DEVELOPMENT OF NUTRITION EDUCATION MATERIAL FOR CAREGIVERS OF IMMUNE COMPROMISED CHILDREN IN CHILDREN'S HOMES IN THE DURBAN AREA

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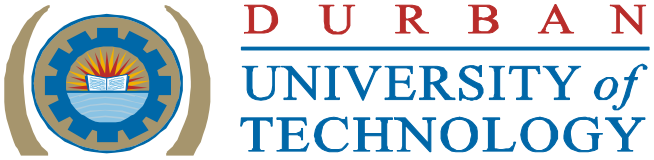

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DECLARATION

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

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And lastly, Jaco, who think that I can do just about anything…….thank you for always believing in me.

DEDICATION

For my father and my brother, Hannes, you would have been proud.

ABSTRACT

Background

Nutrition plays a fundamental role in the care and support of people living with the Human Immunodeficiency Virus (HIV) and children in particular are affected by HIV and the Acquired Immunodeficiency Syndrome (AIDS) epidemic in Africa in various ways. The epidemic puts children at risk physically, psychologically and economically. Children are indirectly affected by HIV and AIDS when the epidemic has a negative impact on their communities and the services these communities provide. Undernutrition is a major problem in HIV-positive children in South Africa with severe malnutrition as a common finding in HIV-positive children. HIV contributes to an increased incidence and severity of undernutrition and micronutrient deficiency. Low serum levels of vitamins A, E, B6, B12 and C, beta-carotene, selenium, zinc, copper and iron deficiencies are frequently documented during all stages of HIV-infection. Malnutrition in turn further weakens the immune system which increases the susceptibility to infections and the duration and the severity of infections. Thus, the immune response is less effective and less vigorous when an individual is undernourished. Although guidelines exist for the treatment and management of HIV-infected children, it is clear from the literature that exceptional measures are needed to ensure the health and well-being of the children are met. Furthermore, residential care should not only be considered as a last resort for children's care, but also as an intervention that requires more than merely addressing children's basic physical needs. Nutrition education has been utilised globally and in South Africa to address nutrition related problems. The main purpose of nutrition education is to provide individuals with adequate and accurate information, skills and motivation to buy, produce and consume the correct foods to stay healthy and lead an active life.

Aim

The purpose of this study was to develop reliable and valid nutrition education material for the child care workers (CCWs) of Immune Compromised children

resident in Children's Homes in the Durban area in order to maintain the child's immune system and to optimise their quality of life.

Methodology

The FAO framework used for planning, implementing and evaluating a nutrition education programme was followed to develop the nutrition education material in this study. Phase I included a situational analysis of the children homes involved. The residential care settings that participated in this study included three Children's Homes in Durban. The total purposive sample included: boys (5–19 years) n = 112, girls (5–19 years) n = 38 and CCWs n = 40. The sample of HIV-positive children included boys (5–19 years) n = 3 and girls (5– 19 years) n = 6. The physical measurements obtained for this study to determine nutritional status were weight and height. The anthropometric measurements were captured and analysed by the researcher using the World Health Organisation's AnthroPlus version 1.0.2. Statistical software. The following indices were included: height-for-age (stunting), weight-for-age (underweight) and BMI-for-age (overweight and wasting). The WHO growth standards for school-aged children and adolescents were used to compare the anthropometric indicators. Dietary intake measurements were done by analysing the cycle menus by means of the Food Finder® Version 3 computer software program and comparing the results with the Dietary Reference Intakes (DRIs), specifically the EAR and AI where the EAR were not available. The data were analysed to determine the adequacy of energy and nutrient intake. Average portion sizes were established by the plate waste studies method as well as observation of practices, interviews with the central buyer and focus group discussions with the CCWs. Nutrition knowledge of the CCWs was determined by a self-administered questionnaire developed and tested for reliability and validity. The problems identified in Phase I through the implementation of the questionnaires and other methods directed the design of messages in Phase II. Once suitable media was selected, nutrition education material was developed based on existing guidelines pertaining to HIV and AIDS. The material developed was then tested for reliability and validity before it was produced.

Results

The anthropometric measurements indicated that the majority of the HIV-negative boys and girls were of normal height-for-age and weight-for-age. The results also showed that possible risk of overweight and overweight were more prevalent in girls whereas underweight was more prevalent in boys. Furthermore, the results indicated that a third (33.0%) of the HIV-positive children were stunted and 16.7% was severely stunted. Findings of the menu analysis indicated that both girls and boys consumed three times more carbohydrates than the recommended intake. The DRIs for girls and boys were met for energy and protein in all the age groups except boys aged 14-18 years did not meet the DRI for energy. However, the comparison of the actual intake of the macro nutrients with the WHO guidelines indicated that the protein (10.78%) and carbohydrate (58.07%) is within the recommendations of 10-15% and 55–75% respectively. This comparison also showed that the total fat intake of 31.15% was above the recommended intake of 15-30%. None of the age groups met the DRIs for fibre. The comparison of the intake with the WHO guidelines also indicated that the total dietary fibre intake was only 19.67g/day and not 27–40g/day. The actual fruit and vegetable intake was a mere 68.64g/day instead of ≥ 400g/day as recommended. None of the groups met the DRIs for calcium and iodine. The results clearly showed that micro nutrient inadequacies were more prevalent in the dietary intake of age groups 9-13 and 14-18 years in both girls and boys. Inadequate intake of magnesium, vitamin A, vitamin C, riboflavin, niacin, vitamin B6, pantothenate, biotin, vitamin E and vitamin K were evident in the age group 14-18 year. Overall, it is evident from the results on nutrition knowledge that although the respondents' knowledge was fair on general nutrition guidelines, the results of the nutrition knowledge questionnaire indicated that knowledge on the importance of a variety in the diet is lacking. The CCWs displayed a very poor knowledge of the recommended number of fruit and vegetable portions per day as well as correct serving sizes of vegetable portions. A very poor knowledge also existed regarding the role of healthy eating in maintaining and supporting the immune system and a limited knowledge on correct hygiene practices was noted. The fridge magnets developed included five messages relating to nutrition and four messages relating to food safety and hygiene.

Conclusion

This study established that malnutrition is apparent in the children's homes and that there were many gaps in the nutrition knowledge of the CCWs. These gaps included the role of good nutrition in the support and maintenance of the immune system and the importance of adequate intake of fruit and vegetables daily. The NEM developed in this study will address these gaps.

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LIST OF ABBREVIATIONS

AMDR: Average Macronutrient Distribution Range
AI: Adequate Intake
AIDS: Acquired Immunodeficiency Syndrome
ASSA: Actuarial Society of South Africa
ASSAF: Academy of Science of South Africa
BMI: Body Mass Index
CCWs: Child Care Workers
DHF: Dihydrofolate
DNA: Deoxyribonucleic acid
DoA: Department of Agriculture
DoH: Department of Health
DoSD: Department of Public Works and the Department of Social Development ADA: The American Dietetic Association
DSC: Development-support communication
EAR: Estimated Average Requirement
FAD: Flavin adenine dinucleotide
FANTA: Food and Nutrition Technical Assistance
FAO: Food and Agricultural Organisation of the United Nations
FBDGs: Food Based Dietary Guidelines
FET: Further Education and Training
FMN: Flavin mononucleotide
HIV: Human Immunodeficiency Virus
HSRC: The Human Sciences Research Council's
IFSNP: Integrated Food Security and Nutrition Programme
ILSI: International Life Sciences Institute
INP: Integrated Nutrition Programme

LIST OF ABBREVIATIONS – continued

LSM:	Living Standard Measures
MDG:	Millennium Development Goals
MRC:	The South African Medical Research Council
MUAC:	Mid-upper arm circumference
NACCW:	National Association of Child Care Workers
NAD:	Nicotinamide adenine dinucleotide
NAPD:	Phosphate form of icotinamide adenine dinucleotide
NCHS:	National Centre for Health Statistics
NE:	Nutrition education
NEM:	Nutrition education material
NEP:	Nutrition Education Programme
NFCS:	National Food Consumption Survey
NGO:	non-governmental groups
NICUS:	The Nutrition Information Centre at the University of Stellenbosch
NSP:	National Strategic Plan for South Africa
PAR:	Participatory Action Research
PEM:	Protein–energy malnutrition Dietary Reference Intakes
PLHIV:	People living with HIV
PLP:	Pyridoxal phosphate
PMP:	Pyridoxamine phosphate
PMTCT:	Prevention of Mother to Child Transmission
RDA:	Recommended Daily Allowance
RNA:	Ribonucleic acid
SAQA:	The South African Qualifications Authority
SAVACG:	South African Vitamin A Consultative Group

LIST OF ABBREVIATIONS – continued

SD:	Standard deviation
STATSSA:	Statistics South Africa
STI:	Sexually Transmitted Infections
THF:	Tetrahydrofolate
TPP:	Thiamine pyrophosphate
UL:	Tolerable Upper Level Intake
UN:	United Nations
UNAIDS:	The United Nations Joint Programme on HIV and AIDS
UNICEF:	United Nations Children Fund
USDA:	United States Department of Agriculture
VUT:	Vaal University of Technology
WHO:	The World Health Organisation

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CHAPTER 1

PROBLEM AND SETTING

1.1 Introduction

Nutrition plays a fundamental role in the care and support of people living with the Human Immunodeficiency Virus (HIV) hence the substantial increase in the efforts by governments, donors, community groups and non-governmental groups (NGO's) to integrate food and nutrition interventions into HIV care and treatment (United Nations Children Fund (UNICEF), 2006).

Children in particular are affected by HIV and the Acquired Immunodeficiency Syndrome (AIDS) epidemic in Africa in various ways. The epidemic puts children at risk physically, psychologically and economically. The implications for these children are serious; however governments, international agencies, NGO's and the communities can have a positive impact (UNICEF, 2006).

1.2 Background to the problem

1.2.1 Prevalence of HIV and AIDS

Worldwide, the number of children younger than 15 years living with HIV increased from 1.6 million (1.4 million - 2.1 million) in 2001 to 2.0 million (1.9 million - 2.3 million) in 2007. Almost 90% live in Sub-Saharan Africa (The United Nations Joint Programme on HIV and AIDS (UNAIDS), 2008). The estimated number of children aged 0–14 years living with HIV and AIDS in South Africa in 2005 was 240 000 (UNICEF, 2006). Shung-King, Abrahams and Berry (2006) confirmed that South Africa was experiencing an "overwhelming HIV pandemic." According to Shung-King *et al.* (2006), the Actuarial Society of South Africa (ASSA) AIDS and Demographic model (ASSA, 2003) suggested that on the whole, HIV prevalence of 1.2% in 2000 has almost doubled six years later to 2.1% for children under the age of 18 years. The model also referred to the prevalence rate in the age group 0-5 year which increased from 2.2% in 2000 to 3.5% in 2006. It further showed that in the age group 6–12 years the prevalence

increased from 0.1% to 1.0%. The HIV-prevalence rate in KwaZulu-Natal was the highest amongst the provinces for children under 15 years (93 000 or 3.2%).

Dorrington, Johnson, Bradshaw and Daniel (2006) estimated the prevalence of HIV to have been 1.9% in the general child population under 14 years old in South Africa.

The Human Sciences Research Council's (HSRC) 2005 national survey estimated HIV incidence among children aged 2-14 years to be 3.3%. Among youth aged 15-24 years the prevalence of HIV is 10.3% with steadily higher infection rates among girls. The HIV prevalence among boys aged 2-4 years was 4.9% and 5.3% among girls. Among boys aged 5-9 years the frequency was 4.2% and 4.8% among girls. These high incidence rates among young children may largely be due to mother-to-child transmission of HIV (Shisana, Rehle, Simbayi, Parker, Zuma, Bhana, Connoly, Jooste and Pillay, 2005). Among children aged 10-14 years, the occurrence was lowest at 1.6% among boys and 1.8% among girls (Shisana *et al.*, 2005). In comparison the prevalence rates are higher in the 2005 HRSC survey than the ASSA 2003 model. This can be clarified by the fact that the youth are now encouraged to do voluntary testing and counselling. An estimated 4.9 million young people (aged 14–25 years) were HIV-positive in low and middle income countries in 2008. Eighty-nine thousand of these young people live in the Middle East and North Africa, 1.1 million in West and Central Africa and 2.9 million in Eastern and Southern Africa (UNICEF, 2009a). Estimates for HIV prevalence among very young children (0-2 years) due to mainly mother-to-child transmission are not available (Shisana *et al.*, 2005).

Recent studies conducted by Meintjies, Moses, Berry and Mampane (2007) in twenty eight children's homes in South Africa, showed that 16% of the children resident in the homes at the time of the study was HIV-positive.

1.2.2 The impact of HIV and AIDS on children

According to UNICEF (2006), children are indirectly affected by HIV and AIDS when the epidemic has a negative impact on their communities and the services

these communities provide. Children are directly affected when they live at a high risk of contracting HIV, they may live with chronically ill parents; they may be orphaned or they may be ill themselves.

The South African Medical Research Council's National Burden of Disease Study established that the foremost causes of death for children under five years of age for the year 2000 were due to HIV and AIDS. Forty percent of deaths in this age group were caused by HIV and AIDS, followed by low birth weight (11%), diarrheal diseases (10%) and lower respiratory infections (6%) (Bradshaw, Groenewald, Laubscher, Nannan, Nojilana, Norman, Pieterse, Schneider, Bourne, Timaeus, Dorrington and Johnson, 2003).

Research conducted by Eley, Davies, Apolles, Cowburn, Buys, Zampoli, Finlayson, King and Nuttal (2006) in the Red Cross Children's Hospital in Cape Town, South Africa, confirmed that more than 50% of HIV-positive children were stunted or underweight and at least 20% develop wasting (Eley *et al.*, 2006). Under nutrition is a major problem in HIV-positive children in South Africa with severe malnutrition as a common finding in HIV-positive children. HIV contributes to an increased incidence and severity of under-nutrition and micronutrient deficiency. Low serum levels of vitamins A, E, B6, B12 and C, beta-carotene, selenium, zinc, copper and iron deficiencies are frequently documented during all stages of HIV-infection (Hendricks, Eley and Bourne, 2007 and Steenkamp, Dannhauser, Walsh, Joubert, Veldman, Van der Walt, Cox, Hendricks and Dippenaar, 2009). Furthermore, children at greater risk of malnutrition and lack of adequate stimulation are those separated from caregivers and living in custodial care (The World Health Organisation (WHO), 2005a).

Studies by Hendricks *et al.* (2007) suggested that ensuring optimal nutritional status in HIV-infected children is very important for their survival as well as improving and maintaining their quality of life. The nutritional impact of HIV and AIDS will be discussed in Chapter 2.

