South African Journal of Clinical Nutrition, vol. 14, no. 3, Suppl: S17 – 24.

Vorster, H.H., Oosthuizen, W., Jerling, J.C., Veldman, F.J. and Burger, H.M. 1997. The nutritional status of South Africans. A review of the literature from 1975-1996. Durban: Health Systems Trust, vol. 1, pp. 1 – 48 and vol. 2, pp. 1 – 122.

Vorster, H.H.; Bourne, L.T.; Venter, C.S. and Oosthuizen, W. 1999. Contribution of nutrition to the health transition in developing countries: a framework for research and intervention. Nutrition Reviews, vol. 57, no. 11, pp. 341 - 349.

Walsh, C.M., Dannhauser, A. and Joubert, G. 2001. The impact of a nutrition education programme on the anthropometric nutritional status of low-income children in South Africa. Public Health Nutrition, vol. 5, no. 1, pp. 3 – 9.

Watkinson, E. and Makgetla, N. 2002. South Africa's food security crisis. National Labour and Economic Development Institute (NALEDI): South Africa.

Weise-Prinzo, Z. and De Benoist, B. 2002. Meeting the challenges of micronutrient deficiencies in emergency-affected populations. Proceedings of the Nutrition Society, vol. 61, no. 2, pp. 251 - 257.

Whitney, E.N. and Rolfes, S.R. 2002. 9th Edition. Understanding Nutrition: Wadsworth: United States of America.

World Health Organisation (WHO). 1992. World Declaration on Nutrition – Plan of Action. World Health Organisation, Division of Food and Nutrition. Geneva.

World Health Organisation (WHO). 1995. Physical Status: the use and interpretation of anthropometry: report of WHO expert Committee. Geneva.

World Health Organisation (WHO). 2002a. Health and sustainable development. Geneva: Switzerland.

World Health Organisation (WHO). 2002b. Reducing Risks, Promoting Healthy Life. Geneva: WHO. Geneva: Switzerland.

World Health Organisation (WHO). 2003. WHO Technical Consultation on Nutrient Requirements for People with HIV/AIDS. Geneva: Switzerland.

World Health Organization (WHO). 2005a. WHO framework convention on tobacco control and its relevance to the ironic disease. South African researchers report. Geneva: Switzerland.

World Health Organization (WHO). 2005b. Malnutrition Quantifying the Health Impact at National and Local Levels. Geneva: Switzerland.

Zere, E. and McIntyre, D. 2003. Inequities in under-five child malnutrition in South Africa. International Journal of Equity in Health, vol. 2, nr. 1, p. 7.

Questionnaire number (leave open)

				1-4
--	--	--	--	-----

D	D	M	M	Y	Y

5-10

		11
--	--	----

11

- | | | |
|------------------|--|----|
| 1. Built-up area | | 12 |
|------------------|--|----|

- ## 2. Informal settlement

State of the environment 13

1. Good

- ## 2. Average

- ### 3. Bad

Composition of the household

[illegible]

0 None
1-12 Grade 1 to 12
13 Tertiary
14 Still at school

1. Father
2. Mother
3. Grandmother
4. Grandfather
5. Child
6. Other

1. Male
2. Female

Caregiver (use same number as above)

N	O	Weight (kg)					Height (cm)						
					.		kg				.		cm

61-72

Children ≤ 6 years (use same number as above)

N O		Weight (kg)				Height (cm)				Breastfed (how long)						
				.		kg				.		cm			month	01-13
				.		kg				.		cm			S	
				.		kg				.		cm			month	14-26
				.		kg				.		cm			S	
				.		kg				.		cm			month	27-39
				.		kg				.		cm			S	
				.		kg				.		cm			month	40-52
				.		kg				.		cm			S	

		.	
		.	
		.	
		.	

kg

kg

kg

kg

			.	
			.	
			.	
			.	

cm

cm

cm

cm

month 53-65

S

month 66-78

S

month 01-13

S

month 14-26

S

(Use same number as above)

Who is the head of the household?**Who provides the most money?**

27-28

29-30

How many people contribute to the income?

--	--

31-32

How many rooms in the house? (without bathroom)

--	--

33-34

Main type of income

1. Pension
2. Permanent job
3. Piece job

--

35

Do you have access to water?

1. Yes
2. No

--

36

If yes, what kind of tap?

1. Inside house
2. Own tap, outside house
3. Communal tap

--

37

Do you have a vegetable garden most of the year?