1.2.3 The cycle of malnutrition and infection

As illustrated in Figure 1.1, HIV can cause or worsen malnutrition due to an inadequate dietary intake, increased nutrient and energy requirements and poor nutrient absorption (Food and Nutrition Technical Assistance (FANTA), 2008). Malnutrition in turn further weakens the immune system which increases the susceptibility to infections and the duration and the severity of infections (FANTA, 2008 and Department of Health (DoH), 2007a). Thus, the immune response is less effective and less vigorous when an individual is undernourished. Furthermore, the response of the host to an infection further compromises the nutritional status of an individual. Loss of appetite results in a decreased energy intake, but at the same time the energy expenditure of the body increases due to the activation of the immune response. This results in loss of lean body mass (wasting) (Manary and Solomons, 2004). On the other hand, clinical symptoms such as nausea, lactose intolerance, oral ulcers, fungal infections, and diarrhoea can decrease appetite and hinder the absorption of nutrients. People living with HIV (PLHIV) are immunocompromised and, therefore, are very susceptible to infections (FANTA, 2008). Hygienic food handling and access to safe food and water are very important. Prevention of food-borne diseases is very important (Egal and Valstar, 2007 and FANTA, 2008). Food-borne diseases cause secondary infections which contribute significantly to the morbidity and mortality of PLHIV. Diarrhoea is the most common manifestation of these infections and it can be a life-threatening complication as it increases weight loss and wasting (FANTA, 2008).

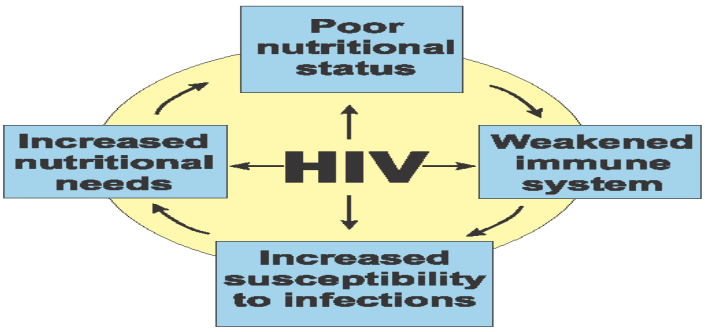


Figure 1.1: Malnutrition and HIV (Adapted from FANTA, 2008).

1.2.4 Malnutrition globally and in South Africa

A substantial increase in child mortality globally is a result of the high incidence of child undernutrition in low-income and middle-income countries (Black, Allen, Bhutta, Caulfield, De Onis, Ezzati, Mathers and Rivera, 2008).

Malnutrition made up over 6% of the direct causes of death among children in South Africa aged between 1 and 5 years (UNICEF, 2009a). Malnutrition makes a child more vulnerable to infectious diseases. The most widespread infectious diseases in South Africa affecting the growth of children and which may result in malnutrition and death are HIV and AIDS, measles, diarrhoea and acute respiratory infections (DoH, 2005). In Chapter 2 the different types of malnutrition will be discussed.

1.2.5 Children in residential care

In Sub-Saharan Africa it was estimated that in 2005, 12% of children 0-17 years old were orphans. This amounted to 48 300 000 children. In 2007, an estimated 47.5 million children in Sub-Saharan Africa had lost one or both parents to AIDS or other causes (United Nations (UN), 2009).

It is suggested that this will increase to 53 million in 2010 of which 10.3 million will be double orphans (a child who has lost both parents) (UNAIDS, 2006 and UNICEF, 2006).

Statistics South Africa (STATSSA) 2005; 2006 as cited by Meintjies, Leatt and Berry (2006) stated that the General Household Survey indicated that there are approximately 3.4 million orphans in South Africa. They verified that half of all the orphans lived in two provinces, namely KwaZulu-Natal (23% or 864 643 children) and in the Eastern Cape (25% or 796 525 children). The survey also indicated that the number of double orphans living in KwaZulu-Natal in 2005 was estimated to be 199 623. No statistical data are available indicating how many of these orphans are institutionalised. Extended families care for the vast majority of these orphans.

The Fourth Stock Taking Report on Children and AIDS, published by UNICEF in December 2009 (UNICEF, 2009a), posited that it is evident in countries greatly affected by AIDS, that the majority of children in residential care have a surviving parent or other close relatives. The report confirmed that it is usually poverty, rather than lack of family support, that increases the demand for orphanages. This suggests that more needs to be done to provide economic support to households affected by AIDS in order to prevent the factors that result in children being placed into institutional care (UNICEF, 2009a). On the other hand, Meintjies *et al.* (2007) agreed that children may also be placed in residential care due to abuse, neglect or abandonment.

According to the principles of the United Nations (UN) Convention on the Rights of the Child, residential care should be a temporary "last resort" for children. Care for children in a home or community is ideal. This is supported by the international and national child welfare sector (UNICEF, 2009a).

However, there is a concern that a large number of orphanages are being established across the Sub-Saharan Africa region in response to the escalating AIDS epidemic (Meintjies, *et al.*, 2007).

Consequently, the Children's Act of 2007 (Republic of South Africa, 2007), noted that facilities concerned with children "in need of care" be referred to as Child and Youth Care Centres. The legislation also emphasised that these residential facilities should provide therapeutic programmes appropriate to the children's developmental and other needs. The legislation, therefore, clearly indicates that residential care should not only be considered as a last resort for children's care, but also as an intervention that requires more than merely addressing children's basic physical needs.

The majority of these centres in South Africa are run by welfare organisations; only a handful country-wide are managed entirely by the government (Meintjies *et al.*, 2007).

1.2.6 Child Care Workers caring for children in residential care

It is noted by Scott (2010 personal communication 23 June) that the Child Care Workers (CCWs) employed by organisations are encouraged to register with the National Association of Child Care Workers (NACCW) but it is not compulsory. This association allows for interaction with a network of colleagues and access to continuous professional development opportunities. The association also offers non-accredited training to child and youth care workers on certain areas of practice. The South African Qualifications Authority (SAQA) accredited training is also provided and this is linked to 14 modules of the Further Education and Training (FET) certificate in Child and Youth Care work. One module in this accredited course offers basic nutrition information.

1.3 Strategies in place to address the impact of HIV AND AIDS

The DoH has developed guidelines which include information on promoting health of HIV-positive children (DoH, 2005). The Integrated Nutrition Programme (INP) also focuses on nutrition intervention for children with HIV (termed disease specific, treatment, support and counselling) (DoH, Directorate Nutrition 2002). Since 2003, the rate of annual AIDS deaths among children has begun to decrease, due to improvement in treatment and Prevention of Mother to Child Transmission (PMTCT)

(UNAIDS, 2008). In 2006, 90% of government health facilities for pregnant women provided PMTCT services and approximately half of the HIV-positive pregnant women in the public health service were taking Nevirapine to prevent mother-to-child transmission. In July 2008 dual therapy with Nevirapine and azidothymidine (AZT) was introduced for the Prevention of Mother to Child Transmission of HIV (UNICEF, 2009b).

The main objectives of the HIV and AIDS and Sexually Transmitted Infections (STI) Strategic Plan for South Africa (NSP 2007-2011) (DoH, 2007b) are to:

- Half the number of HIV infections, and
- Decrease the impact of HIV and AIDS on individuals, families and communities by increasing access to a suitable regime of treatment, care and support to 80% of all people diagnosed with HIV.

According to the NSP, the focus of the interventions should be young people in the age group 15-24 years. Four key priority areas describe the interventions that may be implemented to achieve these goals. These areas include: prevention; treatment, care and support; as well as monitoring, research and supervision and at the same time addressing the issue of human rights and access to justice.

One of the goals identified in the NSP is to allow PLHIV to lead healthy and productive lives through focusing on the key priority area of treatment, care and support (area 2). Some of the interventions stated to achieve this goal are to:

- Re-evaluate and update clinical and programmatic guidelines for the management of HIV and AIDS.
- Improve the competence of health workers and managers to provide complete care, treatment and support.
- Reinforce support, counselling and supervision of health care providers.

The NSP also identifies the importance of addressing the special needs of pregnant women and children. Interventions stipulated in key priority area 2 are reviewing clinical guidelines for the management of infants, children and adolescents with HIV and AIDS, to refer children with development delays for appropriate management and

to implement biannual developmental screening for all children <5 years.

Developing and promoting research on behaviour change is a goal stated in key priority area 3 (monitoring, research and supervising) of the NSP. This can be achieved through supporting research on nutritional interventions and the development of best practice models for community care and support.

1.4 Motivation for the study

The Millennium Development Goals, stemming from the Millennium Declaration (accepted in 2000) and reaffirmed at the World Summit in 2005, relate directly to children and their futures (UNICEF, 2006).

Although the global child mortality rate fell below 9 million in 2007, the world is not yet on track to achieve the Millennium Development Goal target of a two-thirds reduction in the mortality rate by 2015. In 1990, the global under-five mortality rate was 93 deaths per 1 000 live births and in 2007, it was 67. Child mortality rates remain the highest in Sub-Saharan Africa (145 deaths per 1000 live births) (UN, 2009).

According to the South Africa Demographic and Health Survey 2003 (DoH, 2004) estimates, the infant mortality rate reduced in recent years to 43 per 1 000 live births and the under 5 mortality is 58 per 1 000 live births between 2001 and 2005. More needs to be done to enhance access to treatment and means of prevention, to address the overwhelming impact of pneumonia, diarrhoea, malaria, severe acute malnutrition and HIV (UNICEF, 2007). Interventions such as the distribution of insecticide-treated bed nets to decrease malaria infections and continued immunisation against measles could result in major advancement for the children of this region (UN, 2009). Timely diagnosis, suitable antiretroviral treatment and implementation of the Prevention of Mother to Child Transmission programme need to be urgently improved so as to undo the HIV and AIDS epidemic trend (UNICEF, 2009a).

The WHO initiated a collaborative effort to develop approaches based on the latest available scientific evidence addressing the needs of HIV-positive individuals (and in particular children). At the WHO Consultation on Nutrition and HIV and AIDS meeting held in Durban, South Africa in 2005, the representatives called for the integration of nutrition into a comprehensive response to HIV and AIDS. It was recognized that satisfactory nutrition cannot cure HIV and AIDS, but it is crucial to maintain a person's immune system, to maintain healthy levels of physical activity and to optimise the quality of life (WHO, 2005a).

Despite the high percentage of HIV-positive children resident in homes in South Africa, knowledge about HIV and AIDS in the residential care settings was irregular and far from wide-ranging (Meintjies *et al.*, 2007). In addition, Children Homes' practices regarding HIV showed a tendency to be irregular and it only addressed partial components of the necessary range of HIV interventions (UNICEF, 2009a). According to Meintjies *et al.* (2007), the areas that need attention are those relating to staff and caregiver HIV literacy, including awareness of the prevention of mother to child transmission, post-exposure prophylaxis, HIV testing and disclosure, antiretroviral therapy; and associations between HIV health services and homes.

Although AIDS and orphanhood result in many challenges facing children, many other factors such as the education level of their caregiver and the prosperity of the household have a strong impact on the child's well-being (UN, 2009).

Child nutrition, particularly for vulnerable populations, must be given higher priority in national development. Unsatisfactory progress on child nutrition from 1990 to 2007 is inadequate to meet the 2015 target, and will further deteriorate due to the current global economic turmoil resulting in higher food prices (UN, 2009). Improving nutrition requires an integrated approach to health, care and food security. Nutrition education and the transfer of relevant knowledge and skills, using appropriate communication strategies, to individuals involved in caring for these individuals will greatly enhance their chances of survival (Egal and Valstar, 2007). This is confirmed by the DoH which stated that to achieve excellent health and an

most favourable 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, 2000 and DoH, 2002).

However, before planning a successful nutrition intervention programme to address nutrition problems, it is critical to assess the existing nutrition problems (Matji, 2008). Although guidelines exist for the treatment and management of HIV-infected children (DoH and INP), it is clear from the literature that exceptional measures are needed to ensure that the health and well-being of the children are met. The development of nutrition education material for caregivers based on the research to be conducted will ensure that specific problems are addressed and that the overall nutrition knowledge of the children is improved.

The objective of this study was to develop reliable and valid nutrition education material for the child care workers of immune compromised children resident in Child Welfare Durban and District Children's Homes in the Durban area in order to maintain the child's immune system, to sustain healthy levels of physical activity and to optimise their quality of life.

1.5 The Conceptual Framework of the Study

The conceptual framework as depicted in Figure 1.2 was followed to conduct the study.

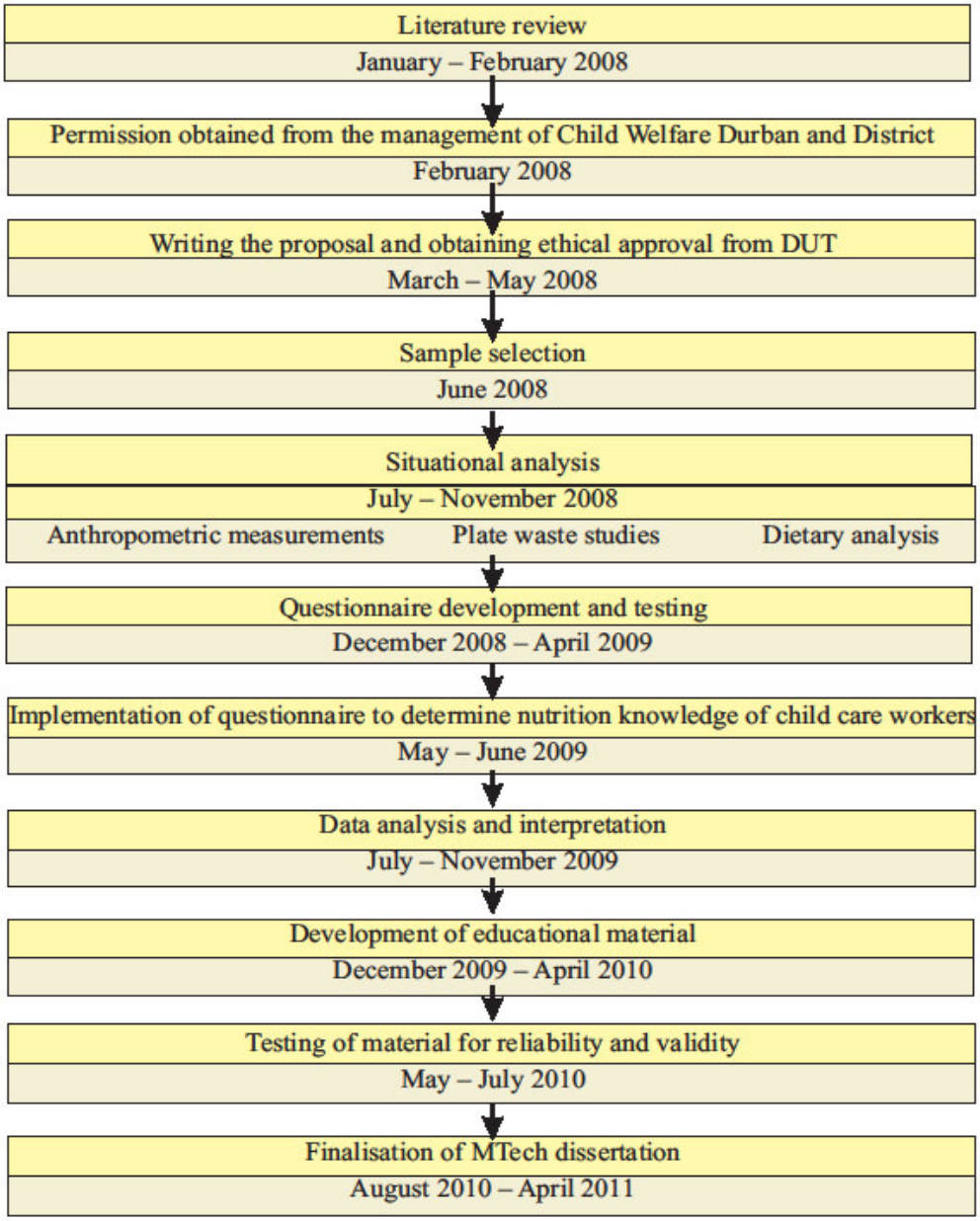


Figure 1.2: Conceptual Framework for the study

1.6 Outline of the dissertation

In Chapter 1, the background to the problem was discussed. The strategies currently in place in South Africa to address the problem were identified and the motivation for the study was linked to existing strategies. In Chapters 2 and 3, a literature review is conducted to explore the theoretical background to the problem posed in Chapter 1. The literature review will cover the nutritional impact of HIV and AIDS on children as well as the role of nutrition education in interventions. Chapter 4 deals with the design of the research project and the methods that were used to collect data. In Chapter 5 the results are stated and discussed. Conclusions and recommendations are included in Chapter 6.

CHAPTER 2

LITERATURE REVIEW: A GENERAL OVERVIEW

2.1 Introduction

The developing world is faced with the challenge of the double burden of disease: non-communicable disease and at the same time with infectious diseases, childhood stunting and under-nutrition (Margetts, 2004). This chapter reports on the literature addressing these issues and investigates concepts that will be applied in this study.

2.2 Definition of malnutrition

Sizer and Whitney (2006) state that malnutrition can be classified as overnutrition or undernutrition and includes various forms of nutrient or energy deficiencies or excesses.

2.2.1 Overnutrition

With urbanisation physical activity levels noticeably decrease and there is an associated increase in the energy density of the diet. These changes are characteristically accompanied by increased occurrence of obesity, impaired glucose tolerance, hypertension and other cardiovascular risk factors. In the past, chronic diseases of life-style were viewed as an adult problem and an emphasis on the problem of under-nutrition, especially in developing countries, may well have resulted in overweight not being investigated in children (Margetts, 2004).

Overnutrition can result in overweight (Body Mass Index (BMI) >25-29.9 kg/m²) or obesity (BMI >30 kg/m²) which is the outcome of eating too much, too much of the wrong foods and also not getting enough exercise (Kuzwayo, 2008). The WHO (2006) defines overweight and obesity as abnormal or too much fat accumulated in the body that may be harmful to the health of an individual. The WHO projects that by 2015, around 2.3 billion adults will be overweight and 700 million will be obese worldwide. Globally, twenty million children under the age of 5 years were overweight in 2005 and the number is estimated to increase to over 42 million in

2010 of which 35 million are living in developing countries (WHO, 2006) and (WHO, 2010).

The National Food Consumption Survey (NFCS) of 1999 indicated that 6% of the children aged 1-9 year were overweight in South Africa (Labadarios, 2000). This increased to 10% in the 2005 survey. Four percent of the children were found to be obese in 2005 (Labadarios, Swart, Maunder, Kruger, Gericke, Kuzwayo, Ntsie, Steyn, Schloss, Dhansay, Jooste, Dannhauser, Nel, Molefe and Kotze, 2008).

Overweight and obesity contributes to the development of diseases such as diabetes, atherosclerotic heart disease, osteoarthritis, hypertension, and the metabolic syndrome (Hammond, 2008) and (WHO, 2006).

Childhood obesity is linked to an increased mortality and disability in adulthood (WHO, 2006). According to the WHO (2010) overweight and obese children are more prone to develop diabetes and cardiovascular diseases at a younger age as they are likely to remain obese into adulthood. Inadequate pre-natal, infant and young child nutrition which is then followed by the intake of high-fat, high energy, micronutrient-poor foods as the child grows older, coupled with a lack in physical activity causes the double burden of disease. This is evident in many low and middle-income countries. These countries have to deal with the issues of infectious disease and undernutrition, and at the same time address the fast increase in chronic diseases (WHO, 2006).

2.2.2 Undernutrition

Undernutrition has multiple causes, involving food availability and access, health and caring practices. According to Manary and Solomons (2004), undernutrition occurs when the recommended nutrient intake levels for one or more nutrients are not being met or when nutrient loss is greater than nutrient intake. Undernutrition also includes protein–energy malnutrition (PEM) syndromes, namely marasmus and kwashiorkor.

Measures of undernutrition are stunting (height-for-age), wasting (weight-for-height) and underweight (weight-for-age) and BMI-for-age (UNICEF, 2009b). These measures are widely associated with poverty and food insecurity.

2.2.2.1 Stunting, wasting and underweight

In 2005 20% of children (<5 years) in low-income and middle-income countries were underweight (weight-for-age z-score <-2 SD). The highest prevalence of underweight was in south central Asia (33%) and in eastern Africa (28%). Thirty-two percent of children in developing countries under the age of 5 years were stunted (height-for-age z-score <-2 SD). The highest prevalence of stunting was in eastern and middle Africa with 50% and 42% respectively. Twenty-three of the 40 countries that showed a prevalence of stunting of more than 40% are in Africa. Globally, 10% of the children are wasted (weight-for-height z-score <–2 SD). In south central Asia, the prevalence is the highest (16%). Severe wasting (weight-for-height z-score <–3 SD) is also the highest in this region (De Onis, Garza, Onyango and Martorell, 2006 and WHO, 2007a and b). According to Black *et al*. (2008), the risk of death increases with descending z-scores for underweight, stunting or wasting.

Research conducted by the South African Vitamin A Consultative Group (SAVACG) in 1994 indicated that 1 in 4 children ages 6–71 months was stunted (Labadarios and Van Middelkoop, 1995). The National Food Consumption Survey (NFCS) of 1999 supported these findings (Labadarios, 2000). The report indicated that in South Africa the most common nutritional disorder in children aged 1–9 years was stunting. The results of the survey showed that 1 in 5 was affected nationally (21%). In informal urban areas the prevalence was the highest (20%) (Labadarios, 2000). The prevalence of stunting indicates that children suffered from chronic malnutrition. In 2005 stunting affected 18% of children nationally. Improvement in rural areas was evident as the prevalence decreased from 26.5% in 1999 to 20.3% in 2005. The prevalence of stunting did not change in children living in urban areas (Labadarios, 2000 and Labadarios *et al*., 2008).

Wasting, which is an indication of current acute malnutrition, increased from 3.7% in 1999 to 4.5% in 2005 (Labadarios, 2000 and Labadarios *et al*., 2008). Wasting is often associated with morbidity.

In 1994, 1 in 10 children (aged 6–71 months) were underweight (Labadarios and Van Middelkoop, 1995) and in 1999, 1 in 10 children (aged 1–9 years) (10.3%) were underweight at national level. The prevalence decreased to 9.3% in 2005. However, this disorder appeared to have increased in urban areas (7.7% to 9.5%) (Labadarios, 2000 and Labadarios *et al*., 2008).

2.2.2.2 Protein–energy malnutrition (PEM)

Gibson (2005) states that nutritional marasmus and kwashiorkor are the two forms of PEM. Both these conditions are encountered in low-income countries and are associated with poverty. Nutritional marasmus develops due to a long-lasting reduction in food intake and is characterised by extreme wasting (Manary and Solomons, 2004), while kwashiorkor transpires from inadequate intake of quality dietary protein accompanied by severe protein losses and metabolic reactions induced by factors associated with hyper metabolism (Gibson, 2005).

In nutritional marasmus, loss of muscle mass and adipose tissue is evident, while in kwashiorkor, the visceral protein pool is depleted and oedema occurs (Gibson, 2005) and (Manary and Solomons, 2004). Marasmic individuals are especially susceptible to infections often resulting in death or disability. Kwashiokor is usually associated with irritability, loss of appetite and ulceration of the skin (Manary and Solomons, 2004).

Marasmic kwashiorkor refers to a condition where severe wasting and oedema occur together. This condition's symptoms are the same as that of kwashiorkor, but the prognosis is worse than that of either marasmus or kwashiorkor (Manary and Solomons, 2004).

2.2.3 Micronutrient deficiencies

The World Health Report of 2002 confirmed that iodine, iron, vitamin A and zinc deficiencies were identified as being the most serious health risk factors worldwide (WHO, 2002). Manary and Solomon (2004) stated that vitamin D, calcium, zinc, vitamin B12 and riboflavin are also emerging as a public concern. According to the WHO (2009) and Food and Agricultural Organisation of the United Nations (FAO) (2006) worldwide, over 2 billion people are anaemic, just under 2 billion have an iodine deficiency and 254 million preschool children are vitamin A deficient. In Africa, 244 million individuals are anaemic, 260 million have an insufficient iodine intake and 53 million pre-school children are vitamin A deficient.

Micronutrient malnutrition is a concern not just because such a large number of individuals are affected, but it can also contribute to high rates of morbidity and mortality (WHO, 2002). It is estimated that micronutrient deficiencies contribute 7.3% to the global burden of disease, with iron and vitamin A deficiency ranking among the top 15 causes of the global disease burden (WHO, 2002).

Micronutrient malnutrition further results in reduced resistance to infections, as well as delayed or impaired physical and psychomotor development.

The SAVACG found that in 1994 a third of the children in the age group 6–71 months had a marginal vitamin A status (serum vitamin A concentration below 20 aeg/dl). This study also stated that only 1% of the children had a serum vitamin A concentration higher than 50 aeg/dl (Labadarios and Van Middelkoop, 1995).

According to the NFCS 1999, the following nutrients were less than 67% of the Recommended Daily Allowance (RDA) for South African children: energy, calcium, iron, zinc, selenium, vitamin A, vitamin D, vitamin C, vitamin E, riboflavin, niacin and vitamin B6 (Labadarios, 2000). The report also identified that 55–68% of children nationally had a vitamin A intake that was less than half of the recommended level (Labadarios, 2000). Labadarios *et al*. (2008) found that the prevalence of the poor vitamin A status in South Africa appears to have increased. The NFCS in 2005 indicated that 2 out of 3 children had a poor vitamin A status.

In 1999, 33–53% of the children had a folic acid intake less than half the recommended level, but this status was adequate in 2005 (Labadarios, 2000 and Labadarios *et al*., 2008).

According to Labadarios and Van Middelkoop (1995), 1 out of 5 children (age 6–71 months) was anaemic, and of these children, 1 out of 10 was iron deficient. The 1999 NFCS showed that the iron intake was consistently low in all the age groups and all the Provinces with 41– 63% of the children with an intake less than half the recommended level. This was also evident for zinc. Fifty-two to sixty-nine percent of the children had an intake of less than 50% of the RDA (Labadarios, 2000). In 2005, the prevalence of a poor iron status in children appeared to have increased with 1 out of 7 children with a poor status. Furthermore, 45.3% of children nationally had a poor zinc status (Labadarios *et al*., 2008).

2.3 Nutritional needs of children and adolescents

"Adolescents" are defined as persons aged 10–19 (WHO, 2005b) and "children" are according to the United Nations Convention on the Rights of the Child of 1989 defined as all individuals below 18 years of age. Childhood is a critical phase in physical growth and physiological development; therefore the nutritional needs of children include what is needed both for maintenance and growth (Barasi, 2003). Furthermore, children and adolescents are vulnerable to many factors influencing their food choices and ultimately their nutritional status (Swart and Dhansay, 2008).

2.3.1 Introduction to the Dietary Reference Intakes (DRIs)

The DRIs were formulated by the Food and Nutrition Board of the Institute of Medicine of the United States of America (Food and Nutrition Board, Institute of Medicine, 2000). These are a set a reference values based on nutrients that can be used to assess diets of individuals or groups (West Suitor and Meyers, 2006). The reference values include (Food and Nutrition Board, Institute of Medicine, 2000):

- Estimated Average Requirement (EAR): this is the average nutrient intake estimated to meet 50% of healthy individuals' requirements in a specific gender and age group.

- Recommended Daily Allowance (RDA): this is the average nutrient intake estimated to the requirements of 97-98% of the healthy individuals in a specific gender and age group.

- Adequate Intake (AI): is the suggested average daily nutrient intake based on experimentally determined or observed estimates of nutrient intakes by a group of healthy individuals.

- Tolerable Upper Level Intake (UL): is the highest average daily nutrient intake level which will not result in undesirable health effects or pose a risk of adverse health effects to almost all individuals in a specific gender and age group.

Using the DRIs allow a health care practitioner to compare the actual intake of an individual or a group with the established nutrient requirements to determine whether the actual intake is adequate, inadequate or excessive (West Suitor and Meyers, 2006). According to The Nutrition Information Centre at the University of Stellenbosch (NICUS, 2003), the DRIs are applied by health care practitioners as indicators of good health, in order to prevent diseases and the undesirable effects of overconsumption of certain nutrients. The EARs are used to assess the occurrence of inadequate nutrient intake within a group by comparing the dietary intake survey data with the dietary references (Younger, 2009); however a statistically valid estimate of the actual intake of the group is necessary (NICUS, 2003). Governments use dietary recommendations to identify the nutrient requirements of population groups and this allows for informed decisions on food policies (Younger, 2009).

2.3.2 DRIs for 4–8 year old children

Swart and Dhansay (2008) confirm that optimal nutrition during this age (4-8 year old) is of utmost importance for the reason that nutrient requirements are higher per unit body weight than at any other time during the life cycle. Tables 2.1 and 2.2 indicate the energy, macronutrient and micronutrient requirements for this age group.

Table 2.1: Macronutrients and energy requirements for girls and boys 4–8 year old (Food and Nutrition Board, Institute of Medicine, 2000)

Gender	Carbohydrates		Fat	Protein		Energy
	RDA/AI/EAR g/day	AMDR	AMDR	RDA/AI/EAR g/day	AMDR	kJ/day
Girls	130	45-65	25-35	19	10-30	6 896
Boys	130	45-65	25-35	19	10-30	7 316

Although symptoms of mild-to-moderate malnutrition and micronutrient deficiency are not always visible, it has a considerable effect on mortality, morbidity, immunity and educational performance of these children (Swart and Dhansay, 2008).

Table 2.2: Micronutrient requirements for girls and boys 4–8 year old (Food and Nutrition Board, Institute of Medicine, 2000).