1. Yes
2. No

--

38

If not, why? _____

--

39

Does anyone in the house have the following condition:

(1=Yes, 2=No)

- Hypertension
 Diabetes
 TB
 Heart disease
 Overweight / Obesity
 Epilepsy
 Diarrhea
 Peptic ulcer
 Constipation
 Loss of appetite
 Weight loss
 Other _____

40

41

42

43

44

45

46

47

48

49

50

51

Do you/ they take the baby / children to the clinic?

☐ 52

1. Yes
2. No
3. Not applicable

If yes, why?

1. When ill
2. To weigh
3. To immunise
4. For all the above reasons
5. Other _____

53

If no, why not? _____

54

Do the children in the house have a growth chart?

1. Yes, all of them
2. Yes, some of them
3. No

55

If yes, is the growth chart completed?

1. Yes, for all the children
2. Yes, for some of the children
3. No

56

If adults feel sick, do they go to the clinic?

1. Yes, always
2. Sometimes
3. No

57

If no, why not?

1. Go to doctor
2. Other _____

58

Do you/ women in the house use family planning?

1. Yes, all of them
2. Yes, some of them
2. No

59

Do you have any food aid?

1. No
2. PSNP
3. PEM
4. PSNP and PEM

60

Does anyone in the household smoke/ snuff?

1. Yes
2. No

61

Dietary intake of the household

Meal	Adults	Children (> 1 year)	Baby/ Babies NB Breastfeeding
Breakfast and mid-morning			
Lunch and mid afternoon			
Supper and late night			

Evaluation of dietary intake:

Do the following meals contain the three food groups?

(1=Yes, 2=No)

Adults

Breakfast + mid-morning

Lunch + mid afternoon

Supper + late night

<input type="text"/>	62
<input type="text"/>	63
<input type="text"/>	64

Children

No children in house

Breakfast + mid-morning

Lunch + mid afternoon

Supper + late night

<input type="text"/>	65
<input type="text"/>	66
<input type="text"/>	67
<input type="text"/>	68

Is the dietary intake of the babies adequate?

1. No babies in the house

2. Yes

3. No

<input type="text"/>	69
----------------------	----

How often are the following items consumed by the family in general?

number of times per day, per week or per month (only use one option)

Food	/day		/week		/month		
Sweets/ chocolates	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	70-75
Chips (crisp)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	01-06
Cake/ biscuits	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	07-12
Cooldrinks	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	13-18
Cremora	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	19-24
Coffee	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	25-30
Tea	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	31-36
Sugar	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	37-42
Full-cream milk	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	43-48
Low fat/ skim milk	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	49-54
Eggs	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	55-60
Peanut butter	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	61-66
Soya mince/ legumes	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	67-72
Chicken/ meat/ fish	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	73-78
Bread	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	01-06
Porridge	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	07-12
Samp/ mielie rice	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	13-18
Margarine/ oil/ fat	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	19-24
Fruit	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	25-30
Vegetables	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	31-36
Salt/ stock/ Royco	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	37-42
Alcohol _____	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	43-48
Water	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	49-54

Is food always available in the household family?

(1=Yes, 2=No)

1. Yes or 2. No

55

Remarks: _____

Appendix B: Informed Consent Form

CONSENT FORM CAUSES OF MALNUTRITION IN MANGAUNG, 2004

Ethics committee reference number:

Declaration by or on behalf of the participant:

Respondent number

I, the undersigned,

iii

[ID.....]

.....(Address)

A Confirm that:

1. I have been asked to participate in the above-mentioned research survey carried out by the National Research Foundation (NRF) and University of the Free State.

2. It has been explained to me that:

2.1 The purpose of the research survey is to assess nutritional status (anthropometrics and dietary intake) and household resources / information (household and parent/caregiver particulars), in an attempt to identify specific issues that play a role in the development in malnutrition. The information collected will be used to determine nutritional problems and to develop solutions for these problems.

2.2 In order to collect this information I have been told that I will be asked a number of questions regarding:

- General background information;
- The types and amounts of foods I eat and how often I eat these foods;
- Breastfeeding practices;
- Composition of the household;
- Weight and height status of the caregiver and children < 6 years;
- Socio-demographic information (head of household, room density, of income, smoking, water, vegetable garden type);
- Prevalence of disease; and
- Clinic attendance and food aid coverage (PSNP and PEM)

2.3 I have been told that this information will be collected from households in Mangaung and I will only be asked these questions once. The measurements will also be taken once only.