Nutrients	DRIs Girls and Boys 4–8 years
Calcium mg/day (AI)	800.00
Iron mg/day (EAR)	4.10
Zinc mg/day (AI)	4.00
Magnesium mg/day (EAR)	110.00
Phosphorus mg/day (EAR)	405.00
Chromium mcg/day (AI)	15.00
Selenium mcg/day (AI)	23.00
Fluoride mg/day (AI)	1.1
Iodine mcg/day (EAR)	65.00
Vitamin A mcg/day/REE (EAR)	275.00
Vitamin B12 mcg/day (EAR)	1.00
Vitamin C mg/day (EAR)	22.00

Nutrients	DRIs Girls and Boys 4–8 years
Thiamin mg/day (RDA)	0.50
Riboflavin mg/day (EAR)	0.50
Niacin mg/day (NE/day) (EAR)	6.00
Vitamin B6 mg/day ((EAR)	0.50
Folate mcg/day (FE/day) (EAR)	160.00
Pantothenate mg/day (AI)	3.00
Biotin mcg/day (AI)	12.00
Vitamin D mcg/day (AI)	5.00
Vitamin E mg/day (EAR)	6.00
Vitamin K mcg/day (AI)	55.00

2.3.3 DRI's for 9–13 year old children

Apart from accelerated growth, additional activities such as sport will increase the need for energy, protein, iron, zinc and calcium in this age group (Wenhold, Kruger and Muehlhoff, 2008). The authors emphasise that it is, therefore, essential to apply the DRI's as indicated in Tables 2.3 and 2.4 accurately.

Table 2.3: Macronutrients and energy requirements for girls and boys 9–13 year old (Food and Nutrition Board, Institute of Medicine, 2000).

Gender	Carbohydrates		Fat	Protein		Energy
	RDA/AI/EAR g/day	AMDR	AMDR	RDA/AI/EAR g/day	AMDR	kJ/day
Girls	130	45-65	25-35	34	10-30	8 698
Boys	130	45-65	25-35	34	10-30	9572

Micronutrient deficiencies frequently arise when the usual diet of the child lacks variety and does not supply sufficient amounts of vitamins and minerals (Wenhold, Kruger and Muehlhoff, 2008).

Table 2.4: Micronutrient requirements for girls and boys 9–13 year old (Food and Nutrition Board, Institute of Medicine, 2000).

Nutrients	DRIs Girls 9-13 years	DRIs Boys 9-13 years
Calcium mg/day (AI)	1300.00	1300.00
Iron mg/day (EAR)	5.70	5.90
Zinc mg/day (AI)	7.00	7.00
Magnesium mg/day (EAR)	200.00	200.00
Phosphorus mg/day(EAR)	1055.00	1055.00
Chromium mcg/day (AI)	21.00	25.00
Selenium mcg/day (AI)	35.00	40.00
Fluoride mg/day (AI)	2.0	2.0
Iodine mcg/day (EAR)	73.00	120.00
Vitamin A mcg/day/REE (EAR)	420.00	445.00
Vitamin B12 mcg/day (EAR)	1.50	1.50
Vitamin C mg /day (EAR)	39.00	39.00
Thiamin mg/day (RDA)	0.70	0.90
Riboflavin mg/day (EAR)	0.80	0.80
Niacin mg/day (NE/day) (EAR)	9.00	9.00
Vitamin B6 mg/day (EAR)	0.80	0.80
Folate mcg/day (FE/day) (EAR)	250.00	250.00
Pantothenate mg/day (AI)	4.00	4.00
Biotin mcg/day (AI)	20.00	20.00
Vitamin D mcg/day (AI)	5.00	5.00
Vitamin E mg/day (EAR)	9.00	9.00
Vitamin K mcg/day (AI)	60.00	60.00

2.3.4 DRI's for 14–18 year old children

As stated in the previous section, adolescence is a period of nutritional liability due the high nutrient requirements, but also because of eating behaviour, lifestyles, the effects of HIV and AIDS and vulnerability to environmental influences (Wenhold, Kruger and Muehlhoff, 2008). Tables 2.5 and 2.6 indicate the energy, macronutrient and micronutrient requirements for this age group.

Table 2.5: Macronutrients and energy requirements for girls and boys 14–18 year old (Food and Nutrition Board, Institute of Medicine, 2000).

Gender	Carbohydrates		Fat	Protein		Energy
	RDA/AI/EAR g/day	AMDR	AMDR	RDA/AI/EAR g/day	AMDR	kJ/day
Girls	130	45-65	25-35	46	10-30	9 946
Boys	130	45-65	25-35	52	10-30	13 235

An increased need of specifically iron, zinc and calcium in this group is because of growth, cellular immunity, cognitive function, skeletal development and neuropsychological function (Wenhold, Kruger and Muehlhoff, 2008).

Table 2.6: Micronutrient requirements for girls and boys 14–18 year old (Food and Nutrition Board, Institute of Medicine, 2000).

Nutrients	DRIs Girls 14–18 years	DRIs Boys 14-18 years
Calcium mg/day (AI)	1300.00	1300.00
Iron mg/day (EAR)	7.90	7.70
Zinc mg/day (AI)	7.50	8.50
Magnesium mg/day (EAR)	300.00	340.00
Phosphorus mg/day (EAR)	1055.00	1055.00
Chromium mcg/day (AI)	24.00	35.00
Selenium mcg/day (AI)	45.00	45.00
Iodine mcg/day (EAR)	95.00	95.00

Nutrients	DRIs Girls 14–18 years	DRIs Boys 14-18 years
Fluoride mg/day (AI)	2.0	3.2
Vitamin A mcg/day/REE (EAR)	485.00	630.00
Vitamin B12 mcg /day (EAR)	2.00	2.00
Vitamin C mg/day (EAR)	56.00	63.00
Thiamin mg/day (RDA)	0.90	1.00
Riboflavin mg/day (EAR)	0.90	1.10
Niacin mg/day (NE/day) (EAR)	11.00	12.00
Vitamin B6 mg/day (EAR)	1.00	1.10
Folate mcg/day (FE/day) (EAR)	330.00	330.00
Pantothenate mg/day (AI)	5.00	5.00
Biotin mcg/day (AI)	25.00	25.00
Vitamin D mcg/day (AI)	5.00	5.00
Vitamin E mg/day (EAR)	12.00	12.00
Vitamin K mcg/day (AI)	75.00	75.00

2.3.5 Functions and food sources of macronutrients

Carbohydrate, fat and protein are referred to as macronutrients as the body requires them in relatively large amounts (Whitney and Rolfes, 2008). These nutrients are organic and are used for energy production (Brown, 2008).

2.3.5.1 Protein

The major roles of protein in the body are as structural proteins, immunoproteins, enzymes, hormones and transporters (Gallagher, 2008). Gibson (2005) confirms that an uninterrupted supply of dietary protein is required to provide the necessary amino acids for the synthesis of body protein and other important nitrogen–containing compounds such as hormones, nucleic acids and certain neurotransmitters. Proteins support the growth, repair and maintenance of body tissues (Whitney and Rolfes, 2008). Therefore, according to Swart and Dhansay (2008), protein is essential for growth of infants and young children and a lack of any of the nine essential amino

acids can result in stunted growth. Furthermore, accelerated growth, especially during adolescence, increases the protein requirements (Wenhold, Kruger and Muehlhoff, 2008). An adequate intake of protein will ensure that the body can manufacture antibodies to resist infectious diseases, thus a lack in dietary protein will result in an impaired immune system (Whitney and Rolfes, 2008 and Barasi, 2003). Proteins act as enzymes responsible for facilitating many chemical reactions in the body (Whitney and Rolfes, 2008). Thyroid hormones, insulin and glucagon all consists of amino acids and play an important role in regulating body processes (Barasi, 2003). Haemoglobin is a transporting protein responsible for carrying oxygen to different parts in the body and lipoproteins transport lipids (Whitney and Rolfes, 2008). In addition, special transport proteins carry vitamins and minerals (Gallagher, 2008). As there are no surplus protein stores in the body, loss of body protein results in loss of structural components as well as impaired body functions (Gibson, 2005).

Foods of animal origin (meat, fish, poultry, milk, milk products, and eggs) are the main sources of protein and these foods also provide high–quality protein (Whitney and Rolfes, 2008). High–quality proteins provide all the essential amino acids required to support growth, maintenance and repair as long as the energy requirements are met (Barasi, 2003). Plant protein sources do not contain all the essential amino acids needed by humans and, therefore, need to be combined with other food sources to render a meal that is complete in amino acids. Cereals, legumes, nuts and seeds are considered good plant sources of proteins (Barasi, 2003).

2.3.5.2 Carbohydrates

Carbohydrates are the major source of energy in the diet contributing about half of the total energy (Gallagher, 2008). Apart from providing the major source of energy, carbohydrates are also responsible for the synthesis of glycolipids, glycoproteins (Mathers and Wolever, 2009) and mucopolysaccharides in the body (Barasi, 2003). Food sources of complex carbohydrates are pasta, bread, cereals, maize meal, cake flour, potatoes and sweet potatoes and food sources of simple sugars are table sugar, carbonated beverages, honey, fruit, some vegetables and sweets (Brown, 2008).

2.3.5.3 Fats

In the human body, fats are precursors to hormones such as steroids and eicosanoids and dietary fats are carriers for fat-soluble vitamins (Griffin and Cunnane, 2009). According to Brown (2008), functions of dietary fats include the provision of energy and fat-soluble vitamins; enhancing the flavour and palatability of food, contribute to the feeling of satiety and are also important components of cell membranes. Sources of fats are margarine, butter, oils, mayonnaise, cream, cheese, salad dressings, meat and fast foods (Barasi, 2003).

2.3.6 Functions and food sources of micronutrients

Vitamins and minerals are micronutrients required by the body in small quantities, namely milligrams or micrograms (Whitney and Rolfes, 2008). These nutrients are chemical substances that perform specific functions in the human body. Minerals are inorganic nutrients and vitamins are organic nutrients (Barasi, 2003).

2.3.6.1 Water-soluble vitamins

a) Thiamin

Thiamin forms part of the coenzyme thiamine pyrophosphate (TPP) which assists in energy metabolism (Whitney and Rolfes, 2008). This vitamin can be readily destroyed by prolonged cooking. The vitamin leaches into the water when applying cooking methods such as boiling and blanching (Barasi, 2003). Prolonged deficiency in thiamin can result in beriberi, which causes damage to the nervous system as well as to the heart and other muscles. Other deficiency symptoms include an enlarged heart, cardiac failure, muscular weakness, apathy, poor short term memory, confusion, irritability, anorexia and weight loss (Whitney and Rolfes, 2008). Important food sources include wholegrain cereals, pork (Whitney and Rolfes, 2008), fortified maize and wheat flour (Moeng and De Hoop, 2008), legumes, seeds and nuts (Barasi, 2003).

b) Riboflavin

Riboflavin acts as coenzymes flavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD) in the release of energy from macronutrients in all body cells (Whitney and Rolfes, 2008). Lack of riboflavin causes inflammation of the

membranes of the mouth, resulting in cracks at the corners of the mouth and a painful, smooth, purplish red tongue. Deficiency of this vitamin also causes inflammation of the skin which is characterised by lesions covered with greasy scales (Whitney and Rolfes, 2008). Good food sources include milk and milk products, wholegrain cereals and fortified maize and wheat flour (Moeng and De Hoop, 2008), and liver (Barasi, 2003).

c) Niacin

The two coenzymes which forms part of niacin, namely nicotinamide adenine dinucleotide (NAD) and the phosphate form (NAPD) are vital in energy transfer reactions, especially in the metabolism of glucose, fat and alcohol (Whitney and Rolfes, 2008). Niacin deficiency results in pellagra, a disease characterised by diarrhoea, dermatitis, dementia and death (Gallagher, 2008). Significant food sources include all protein-rich foods for example, milk, eggs, meat, chicken and fish (Whitney and Rolfes, 2008 and Gallagher, 2008). Wholegrain cereals, nuts (Barasi, 2003) and fortified maize and wheat flours (Moeng and De Hoop, 2008) are also good sources of this vitamin.

d) Biotin

Biotin forms an important part of coenzyme A used in energy metabolism. This coenzyme also participates in the synthesis of glucose from amino acids or glycerol (gluconeogenesis), fatty acid synthesis and the breakdown of certain fatty acids and amino acids. Deficiency symptoms may include depression, lethargy, hallucinations, numb or tingling sensation in the arms and legs, and red, scaly rash around the eyes, nose and mouth (Whitney and Rolfes, 2008). Biotin is widely spread in foods, therefore, eating a variety of foods is recommended. Good Food sources include liver, egg yolks, soybeans, fish and wholegrain cereals (Barasi, 2003 and Gallagher, 2008).

e) Pantothenic acid

Pantothenic acid is part of the chemical structure of coenzyme A used in energy metabolism. Pantothenic acid deficiency is rare, but symptoms may include fatigue, gastrointestinal disorders and neurological disturbances (Gallagher, 2008). This

vitamin is widely spread in foods. Particularly good sources are chicken, beef, potatoes, oats, tomatoes, liver, egg yolk, broccoli and whole grains (Barasi, 2003).

f) Vitamin B6

Vitamin B6 is part of coenzyme pyridoxal phosphate (PLP) and pyridoxamine phosphate (PMP) used in amino acid and fatty acid metabolism. PLP also plays an important part in the conversions of the amino acid tryptophan to niacin or the neurotransmitter serotonin (Whitney and Rolfes, 2008). The synthesis of the nonprotein component of haemoglobin (heme), nucleic acids (DNA and RNA) and lecithin depend on PLP (Whitney and Rolfes, 2008). Deficiency symptoms include scaly dermatitis, anaemia, depression, confusion and convulsions (Barasi, 2003). Significant food sources are meat, fish, chicken, potatoes, legumes, fortified maize and wheat flour, liver and soy products (Whitney and Rolfes, 2008).

g) Folate

According to Whitney and Rolfes (2008), folate forms part of the coenzymes tetrahydrofolate (THF) and dihydrofolate (DHF) which is used in DNA synthesis and it is for this reason important in new cell formation. The folate coenzyme is activated by the removal of the methyl group by vitamin B12 and this in turn activates vitamin B12. Folate supplements are taken one month before conception and are continued throughout the first trimester and are critical in reducing the risks of neural tube defects such as spina bifida (Gallagher, 2008). Good food sources include fortified maize and wheat flour (Moeng and De Hoop, 2008), leafy green vegetables, legumes, seeds and liver (Gallagher, 2008). Deficiency symptoms are anaemia, smooth, red tongue, mental confusion, fatigue and irritability (Whitney and Rolfes, 2008).

h) Vitamin B12

As indicated, vitamin B12 and folate depend on each other for activation (Whitney and Rolfes, 2008). Vitamin B12 is part of the coenzyme methylcobalamin and deoxyadenosylcobalamin (Gibson, 2005). The syntheses of DNA and RNA as well as regeneration of the amino acid methionine depend on both vitamin B12 and folate (Whitney and Rolfes, 2008). According to Barasi (2003), vitamin B12 promotes the

normal growth of nerve fibres and it maintains the myelin coating that surrounds and protects them. Once vitamin B12 is released from the proteins by hydrochloric acid and pepsin to which it is attached in foods in the stomach, the intrinsic factor, secreted by the stomach, binds with it and this ensures absorption of the vitamin in the lower end of the small intestine (Gallagher, 2008). The deficiency disease, pernicious anaemia, is caused by a lack of the intrinsic factor resulting in decreased absorption of vitamin B12 (Whitney and Rolfes, 2008). Other deficiency symptoms include large cell type anaemia, fatigue, paralysis due to degeneration of peripheral nerves (Gallagher, 2008), loss of appetite, and constipation (Whitney and Rolfes, 2008). Foods from animal origin for example meat, poultry, milk, cheese and eggs are significant sources (Whitney and Rolfes, 2008). Gibson (2005) confirms that the vitamin is also found in shellfish and fish. Organ meats, namely liver and kidney are the richest source (Barasi, 2003).

i) Choline

The functions of choline include the synthesis of the neurotransmitter acetylcholine and the phospholipid lecithin (Gallagher, 2008). Furthermore, choline plays an important role in the structure and function of the spinal cord during fetal development (Whitney and Rolfes, 2008). Food sources rich in choline are milk, liver, eggs and peanuts (Whitney and Rolfes, 2008).

j) Vitamin C

Vitamin C plays an important role as both a cofactor to facilitate the action of an enzyme and as an anti-oxidant (Whitney and Rolfes, 2008).

This vitamin helps to form collagen by the hydroxylation of proline and lysine (Gibson, 2005). Collagen is the structural protein which forms part of connective tissue such as scars, tendons, ligaments as well as the foundation (or matrix) of bone and teeth (Whitney and Rolfes, 2008). Vitamin C protects the body tissue against oxidative stress, thus preventing diseases (Gibson, 2005). However, the exact role of vitamin C in the prevention and treatment of cancer, heart disease, cataract, and a variety of other diseases is still being studied (Whitney and Rolfes, 2008). Vitamin C's role as a reducing agent enhances the gastrointestinal absorption of nonheme iron

by reducing ferric iron to ferrous iron which is more absorbable (Gibson, 2005) and (Gallagher, 2008). Deficiency symptoms are small-cell type anemia (microcytic anemia), pinpoint haemorrhage; poor wound healing, fragile bones, high incidences of infections, bleeding gums and loosened teeth, joint pains and depression (Whitney and Rolfes, 2008). Clinical symptoms of scurvy include weakness, bleeding gums, anaemia and defects in bone development in children (Gibson, 2005). This vitamin is readily destroyed by heat and oxygen (Whitney and Rolfes, 2008) and, therefore, special care needs to be taken storing and preparing fresh fruit and vegetables in order to retain vitamin C (Barasi, 2003). Gibson (2005) substantiates that the major sources of vitamin C in the diet of most developed countries are fresh fruits, fruit juices and some fresh vegetables and in developing countries, the intake of vitamin C is very often seasonal so intakes may vary extensively. Excellent food sources of vitamin C are citrus fruits, brussel sprouts, broccoli, and cauliflower, bell peppers, strawberries, tomatoes, potatoes, papayas and mangoes (Whitney and Rolfes, 2008).

2.3.6.2 Fat-soluble vitamins

Fat-soluble vitamins require bile for absorption after which they travel through the lymphatic system carried by chylomicrons before entering the bloodstream where many of these vitamins then require protein carriers (Gallagher, 2008).

a) Vitamin A

The active forms of vitamin A in the body known as retinoids, are retinol, retinal and retinoic acid (Gallagher, 2008). Animal sources provide retinyl esters that are easily digested and absorbed as retinol in the intestines, whereas plant sources provide carotenoids of which beta–carotene is an important one. Beta–carotene can be split in the intestines and liver to form retinol (Whitney and Rolfes, 2008). Retinol can be converted to retinal and *vice versa*, but once retinoic acid has formed, it cannot be reversed (Barasi, 2003). In the body, retinol supports reproduction, while retinal is active in vision and retinoic acid regulates cell differentiation, growth and the development of the fetus (Whitney and Rolfes, 2008). Gibson (2005) states that in addition to the previously mentioned functions, retinoic acid also has an important role in the maintenance of the immune function by supporting cell mediated

immunity and systemic and mucosal humoral immunity. According to Gibson (2005), early signs of vitamin A deficiency can include growth failure, loss of appetite, and a lower resistance to infections due to a weakened immune response. Other deficiency symptoms include night blindness, corneal drying, Bitot's spots, keratomalacia, xerophthalmia and hyperkeratosis (Whitney and Rolfes, 2008).

Foods of animal sources are good sources of preformed vitamin A. These include: fish liver oils (Gallagher, 2008), liver, cheese, cream, butter, eggs (Whitney and Rolfes, 2008), fortified margarine (Barasi, 2003), and fortified maize meal and wheat flour (Moeng and de Hoop, 2008). Spinach and other dark, leafy vegetables, broccoli, apricots, mangoes, papaya, carrots, sweet potatoes and yellow pumpkin varieties are excellent sources of beta–carotene (Whitney and Rolfes, 2008).

b) Vitamin D

The synthesis of vitamin D takes place in the skin through exposure to sunlight. Only 20– 30% of the requirement is met from the diet (Gallagher, 2008). The two important forms of vitamin D are vitamin D2 (ergocalciferol) from plants and vitamin D3 (cholecalciferol) which is available from animal sources (Whitney and Rolfes, 2008). Vitamin D regulates the metabolism of calcium and phosphorus in the bone by promoting bone mineralisation and in the kidney by inducing the re-uptake of calcium and phosphorus. An optimum vitamin D status is indispensable for the mineralisation of bone tissue (Barasi, 2003). Deficiency conditions in children include rickets resulting in deformities in bones, including legs and ribs and the enlargement of the ends of long bones (Whitney and Rolfes, 2008). Lack of this vitamin in adults result in osteomalacia or osteoporosis which is characterised by loss of calcium resulting in soft, flexible and brittle bones, progressive weakness and pain in the pelvic area, lower back and legs (Gallagher, 2008). Fortified milk and margarine are good sources of vitamin D (Whitney and Rolfes, 2008). Other significant sources are egg yolk, fatty fish such as herring, salmon and sardines, and the oils from these fish (Barasi, 2003).

c) Vitamin E

Vitamin E is an antioxidant and is considered as the principal defendant against damaging free radicals (formed when unpaired atoms react with oxygen in the body) by protecting susceptible components in cell membranes from being destroyed (Barasi, 2003). This vitamin, in particular, protects polyunsaturated fatty acids and vitamin A against oxidation (Gallagher, 2008). According to Whitney and Rolfes (2008), growing evidence also indicate that vitamin E may play a role in protecting low–density lipoprotein against oxidation and thus reducing the risk of heart disease. Gibson (2005) stated vitamin E has been linked to anticarcinogenic properties by protecting DNA from free radical attacks. Good food sources are polyunsaturated plant oils, leafy green vegetables, whole grains, liver, egg yolks, nuts, seeds and fatty meats (Whitney and Rolfes, 2008).

d) Vitamin K

Vitamin K is involved in synthesising proteins involved in blood clotting (Barasi, 2003) as well as in the synthesis of bone proteins (Whitney and Rolfes, 2008). A deficiency in vitamin K results in haemorrhaging and low bone density (Whitney and Rolfes, 2008). Bacteria in the small intestines synthesise vitamin K and individuals typically receive half of their vitamin K requirements from this process (Gallagher, 2008). However, vitamin K needs cannot be met by bacterial synthesis alone, foods such as green leafy vegetables and vegetable oils are also considered as good sources (Whitney and Rolfes, 2008).

2.3.6.3 Minerals

All minerals are vital to health; therefore, the classification into major minerals and trace elements does not mean that one group is more important than the other (Whitney and Rolfes, 2008). Major minerals are needed in larger amounts and are present in the amounts larger than 5g in the body, while trace elements on the other hand together amount to 15g maximum (Barasi, 2003). Minerals are inorganic elements and not as readily destroyed as vitamins by heat, oxygen and acid (Whitney and Rolfes, 2008). Table 2.7 indicates the classification, functions and food sources of minerals.

Table 2.7: Classification, functions and food sources of minerals

Mineral	Deficiency symptoms or diseases	Functions of the mineral	Food sources
Major minerals			
Calcium	Deficiency symptoms are stunted growth in children and osteoporosis in adults (Whitney and Rolfes, 2008).	High calcium intakes allow greater bone density, diameter and strength (Gallagher, 2008). During pre-puberty bone mineralisation intensifies. Half the calcium of an adult is laid down between birth and the age of 11–13 years. During adolescence, 25% of the final bone mass is acquired (Barasi, 2003) and (Harvey and Cooper, 2004). Calcium is also involved in muscle contraction and relaxation (Whitney and Rolfes, 2008). This mineral may protect against hypertension (Gallagher, 2008) and play a role in blood clotting (Barasi, 2003).	Major food sources are milk and milk products, fish with edible bones, green leafy vegetables and legumes (Whitney and Rolfes, 2008).
Phosphorus	Classic deficiency symptoms include muscle weakness and bone pain due to bone loss (Whitney and Rolfes, 2008).	This mineral forms part of every cell in the body, including genetic material namely DNA and RNA (Whitney and Rolfes, 2008). The main functions are bone and teeth mineralisation (Barasi, 2003), but it also forms an integral part of the structure of phospholipids (Whitney and Rolfes, 2008) and it assists in energy metabolism (Gallagher, 2008).	Although phosphorus is widely available in animal and plant foods (Barasi, 2003), the most significant sources are meat, fish, poultry, eggs and milk (Whitney and Rolfes, 2008).
Magnesium	Growth failure in children is a deficiency symptom of this mineral (Whitney and Rolfes, 2008). Other deficiency symptoms are weakness, irregular muscle contractions, difficulty in swallowing and hallucinations (Gallagher, 2008).	Apart from bone mineralisation (Whitney and Rolfes, 2008 and Harvey, Cooper, 2004), magnesium forms part of the process of protein building and is important for energy metabolism (Gallagher, 2008). This mineral also supports the normal functioning of the immune system (Whitney and Rolfes, 2008).	Whole grain cereals, nuts, legumes, seafood, cocoa and chocolate are good food sources (Whitney and Rolfes, 2008). Dark green vegetables containing chlorophyll are also good sources (Barasi, 2003).

Mineral	Deficiency symptoms or diseases	Functions of the mineral	Food sources
Trace elements			
Iron	Iron–deficiency anaemia includes symptoms such as weakness, lethargy, fatigue and headache (Vijayaraghavan, 2004). A lack of this mineral can also lead to impaired brain function and immune competence (Whitney and Rolfes, 2008).	Iron forms part of the protein haemoglobin which main function is to carry oxygen the blood (Barasi, 2003). It is also an integral part of myoglobin in muscles which provides oxygen for muscle contraction. Iron is involved with the metabolism of neurons and can affect cognitive and behavioural functions (Gallagher, 2008).	The best food sources of iron are red meat, liver, fish, poultry, shellfish and eggs and legumes (Whitney and Rolfes, 2008). Barasi (2003) also states that dried fruit are significant sources.
Zinc	Deficiency symptoms are growth retardation, impaired immune function (Whitney and Rolfes, 2008), as well as hair loss, skin lesions (Gallagher, 2008) and a loss of appetite (Barasi, 2003).	Zinc adapts the transmission of nerve signals (Gallagher, 2008). It also plays a role in cell growth and neurological development of the fetus. Zinc assists in the immune function as well as in the release and action of the hormone insulin (Whitney and Rolfes, 2008). Gallagher (2008) confirms that zinc is important in normal taste perception and in wound healing.	Protein–containing foods are the best sources of zinc. These include red meat, shellfish, milk and milk products (Barasi, 2003). Other sources include fortified cereals (Moeng, De Hoop, 2008), legumes and whole grains Whitney and Rolfes, 2008).
Iodine	Deficiency diseases of iodine are goitre in children and adults and irreversible mental and physical retardation in infants (cretinism) (West, Jooste and Pandav, 2004).	Iodine forms part of the thyroid hormones responsible for regulation of body temperature, metabolic rate, growth, nerve and muscle function (Gallagher, 2008). This mineral is necessary for normal growth and intellectual development (West, Jooste and Pandav, 2004).	Important sources are iodated salt (Moeng, De Hoop, 2008), seafood (Barasi, 2003), plants growing in iodine–rich soil and animal sources eating these plants (Whitney and Rolfes, 2008).
Selenium	Selenium deficiency is associated with a heart disease characterised by heart enlargement and the development of fibrous tissue in the heart known as Keshan Disease (Whitney and Rolfes, 2008).	The chief function of this mineral in the body is as an anti–oxidant (Whitney and Rolfes, 2008), but it also plays a role in regulating the thyroid hormone (Gallagher, 2008).	The best food sources are seafood, meat, wholegrain (Whitney and Rolfes, 2008) and fortified cereal products (Moeng, De Hoop, 2008).
Fluoride	Individuals deficient in fluoride are more prone to tooth decay (Whitney and Rolfes, 2008).	This mineral maintains teeth and bone (Gallagher, 2008).	Drinking water is the best source of fluoride (Whitney and Rolfes, 2008), as well as tea and seafood (Barasi, 2003).

Mineral	Deficiency symptoms or diseases	Functions of the mineral	Food sources
Chromium	Deficiency in chromium can result in a diabetes–like condition due to its role in maintain glucose levels in the body by improving the activity of insulin (Whitney and Rolfes, 2008).	The main function is to enhance the action of insulin (Gallagher, 2008).	The best food sources are unrefined foods (Whitney and Rolfes, 2008), liver, legumes and nuts (Barasi, 2003).

2.4 Nutrient requirements for children and adolescents living with HIV and AIDS

One of the problems that people living with HIV and AIDS face is the fact that their bodies have increased nutritional demands which need attention. Therefore, consuming the right foods and nutrients has a direct effect on their quality of life (Manary and Solomon, 2004). Nutritional deficiencies are linked to a weakened immune system and an increased vulnerability to infections (Naude, Labuschagne and Labadarios, 2008).

The non-specific mechanism of the immune system, namely the skin and mucous membranes act as a first line of defence and slows down the development of apparent infections. On the other hand, the antigen–specific mechanisms are responsible for restricting the spread of infection and destroying the invading organisms. Various nutrients are required to maintain the integrity of the immune system. Malnutrition results in the interference with both of these mechanisms further contributing to a decreased resistance (Scrimshaw and SanGiovanni, 1997).