2.4 I have been told that it will not take more than one visit to collect the information.

3 I have been told that the measurements will not cause any harm to me in any way.

4 It was also explained to me that by participating in the research survey I would help other people in the country.

5 It was also explained to me that the information would be kept confidential but that it will be used anonymously for making known the findings to other scientists.

6. I understand that I will have no direct access to the results of the survey but I can contact the researcher who will inform me of the findings.

7. It was also clearly explained to me that I can refuse to participate in this research survey. If I refuse, it will not be held against me in any way.

8. The information in this consent form was explained to me by(name of interviewer) in(language) and I confirm that I have a good command in this language and understood the explanations. I was also given the opportunity to ask questions on things I did not understand clearly.

9. No pressure was applied on me to take part in this research survey.

B I hereby agree voluntarily to take part in this research survey.

Signed / confirmed at on 2004

.....
Signature or hand mark of
Participant

.....
Signature or hand mark of
Witness (M Pienaar:
051-4442025)

Appendix C: Foromo Ya Tumello

TSE BAKANG PHEPO MPE MANGAUNG, 2004

Boikano ka, kapa boemong ba motho ya nkang karolo:

Nna,

[ID]

..... (Address)

A Ke netefatsa hore:

1. Ke kopilwe ho nka karolo ho dipatlisiso tse boletsweng ka hodimo tse etswang ke National Research Foundation le Yunivesithi ya Foreistata.

2. Ke hlaloseditswe hore:

2.1 Sepheo sa dipatlisiso tsena ke ho hlahloba maemo a phepo ("anthropometrics" le mokgwa wa ho ja) le maemo a lehae (lehae le dintlha tsa motswadi/ mohlokomedi), e le teko ya ho lekola dintlha tse bapalang karolo ho beng teng ha phepo e mpe, tseo ho hlokehang ho sebedisana le tsona. Ditaba tse tla bokanngwang di tla sebediswa ho fumana mathata a phepo le ho fana ka tharollo bakeng sa mathata ana.

2.2 Hore ho fumanwe dintlha tsena, ke bolelletswe hore ke tla botswa dipotso mabapi le:

- Maemo a ka le bophelo ba ka;
- Mefuta le bongata ba dijo tseo ke di jang, le hore ke di ja ha kae;
- Ho nyantsha;
- Batho ba bang ka tlung;
- Boima le botelele ba motswadi le bana ba ka tlasa dilemo tse 6;
- Hlooho ya ntlo, mokgwa wa lekeno, ho tsuba, metsi, serapa sa dimela;
- Boteng ba mahloko, le;
- Ho tsamaya tlilini le thuso tsa teng (PSNP le PEM).

2.3 Ke bolelletswe hore ditaba tsena di tla nkuwa ho bomme ba fetang 500 ka palo mona Mangaung, le hore ke tla botswa dipotso tsena hanngwe feela. Ho methwa ha botelele, boima le tse ding le hona ho tla etswa hanngwe feela

2.4 Ke bolelletswe hore ho tla nka letsatsi le le leng feela ho nka ditaba tsena

3 Ke bolelletswe hape hore ho methwa ha ka ho ka ka be ha nkutlwa boholoko ka mokgwa ofe kapa ofe

4 Ke hlaloseditswe hore ka ho nka karolo dipatlisisong tsena ke tla thusa batho ba bangata naheng ya rona

5 Ke hlaloseditswe hore ditaba tse tswang ho nna di tla ba lekunutu le hore di tla sebediswa ke ditsibi ntle le ho sebedisa lebitso la ka.

6 Ke utlwisisa hore ha ke na ho ba le bohona ba ho fumana diphetho tsa dipatlisiso tsena kantle le ho ikopanya le motho ya etsang dipatlisiso hore a ntsibise.

7 Ke hlaloseditswe hantle hore ke kgona ho hana ho nka karolo dipatlisisong tsena.

8 Dintlha tse mona ke di hlaloseditswe ke(lebitso la ya botsang dipotso) ka(puo), mme nna ke hlakisa hore ke utlwisisa puo ena hantle, mme ke utlwisisitse ditlhaloso tsohle. Ke fuwe sebaka sa hore ke botse dipotso ho ntho tseo ke sa di utlwisisang.

9 Ha ho aka ha eba le kगतello hore ke nke karolo dipatlisisong tsena.

B Ke dumela ho nka karolo dipatlisisong tsena ntle le kगतello.