The nutrient requirements for children living with HIV and AIDS are different from those for non-HIV positive individuals (FANTA, 2007 and WHO, 2003). Current evidence further suggests that as the HIV infection progresses, the nutrient requirements change (DoH, 2007a). The stage of the disease (asymptomatic or symptomatic) influences the nutritional requirements of the child (FANTA, 2007). According to the WHO (2003), Clinical Stage I is asymptomatic and Clinical Stages II, III and IV is symptomatic. Clinical Stage II is associated with unintentional weight loss of <10% of body weight, while a weight loss of >10% of body weight is

noted in Clinical Stage II. Weight loss of <50% is associated with Clinical Stage III and >50% with Clinical Stage IV.

2.4.1 Energy requirements

During the asymptomatic phase, energy requirements increase for both adolescents and children by 10%. Energy requirements increase by 20-30% for adolescents during the symptomatic phase. During the symptomatic phase for children with no weight loss, the energy requirements increase by 20-30% and with weight loss; the needs increase by between 50-100% (WHO, 2003 and WHO, 2005c). According to Hendricks *et al*. (2007), the increased energy needs should be met through locally available and affordable foods.

2.4.2 Macronutrient requirements

Although most immune responses involve the production of proteins with specific functions (Scrimshaw and SanGiovanni, 1997), there is insufficient evidence to support an increase in protein intake. However, recent studies do indicate the important role of amino acids in the immune response by regulating the activation of T lymphocytes, B lymphocytes, natural killer cells, macrophages and the production of antibodies and cytokines (Li, Yin, Li, Kim and Wu, 2007).

The recommended protein intake is 12–15% of the total energy intake (Hendricks *et al*., 2007), (NICUS, 2005) and (WHO, 2005c). The consumption of a varied diet should be promoted to meet the macronutrient requirements of the child. Animal-source foods such as meat, poultry, fish and eggs should be eaten daily (Hendricks *et al*., 2007).

According to the WHO (2003) and FANTA (2008), there is no evidence that fat requirements are different or increased because of HIV infection. However, specialised advice may be required for PLHIV undergoing antiretroviral therapy or suffering from chronic diarrhoea (WHO, 2003).

2.4.3 Micronutrient requirements

HIV infection causes micro-nutrient deficiencies which can, apart from the disease, further compromise the immune system (Steenkamp and Visser, 2002 and DoH, 2007a). According to the Academy of Science of South Africa (ASSAF) (2007), micronutrient deficiencies are more evident in individuals with progressed disease and in those with inadequate diets. During the acute phase response blood levels of vitamins A, B6, C, D, E, folic acid and trace elements zinc, selenium and iron are decreased. To prevent micronutrient deficiencies and their complications, supplementation can be considered (NICUS, 2005).

A study by Steenkamp *et al.* (*2009*) in care centres in the Free State, confirmed that micronutrient deficiencies are common in children living with HIV and AIDS. They further stated that the highest prevalence of deficiencies relate to glutathione, vitamin A, zinc and vitamin D. These micronutrients also play an important role in maintaining the immune function.

2.5 Causes of malnutrition

The UNICEF framework (2004) (Figure 2.1) recognises the basic, underlying and immediate causes of malnutrition. The framework allows for the analysis of the causes of malnutrition and death in any community as it indicates the relationship between various contributing factors. The immediate causes of malnutrition are associated with dietary intake, stress, trauma and disease (UNICEF, 2004). Voster (2009) confirms that immediate causes also include health status, social structures, dietary taboos and personal choice. The immediate causes are influenced by the underlying causes of malnutrition which are linked to household food security, maternal and child care, inadequate caring capacity of vulnerable groups, education and information, the availability and access to health services, as well as environmental influences (Matji, 2008). The size of the family, family composition and rules of food distribution in the family further contributes to underlying causes (Voster, 2009). The underlying causes are in turn influenced by the basic causes of malnutrition. These causes include the availability and control of resources, as well

as the political, social, ideological, cultural and economic factors that affect the availability and control of these resources (Matji, 2008).

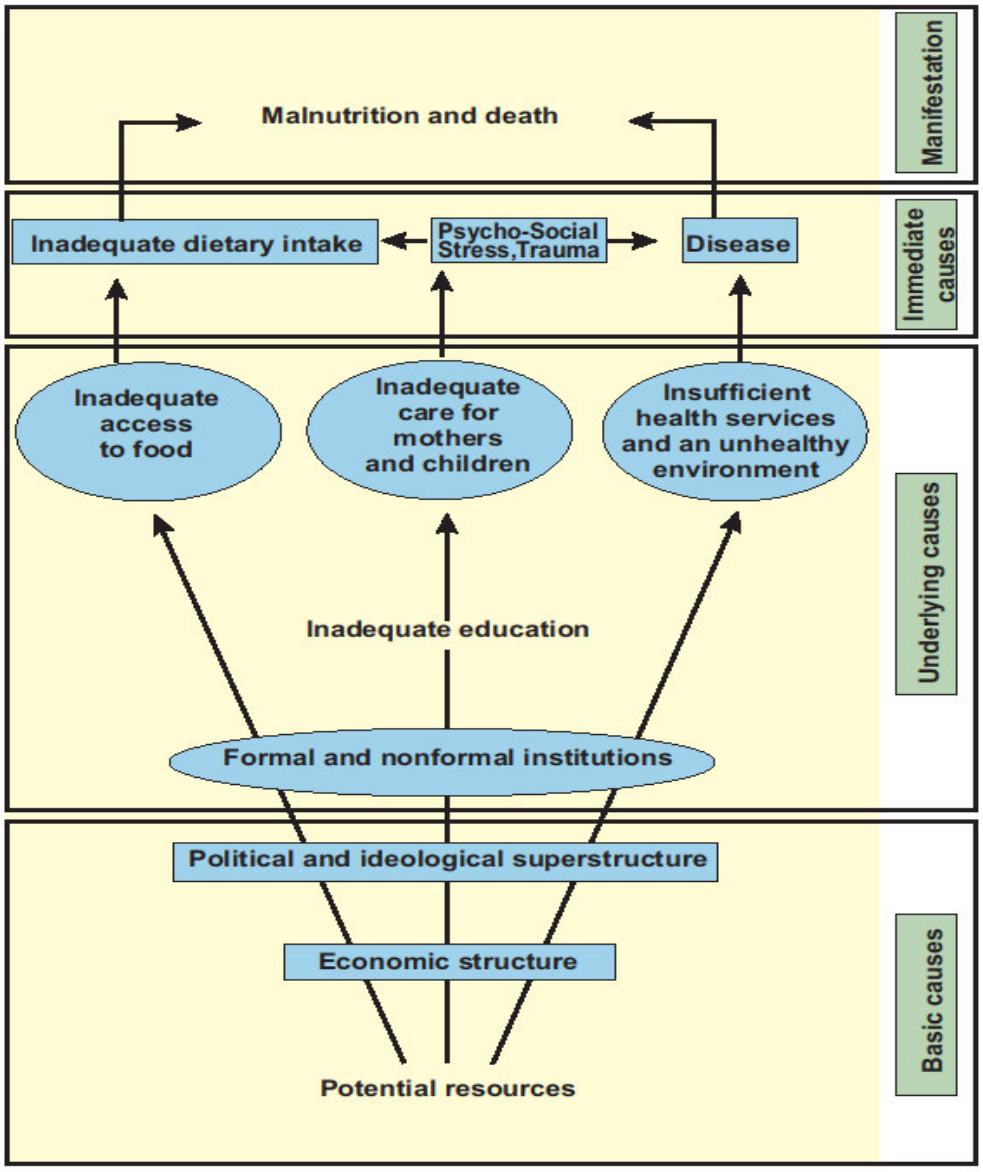


Figure 2.1: UNICEF (2004) framework of the causes of malnutrition

Voster (2009), states that in order to address the causes of malnutrition as depicted in the above figure, individuals and communities should be assisted in various ways to empower themselves to address food insecurity and to develop livelihood.

2.6 Factors affecting the food intake of children and adolescents

As illustrated in Table 2.8, Story, Neumark–Sztainer and French (2002) identified lifestyle, biological and psychological factors as influences on the eating behaviour of children and adolescents with individual influences, the social environment, the community setting and the macro system which all play a role.

Table 2.8: Factors influencing the eating behaviour of children and the youth (Story, Neumark–Sztainer and French, 2002)

	Individual influences **(Intrapersonal)**	**Social environmental influences** **(Interpersonal)**	**Physical environmental influences** **(Community)**	**Macrosystem influences** **(Societal)**
PSYCHOLOGICAL	Food preferences Taste and sensory perceptions Health and nutrition Meanings of food Self – efficacy Nutrition knowledge	***FAMILY/ HOUSEHOLD*** Demographic and cultural characteristics Family meals Food availability Affordability of food	Schools Fast food outlets Vending machines Convenience stores Worksites	Children and youth as consumers Media, advertising: food, eating
BIOLOGICAL	Hunger Sex	***PEERS***		
LIFESTYLE	Time Convenience Cost Meal patterns Dieting			

Due to changes in their lifestyle, development, social activities and sometimes the environment, dietary quality declines from childhood to adolescence resulting in a higher intake of soft drinks and fast food and a decrease in fruit and vegetable intake (Barasi, 2003). Food choices are also affected by growing independence, concern with physical appearance and body weight, the importance of peer acceptance and sometimes busy schedules (Story, Neumark–Sztainer and French, 2002). Poor

dietary practices can have long-term implications on health. It can affect growth, sexual development, result in iron-deficiency, obesity, underweight, poor bone health and dental caries (Barasi, 2003). Eating behaviour is also influenced in a social setting through reinforcement, modelling, social support and perceived norms (Story, Neumark–Sztainer and French, 2002). In a residential care setting, various steps can be implemented to make mealtimes a positive experience for children and adolescents thus encouraging learning of healthy eating habits (Harrison and Crocker, 2011). These include:

- Where possible, present food family-style to encourage self-service thus allowing the children to be in control of what and how much food is consumed,
- Do not bribe, reward, punish or apply pressure as this can lead to overeating,
- Meals and/or snacks should be served at the same time every day,
- Children and adolescents learn from good examples, therefore, caregivers should model good habits,
- Encourage socialising during meal times; therefore, do not eat with the radio or television on. Distractions make it harder for children and adolescents to focus on eating,
- Children and adolescents who feel stressed, unsafe or anxious do not eat well, so mealtimes should be kept relaxed,
- Introduce new foods along with familiar and well-liked dishes,
- Involve children and adolescents in menu planning, preparation and serving.

2.7 Methods to assess the nutritional status of children and adolescents

Hammond (2008) confirms that careful assessment of the nutritional status of an individual enhances the success of a nutrition intervention, nutrition education or consultation**.** The methods discussed below are used in combination to increase effectiveness of an assessment and to accurately interpret the results, other factors such as socio-economic status, cultural influences, and existing health statistics should be considered (Gibson, 2005).

2.7.1 Dietary methods

Various methods exist to determine the dietary intake of children and adolescents. The accurate assessment of dietary intake of individuals to estimate food and/or nutrient intakes offers many challenges to researchers (Patterson and Pietinen, 2004). Regardless of the method selected, it should match the cognitive development of the child. Depending on the development stage, it is suggested that before the age of 11 years, the caregiver of the child should be included in the process (Wenhold, Kruger and Muehlhoff, 2008). Gibson (2005) reported that memory and conceptualisation skills can affect the response in dietary assessment of individuals younger than 18 years and, therefore, the method selected should take this into account. In addition, the researcher must also rely on the accuracy and completeness of available food composition databases which further complicates the matter (Patterson and Pietinen, 2004). Dietary intake evaluation determines whether the macro and micro-nutrient composition of the diet is adequate, and identifies factors which may affect intake. Furthermore, this procedure aims to prevent weight loss and improve the overall health of PLHIV (Manary and Solomon, 2004).

2.7.1.1 Food Frequency Questionnaires

The Food Frequency Questionnaire (FFQ) is used to collect qualitative, descriptive data relating to usual food consumption patterns. This method provides information on how often foods are consumed per day, per week or per month. The FFQ organises foods into food groups that have similar nutrients. The data obtained can, therefore, be useful to determine general usage of food groups rather than the intake of specific nutrients (Barasi, 2003 and Hammond, 2008). Quantitative dietary intake data can be collected using the Quantity Food Frequency Questionnaire should information be required not only on the type of food consumed, but also the quantity. This method of dietary data collection is, however, very time consuming with a high burden on the participant and interviewer (Wolmarans, Kunneke, and Laubscher, 2009).

2.7.1.2 24 Hour Recall

Hammond (2008) states that this method of dietary assessment is whereby an individual is asked by a health care practitioner or a fieldworker to recall the exact food intake during the previous twenty-four-hour period. During the interview, detailed descriptions of all the food and beverages consumed are recorded. Dietary information for both the weekdays and weekends needs to be recorded. This method is used when quantitative data are required for a study and time constraints exist (Wolmarans, Kunneke, and Laubscher, 2009). Limitations of a 24-Hour Recall are that it requires skilled and well trained interviewers and participants with a reasonably good memory and concentration. This method may, therefore, not be suitable for children and the elderly (Barasi, 2003).

2.7.1.3 Food diary

This is a written record of the amounts and types of food and beverages taken in over a specified period of time, usually 3 to 7 days. The information recorded may include; eating time, place, situation, cooking methods and estimate of portion sizes (Barasi, 2003 and Hammond, 2008).

2.7.1.4 Diet history

According to Hammond (2008), a diet history is a detailed dietary record. This record may include a 24-Hour Recall, food frequency data and information on weight, previous dietary records and information on food intolerances. Barasi (2003) confirms that a diet history gives a health care practitioner a comprehensive picture of a person's food intake as the time frame is usually 7 days and can be sufficient to identify potential excesses or deficiencies. It, however, requires a skilled interviewer to obtain an accurate depiction of a person's actual intake and an individual with a logical and reasonable memory to recall their intake.

2.7.1.5 Plate waste studies

Plate waste is the amount of food left on a plate and is often used as a measure of food acceptability. The plate waste is weighed to provide numerical results which can be used in studies (Spears, 2000).

In a study conducted by Jacko, Dellava, Ensle and Hoffman (2007), the researchers confirmed that using the plate waste method for estimating food intake in children is useful to determine macronutrient consumption and energy density of the foods consumed. This method provide aggregate plate waste measurements, accurate results for groups of children, less subjective results and reduced the need to interact with the children. According to Spears (2000), when the research conducted requires an accurate measurement of nutrient intakes of the individuals, the weighed method, rather than the visual or recall methods are more suitable to use.

2.7.1.6 Weighed food records

According to Gibson (2005), this is the most accurate method available to establish typical food and nutrient intakes of individuals. This method requires for the subject, the parent or caregiver to be literate and numerate and to weigh all the foods and beverages consumed by an individual. The weight of the portion consumed is recorded as well as the weights and description of ingredients used in recipes.

2.7.2 Anthropometric assessment of children and adolescents

Dietary data, supported by evaluation of anthropometric growth, form the basis for nutrition screening and assessment of children and adolescents (Wenhold, Kruger and Muehlhoff, 2008). Nutritional status in children and adolescents is assessed by collecting anthropometric data which includes length or height, weight, mid-arm circumference, head circumference and triceps or subscapular fat folds (Lucas and Feucht, 2008). Patterson and Pietinen (2004) reported that random errors can occur when the fieldworkers misread a measuring tape or incorrectly record the weight of a subject.

2.7.2.1 Head circumference

This measurement is used with children aged <3 years (Hammond, 2008). A narrow, flexible, nonstretch tape should be used. The measurement is taken just above the supraorbital ridge and over part of the occiput. The measurement is recorded to the nearest millimetre (Gibson, 2005).

2.7.2.2 Length and height

Recumbent length is measured for infants and children ≤85cm (Gibson, 2005). A wooden or perspex board with a head and footboard is used for this purpose. The child is placed facing upwards with the crown of the head touching the headboard and the heels against the footboard with toes pointing directly upward. The knees must be straight (Hammond, 2008).

Height >85cm is measured standing using either a stadiometer or nonstretchable tape fixed to a vertical surface (Gibson, 2005). The subject should stand erect with arms at their sides, looking straight ahead. The shoulder blades, buttocks and heels should be touching the vertical surface (Hammond, 2008).

2.7.2.3 Weight

Hammond (2008) recognises weight as a more accurate measurement of nutritional adequacy than height as it reflects recent dietary intake in children. Weight is measured using a calibrated scale. The subject should wear minimal light clothing. To weigh children aged <2 years, a suspended scale and a weighing sling can be used (Gibson, 2005). The measurement of weight in older children and adults is done using a beam balance or an electronic scale. Body weight is recorded to the nearest 0.1kg (Gibson, 2005).

2.7.2.4 Mid-upper arm circumference (MUAC)

MUAC reflects lean body mass and fat stores in adults and children older than one year (Heller, 1997). MUAC is, therefore, an indication of either a loss in muscle mass, subcutaneous fat or both (Gibson, 2005). The measurement is taken with a nonstretchable tape around the left upper arm halfway between the tip of the

acromion process (shoulder) and the tip of olecranon (elbow) while the arm hangs loosely by the side, with the palm faced inwards (Hammond, 2008).

2.7.3 Laboratory methods

Gibson (2005) states that static biochemical and functional tests can both be used in this method. Static biochemical tests measure the nutrients in biological fluids, tissues or urine, while functional tests measures the biological significance of a given nutrient in the body.

2.7.4 Clinical methods

This method requires a physical examination by an experienced and qualified person and a medical history. Diagnosis of a nutritional deficiency should, however, not rely on this method only as signs and symptoms of a nutrient deficiency usually develop in the advanced stages of depletion (Gibson, 2005). Patterson and Pietinen (2004) report that shortcomings of this method include inconsistency in the methods of examination and differences in the interpretation of the physical signs.

2.8 Growth indices for children and adolescents

Anthropometric indices are used to interpret anthropometric measurements and allow researchers to compare an individual or a group with a reference population (Gibson, 2005 and WHO, 2008). New WHO Child Growth standards for children under 5 years of age were released in 2006. As a result, the recommended National Centre for Health Statistics (NCHS)/WHO international growth reference did not allow the calculation of percentiles and z–scores on a continuous age scale from 5-19 years as it only started at the age of 9 years. This shortcoming necessitated the development of a single international growth reference standard for this age group (De Onis, Onyango, Borghi, Siyam, Nishida and Siekmann, 2007).

2.8.1 Weight–for–age

Weight–for–age reflects body weight in relation to the chronological age of the child and is expressed as z–scores or as percentage of the median (Gibson, 2005). A z–score of >-1 SD to +3 SD is classified as normal weight–for–age, a z–score of <-2

SD is underweight and <-3 SD is severely underweight (De Onis *et al*., 2007). However, weight–for–age does not distinguish between tall, thin children and short children of normal weight. Thus a child with a low weight–for–age may be genetically short or stunted, which means that although the child is rated as low in the height–for–age category, their weight is appropriate to their stature (Gibson, 2005).

2.8.2 Height-for–age

Gibson (2005) states that height-for-age is an indicator for linear growth and can be used as a guide of past nutritional and health status. Stunting is an indication that a child has failed to reach his/her linear growth potential and did not gain sufficient height for their age. Stunting results from extended periods of insufficient dietary intake and a poor dietary quality (De Onis *et al.,* 2006). A z-score <-2 SD is categorised as stunting and a score <-3 SD is categorised as severely stunted (De Onis *et al*., 2007).

2.8.3 BMI-for-age

BMI is calculated as weight(kg)/height(m^2) (Gibson, 2005). BMI-for-age complements height-for-age in the assessment of thinness (low BMI-for-age), overweight and obesity (high BMI-for-age) as weight-for-age is inadequate for monitoring growth beyond childhood due to its inability to distinguish between relative height and body mass (De Onis *et al*., 2007).

2.8.4 Weight-for-height

De Onis *et al*. (2007) state that weight-for-height measures body weight in proportion to height and low weight-for-height is described as thinness and reflects a process of failure to gain sufficient weight or losing weight. This process is also referred to as wasting. Weight maybe appropriate for height in stunted children, however, in wasting, weight is very low for height as a result of significant loss in both muscle and fat mass (Gibson, 2005).

2.9 Strategies to address malnutrition in South Africa

The following strategies are implemented in South Africa to address malnutrition:

2.9.1 Food fortification

To address the high prevalence of micronutrient deficiencies as identified in the NFCS of 1999 and the SAVACG study in 1994, the DoH implemented a compulsory food fortification programme (Witten, Jooste, Sanders and Chopra, 2003). Food fortification has the advantage of being able to improve the intake of nutrients of large segments of the population without involving drastic changes in food consumption patterns. However, food fortification can only be a cost-effective method to improve micronutrient deficiencies if the foods which are fortified are consumed by a large proportion of the targeted population (WHO and FAO, 2006). The NFCS of 1999 established that the five most commonly consumed staple foods in South Africa to be: maize, sugar, tea, whole milk and brown bread (Labadarios, 2000). Salt was fortified with iodine in 1995 and in October, 2003, it became legally applicable to fortify maize and wheat flours with eight micronutrients. These micronutrients are: vitamin A, thiamin, riboflavin, niacin, folic acid, pyridoxine, iron and zinc.

Studies conducted in 2005 and 2007 respectively, indicated significant weight gain and an improved vitamin A status in rural African children and a significant improvement in the folate status of non-pregnant women of childbearing age, before and after fortification of foods (Nesamvumi, Vorster, Margetts and Kruger, 2005 and Modjadji, Alberts and Mamabolo, 2007). Labadarios *et al*. (2008) stated that folic acid and iodine deficiencies have decreased. The study conducted by Modjadji *et al*. (2007) did not show a significant increase in the iron status of the non-pregnant women. Although individual studies showed a decrease in micronutrient deficiencies, the 2008 Fortification Baseline (based on the NFCS of 2005) indicated less progress in the two years of fortification since 2003 (Labadarios *et al*., 2008) with the prevalence of poor iron, vitamin A and zinc status in children to have increased.

2.9.2 Promoting the diversity of food intake

Dietary diversification means increasing the amount and the variety of micronutrient-rich foods consumed (WHO and FAO, 2006). According to Kruger, Hendricks and Puoane (2008), increasing the diversity of food intake is the most sustainable way of addressing micronutrient malnutrition as it can address several micronutrient deficiencies concurrently. Increasing dietary diversity also improves the intake of components in foods such as antioxidants and probiotic substances that has been established to play an important role in protection against non-communicable diseases and for strengthening the immune system (WHO and FAO, 2006). Adequate access to micronutrient-rich foods can become a barrier in this type of intervention. However, production of these foods can take place through household vegetable and fruit gardens, school-based gardens and animal, poultry and fish production (FAO and International Life Sciences Institute (ILSI), 1997).

Faber, Phungula, Venter, Dhansay and Benade (2002) confirmed that establishing home gardens focusing in the planting of yellow and dark-green leafy vegetables increases the serum retinol concentrations of children 2–5 year old. Although the dietary intake of a variety of vegetables and fruit can improve the intake of provitamin A carotenoids as well as folate and vitamin C, the importance of foods from animal sources to improve dietary quality is increasingly being recognised (WHO and FAO, 2006). Apart from the fact that animal products such as eggs, milk and organ meats contain the active form, namely retinol, consumption of these foods can also lead to an increased dietary intake of iron, zinc, thiamin, riboflavin and vitamin B6 and B12 (Krebs, Westcott, Butler, Robinson, Bell and Hambridge, 2006).

2.9.3 Micronutrient supplementation

In South Africa, pregnant, lactating and post-partum women as well as infants and young children are specific target groups of the Nutrition Supplementation Programme. This programme is part of the Health Facility-based Nutrition Programme of the INP (DoH, 2003).

According to the DoH (2003), vitamin A is administered according to a schedule indicating specific dosing to infants 0–11 months, children 12–60 months, pregnant

women and all post-partum women within 6–8 weeks after delivery. The purpose of the supplementation is to reduce child mortality and to improve maternal health (Moeng and De Hoop, 2008).

All pregnant women with a haemoglobin level of ≤10g/dL should be given a 200mg ferrous sulphate supplement daily for the duration of the pregnancy to prevent iron–deficiency anemia and five mg folic acid for the first trimester to prevent birth defects (DoH, 2003).

Sazawal (2007) reports that supplementation of zinc needs to be considered as fortification may not entirely address zinc deficiency problem, however the role of zinc supplementation in public health policy to improve mortality, morbidity, growth and development in young children needs to be further investigated.

2.9.4 Nutrition education and promotion

The purpose of nutrition education is to change habits and nutrition–related behaviours that may contribute to poor food choices (Andrien, 1994). Nutrition education will be discussed in more detail in Chapter 3.

2.9.5 Other Government initiatives

The INP, formulated by the DoH, aims to address malnutrition through a more integrated and focused approach. Specific focus areas and support systems were identified. The focus areas are disease-specific nutrition support, treatment and counselling, maternal nutrition, infant and young child feeding, youth and adolescent nutrition, micronutrient malnutrition control, food service management, nutrition education, promotion and advocacy and lastly, community-based interventions. Support systems include the nutrition information system, human resource plan and the financial and administrative system (DoH, 2008).

The Integrated Food Security and Nutrition Programme (IFSNP) (Department of Agriculture (DoA, 2002), aims to eliminate hunger, malnutrition and food insecurity by means of a developmental approach which involves the public, private and civil sectors through partnerships. The IFSNP is supported by various government departments in achieving its goals, including the DoH, Department of Public Works

(DoPW) and the Department of Social Development (DoSD). Some of the strategic objectives of the IFSNP are to enhance household food production and trading, develop income generation and job creation, and to improve nutrition and food safety. Part of the IFSNP is the distribution of food parcels by the DoSD to vulnerable groups including children and child–headed households, orphaned children, people with disabilities, female-headed households and HIV and AIDS affected households. The food-based contents of the food parcels are maize meal, tinned pilchards, sugar, soya mix, cooking oil, dry peas, rice, dry beans, salt and peanut butter.

The Primary School Nutrition Programme (PSNP) was implemented by the DoH in 1994 with the purpose to address the effect malnutrition has on the learning ability of children. In 2004, the PSNP was transferred from the DoH to the Department of Education. Specific targeting strategies are used for school feeding including identifying geographic areas with high levels of poverty, rural and farm schools and prioritising grade R learners (Behr, 2008). It is recommended by the DoH that the menus planned must meet 20 to 30% of the recommended Dietary Allowances for 7-10 year old children for the following nutrients: protein, calcium, iron, zinc, vitamin A and energy (Food and Nutrition Board, Institute of Medicine, 2000).

2.10 Nutrition interventions to address the impact of HIV and AIDS on children and adolescents

Figure 2.2 illustrates how nutrition interventions such as nutritional assessment and nutrition education can transform the cycle of malnutrition and HIV into a cycle of improved nutritional status and a stronger immune response (FANTA, 2008). This framework illustrates that by improving living conditions (including source of revenue), providing food products (supplementary or therapeutic), micronutrient supplementation, nutrition assessment, education and counselling result in availability of resources and transformed knowledge on an individual and household level. This in turn has an effect on food access and dietary/hygiene practices which affect the food intake, health and nutritional status of a PLHIV.

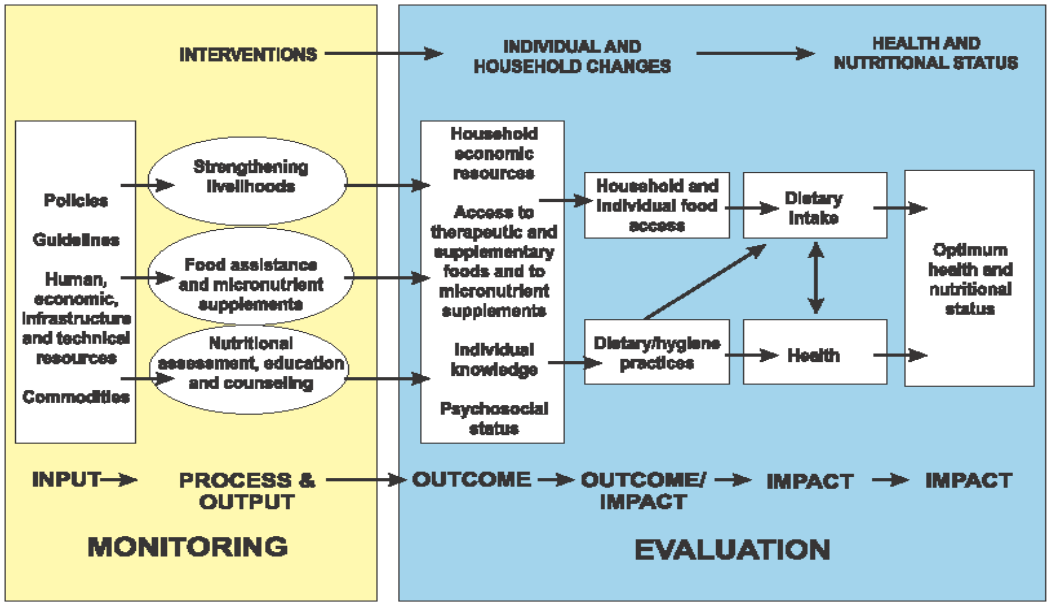


Figure 2.2: Conceptual Framework of Food and Nutrition Interventions addressing HIV and AIDS (Adapted from: FANTA, 2008).

A study conducted in Botswana concluded that continuous nutrition screening can assist in identifying the people living with HIV and AIDS with a BMI of >18.5 kg/m² who are at high risk developing malnutrition. Well-timed nutrition interventions can then be implemented in order to prevent deterioration in nutritional status (Nnyepi, 2009).