Signed ka 2004

.....
Signature/letshwao la motho
ya nkang karolo

.....
Signature ya paki
(Researcher: M Pienaar
051 – 4442025)

Appendix D: Councilor of Namibia

The community of Namibia

This letter serves to inform the community of a research project titled “Causes of Malnutrition in Mangaung” that will be undertaken by the University of the Free State and the National Research Foundation during 2004. The project is aimed at assessing nutritional status (anthropometric status and dietary intake) and household resources / information (household and parent / caregiver particulars), in an attempt to identify specific issues that play a role in the development in malnutrition, which should be addressed.

All people at their households during the day in Namibia will be included in the study. The researcher and community health workers will visit these households and they will be asked whether they are interested in participating in the study.

On the day that they participate, household information will be obtained from the caregiver during a personal interview at the household. A personal interview will be undertaken by means of a questionnaire. Interpreters will be used where respondents cannot understand Afrikaans or English. They will be asked a number of questions about the household (e.g. who is the head of the household) as well as what food is eaten in the household. None of the questions are difficult and anyone will be able to answer these questions. The caregiver and all children younger than six years will be weighed and measured.

The information will help to determine nutritional problems in the community and to develop solutions for these problems. The project will benefit the community since we will be able to determine what interventions are required to improve the health of the community. The project will not cause any harm to the participants in any way. By participating in the research survey you will help other people in the country. The individual information will be kept strictly confidential and the study was approved by the Ethics Committee of the Faculty of Health Sciences of the University of the Free State (UFS).

Please feel free to contact the researcher or community health workers at any time if you have any questions about the project.

MISS MICHÉLLE PIENAAR
M Sc RESEARCH STUDENT

Contact number: 082 936 8953

Appendix E: Criteria used by fieldworkers in the completion of the questionnaire

Built-up or Informal settlement: The area is classified according to Municipality policy. Most households in JB Mafora and Namibia are still considered as informal areas by the Municipality of Bloemfontein, although it is built-up houses.

State of environment: The environment is classified as good if the area does not consist any harmful waste on the premises and appears neat. The environment is considered average if there is only garden disposal visible and appears neat. The environment is categorised as bad if any harmful waste is visible.

Education level: For the analysis of this report we generally used four categories.

- No schooling includes those who have no formal schooling as well as those who have only completed grade 0 (Statistics SA, 2001).
- Primary and secondary schooling include all schooling from grade 1 up to 12.
- Higher than matric comprises those who have completed grade 12 and then obtained further qualifications (Statistics SA, 2001).
- Scholars still attending school formed part of the last category.

Socio-demographic Information:

- **Head of household:** The person who is considered head of the household by the household members.
- **Who provides the most money?** The person who provides the most money must for the household.
- **How many people contribute to the income?** The amount people who contribute to the income.
- **Room density:** The amount of rooms, excluding the bathroom, is stipulated.
- **Water:** Stated whether the household do has access to water. If so, the kind of tap (inside house, own tap, outside house or communal tap) is indicated.
- **Vegetable garden:** The existence of a vegetable garden is stipulated on the questionnaire. If there is no vegetable garden, a reason must be given why.

Health Status:

- **Prevalence of disease:** Hypertension, diabetes, TB, heart disease, overweight / obesity, epilepsy, diarrhea, peptic ulcer, constipation, loss of appetite, weight loss. Any other disease is stipulated on the questionnaire.
- **Clinic attendance:** The attendance by both children and adults. Accessibility of the clinic and conditions when household members attend.

- **Growth Monitoring: Road to Health Charts (RTHC):** The chart is also referred to as an immunisation chart or growth chart.
- **Family Planning:** The use of any form of contraception including oral contraceptives, intra-uterine devices or condoms.
- **Smoking:** The use of cigarettes, cigars or snuff.

Food Aid Coverage: Food aid coverage, e.g. the Protein Energy Malnutrition (PEM) scheme or Primary School Nutrition Programme (PSNP), determine if the household has previously been on a food aid scheme, and whether they are aware of the schemes available

Breastfeeding Practices: Exclusive breastfeeding implies only breastmilk, on demand and frequently, until the age of six months. The period the child received breastfeeding, with or without additional food, is stated.

Dietary Intake: Refers to type of daily food intake (meal patterns and meal composition) of adults, children and babies. A minimum amount of three food groups in each meal will be considered as adequate.

Food frequency: Refers to how often the mentioned food is consumed daily, weekly or monthly.