2.11 Consequences of malnutrition

Malnutrition slows economic growth and causes poverty to continue (Nelson, 2006). The negative impact of malnutrition on the economy of a country is due to loss in productivity because of poor physical status of individuals, poor cognitive development and insufficient education (The World Bank, 2006). Micronutrient nutrient deficiencies, especially anaemia, lead to reduced productivity suggesting that economic productivity is weakened by undernutrition. Illness causes days lost from productive work which is a direct effect on productivity. Furthermore, reduced

stature and lower lean body bass due to impact of early childhood malnutrition on the physical development of a child are linked to lowered work capacity as measured by strength and endurance (Manary and Solomons, 2004).

2.12 Conclusion

It is evident from the literature that there is a strong relationship between nutrition and health. Nutritional conditions such as undernutrition results in declined physical and mental development, a weakened immune system with an increased risk to infections while overnutrition causes obesity with an increased risk of developing non-communicable diseases (Vorster, 2009). Therefore, investing in nutrition can minimise the serious economic and social consequences associated with malnutrition. Policies and programmes should include a variety of interventions – from food assistance to educating the consumers. In Chapter 3 nutrition education as such an intervention will be discussed.

CHAPTER 3

LITERATURE REVIEW: NUTRITION EDUCATION

3.1 Introduction

In December 1992 at the International Conference on Nutrition, 150 countries collectively adopted a World Declaration and Plan of Action for Nutrition (Food and Agricultural Organisation of the United Nations (FAO), 1993). The plan identified poverty, social inequality and the lack of nutrition education to be the basic causes of malnutrition. It further emphasised that the major focus should be on strategies and actions to promote better nutrition through a variety of agricultural and developmental policies and programmes by including nutrition goals into policy planning and implementation. The FAO also stresses that addressing the challenges of a lack of trained personnel in nutrition as well as a shortage of suitable training materials is essential in order to reach the Millennium Development Goals (MDG's) (FAO, 2005). Furthermore, the DoH (2008), through the INP, identifies nutrition education as a main focus area.

3.2 Purpose of Nutrition Education

The main purpose of nutrition education is to provide individuals with adequate and accurate information, skills and motivation to buy, produce and consume the correct foods to stay healthy and to lead an active life (FAO, 2004 and DoH, 2003). Nutrition education is an instructional method to encourage and promote behavioural change relating to food choices, dietary habits and general health. Therefore, nutrition education is not merely imparting of information, but also changes current behaviour patterns to improve nutrition (Contento, Randel and Basch, 2002). Developing nutrition education programmes (NEP) that are focused on information that is useful to an individual and on strategies to improve food security and better use of available food and economic resources will make sure that behaviour change is facilitated (FAO, 2004 and Boyle, 2003).

As illustrated in Figure 3.1, nutrition education opportunities range from merely providing general information to actual interventions to generate behavioural change (The American Dietetic Association (ADA), 1996).

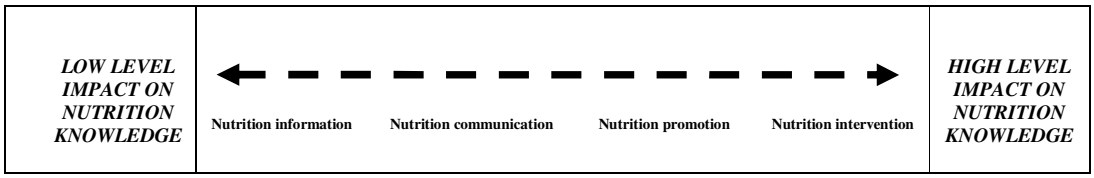


Figure 3.1: The range of nutrition education opportunities (adapted from ADA, 1996).

General nutrition information is mostly provided through the media and the purpose is to meet consumer interests (ADA, 1996). Nutrition communication on the other hand, is communication designed to support the objective of nutrition education by supporting and underpinning the education (Schwartz, 1996). Nutrition promotion is consumer-orientated messages based on translated science-based dietary information that aids the appropriate eating behaviour and lastly, nutrition intervention is the planned change to empower individuals and communities to make healthier food choices and improve existing practices (ADA, 1996).

3.3 Theoretical frameworks or models for nutrition education

In nutrition education a combination of theories and models are often used to achieve the desired outcome (Contento, Balch, Bronner, Lytle, Maloney, Olson and Swadener, 1995). The authors also emphasise that it is evident that strategies promoting behaviour change involve a combination of theories and models. Table 3.1 summarises the theories and models most commonly used in nutrition education.

Table 3.1: Theoretical frameworks and models for nutrition education (Contento *et al.*, 1995)

<table>
<tr><th colspan="2">Knowledge-attitude-behaviour model</th></tr>
<tr><td colspan="2">An increase in new nutrition knowledge results in changes in attitude, which in turn, leads to improved dietary practices. The knowledge supplied must be both motivational and instrumental (how-to) to bring about changes in attitudes and behaviour.</td></tr>
<tr><th colspan="2">Motivations-behavioural change-community development models</th></tr>
<tr><td colspan="2">Various factors that are expected to contribute to the success of nutrition education are carefully investigated and measured. The interventions planned and implemented rely on variants or combinations of various models. As indicated below, some of the theories and models are appropriate to guide interventions directed at individuals and other are more suitable for communities.</td></tr>
<tr><th>Models of individual behavioural change</th><th>Models of community change</th></tr>
<tr><td>▪ Social psychological or expectancy-value models of motivation

The health belief model is the most commonly used model in this category. The emphasis is on the perceived threat as a motivating factor and the perceived benefits as providing a preferred path to action.

The theories of reasoned action and planned behaviour, personal beliefs about the expected outcomes of behaviour and the values linked to these outcomes represent “attitudes”. These attitudes influence behavioural intention which is claimed to be the key predictor of behaviour. The planned behaviour theory also adds the variable of perceived control.</td><td rowspan="2">▪ Community organisation and social action models

The empowerment of the community is the focus point of these models. This is achieved through identifying the community’s needs, mobilising the resources and solving the existing problems.

The most common of these models are social planning, “developing the locality” and social action. Social planning emphasises rational problem-solving using and outside expert, while in communities with a weak structure, developing the identity and sense of community may be necessary. Social action may be necessary in communities where there is conflict between community leaders and potential health beneficiaries.

Community interventions are directed at food availability and accessibility issues as well as changing behaviour.</td></tr>
<tr><td>▪ Social learning theory

In this theory, cognitive processes are considered to be important fundamental influences on human motivation and behaviour change, and not just training, reinforcing or learning. Emphasis is placed on the interactive nature of the effects of cognitive and other personal factors and environmental events on behaviour.</td></tr>
<tr><td>▪ Consumer information-processing models

These models are based on the argument that people have limited ability to store and retrieve information to make rational decisions quickly. In order to make a decision, individuals search internally (memory) first, and should enough information not be found, then the environment is searched. Therefore, providing useful and</td><td>▪ Diffusion of innovations theory

The adoption of an intervention (innovation) by a community is based on the compatibility of the intervention with current beliefs, values and habits of the community. A new intervention would also be adopted by a community more successfully if the members of the community are involved in both the</td></tr>
</table>

<table>
<tr><td>relevant nutrition information in the environment would be important.</td><td rowspan="2">development and in the methods applied.</td></tr>
<tr><td>▪ Communications planning models

These models are used as tools or frameworks for implementing theories as it describe the process taking place between the sender and the receiver in the communication process. These models are effective to bring about changes in both behaviour and mediating variables such as beliefs, values and attitudes.

Social marketing is another planning tool for implementing nutrition education and will be discussed separately.</td></tr>
<tr><td colspan="2">Integrated models</td></tr>
<tr><td colspan="2">Most interventions use a combination of the above theories and models. The PRECEDE-PROCEED framework is integrates many of the theories of individual and community change as discussed above. The PRECEDE component is a needs assessment activity which categorises the various social psychological theories and environmental factors that may impact on health as predisposing, enabling and reinforcing factors. The PROCEED component facilitates the planning, implementation and evaluation of not only educational, but also policy and organisational strategies.</td></tr>
</table>

3.4 Advances in nutrition education

Past approaches in nutrition education proved to be unsuccessful as the education methods applied have merely led to an increase in knowledge and not the desired behaviour change (FAO, 1995 and Andrien, 1994). Andrien (1994) states that this was mostly due to ineffective communication methods and the unsuitable content of the messages. The author iterates that this frequently occurred because the educators ignored the specific cultural context of the community. This conservative approach is restricted as it excludes an examination of the causes of malnutrition.

However, over the past years several approaches have been developed by combining theories and models previously discussed and these have been effectively applied. Of these, the most prominent approaches are: social marketing, development-support communication and social mobilisation (Stuart and Achterburg, 1997).

3.4.1 Social marketing

In social marketing, business marketing principles are applied to plan, implement and evaluate a Nutrition Education Programme (NEP). Four elements are used to make up the marketing mix namely; product, price, place and promotion to bring about behaviour change (Contento *et al.*, 1995). This approach further imitates the belief that by providing information only is inadequate to bring about desired behaviour change in the target audience and that the decision to change behaviour is influenced by social cultural, political, environmental and practical factors (Stuart and Achterburg, 1997). For this reason, social marketing programmes focus on identifying and satisfying the needs and wants of the target audience. Consumer research identifies these needs and wants as well as beliefs, values, attitudes, lifestyles, habits and decision-making processes (Contento *et al.*, 1995). Health or nutrition programmes are then designed for the specific target audience with the right message, at the right place for the product at the right price. Programmes are closely monitored and feedback from the participants can then be used to change the mix (Contento *et al*., 1995).

The steps in planning and implementing a social NEP are (FAO, 1997a):

- Firstly, the existing nutrition situation should be carefully analysed to establish the current knowledge, attitudes and practices of the target audience in order to determine the specific needs and expectations of the group,

- Secondly, messages should be developed that are receiver-orientated and at the same time taking into account the locally available resources and cultural milieu so that behaviour change can be facilitated, and

- Lastly, the most suitable channels of communication are selected to convey the messages developed. A combination of strategies (multimedia) is usually applied to communicate to the target audience.

3.4.2 Development-support communication (DSC)

Development-support communication is described as the methodical use of suitable communication channels and techniques to increase the community's participation in development. Individuals in rural populations at the grassroots level is hereby informed, motivated and trained (Stuart and Achterburg, 1997). The community-based approach to nutrition education highlights the significance of active community participation in the design, implementation and evaluation of the educational process (FAO, 1997a). Stuart and Achterburg (1997) indentify the sub-systems in this approach that furnish the framework for planning, implementation and evaluation as:

- DSC action plan or process model which provides a systematic approach to changing and exchanging knowledge, attitudes and practices. This sub-system has four main stages namely, pre-planning, planning, implementation and post-implementation with corresponding steps and activities. It also allows for adjustments according to the local settings and realities.

- The DSC training plan recognises the importance of capability and capacity building for all participants in a development programme in order to support sustainability of the programme. The eight steps in the training plan are: training needs assessment, setting training objectives, selection of the training format, preparation of programme content, development of support materials and media, conducting the training and evaluation.

- The DSC management plan is an important part of the system as it requires cautious management of people, resources and time. This involves planning, staffing, budgeting, controlling, guiding and co-ordinating activities, setting policies and standards, as well as monitoring and evaluation.

The FAO (1997b) confirms that through this approach, the nutrition educator can empower communities by identifying and evaluating factors that influence malnutrition and assist communities in finding solutions and implementing actions to overcome nutritional problems. A study conducted by Walsh, Dannhauser and

Joubert (2003) in a coloured community confirmed that a community-based NEP can have a positive impact on current knowledge of nutrition and dietary practices.

3.4.3 Social mobilisation

Social mobilisation is a process whereby active and co-ordinated participation of all sectors at various levels of a community is mobilised in order to assist and hasten the improvement of the situation of children, women and other vulnerable groups (Stuart and Achterburg, 1997). The purpose of social mobilisation is to accelerate the delivery of basic services and to encourage convergence and create resources for children and women's programmes (FAO, 1995). To facilitate a high level of commitment amongst all the participants in this approach, several strategies are employed (Stuart and Achterburg, 1997), namely:

- Promotion at various levels to persuade the role players to adopt the relevant policies and to allocate the necessary resources.

- The use of all the available and possible communication approaches, resources, techniques, channels, methods and tools to reach the target groups. This is to ensure the establishment of a long-term programme that is part of all sectors of the community. Some examples are: printed materials, radio spots, jingles, documentaries and messages integrated into existing communication programmes and services.

- Training of the implementers of the programme allows for the opportunity to increase knowledge, appreciation and mobilisation of the available community resources

- Community organising facilitates further community participation through capacity building. This assists the community in problem solving, identifying their own needs, decision making and combined action to solve problems.

- The implementer of the programme also networks with institutions, agencies and organisations to establish linkages with those who can assist in the programme. This approach can assist communities to improve limited resources and services.

- Monitoring and evaluation of the programme is conducted to establish the effectiveness of the programme. The programme is adjusted based on the results to improve the impact.

3.5 Components of an effective NEP

A NEP should have at least three components to ensure effectiveness. These components are (FAO, 2004):

- Increasing nutrition knowledge and consciousness of the public and policymakers,
- Promoting desirable healthy food choices and nutritional practices, and
- Increasing variety and quantity of family food supplies.

Furthermore, effective communication of educational messages should (ADA, 2007):

- Focus on serious and high-priority personal and/or public health needs,
- Provide a practical, positive and realistic approach,
- Encourage an agreeable guide to food and activity choices as part of a long-term overall healthy lifestyle,
- Use successful learning strategies based on theories and models that promote behavioural change, and
- Assess and share information on effectiveness of the intervention programmes.

Nutrition education programmes have to take into consideration the access to and nature of the food supply as well as the cultural and habitual practices within a community (refer to Figure 3.2). The purpose of nutrition education should be to enhance the ability of households to use accessible resources, introduce ways to produce food at the household level and how to store, process, and prepare these foods (FAO, 1997b).

As indicated in Figure 3.2, the starting point in this model is the identification of nutrition related issues affecting the community. Dietary intake analysis and assessment of the nutritional status of the community are commonly used. However, a successful NEP will also consider environmental indicators such as poverty and income, social impacts including race, gender and age and lastly, the physical infrastructure such as housing and transport (FAO, 1997b).

The target groups identified in the community based on the assessment of the nutrition issues, can be primary, secondary or tertiary. The primary target group can include individuals at any stage of the life cycle or those with special needs. The secondary target group is those individuals who will be used to reach the primary taraget group and the tertiary target group is those who are able to facilitate or support the nutrition education program (FAO, 1997b).

To reach the target groups where they live, work and play, key settings are used. This allows for integration across disciplines and facilitates a much wider community involvement in addressing nutrition issues (Figure 3.2).

The education and communication methods selected should be based on what is suitable for the target groups and the setting. This process will be discussed in detail in the next section of the literature review.

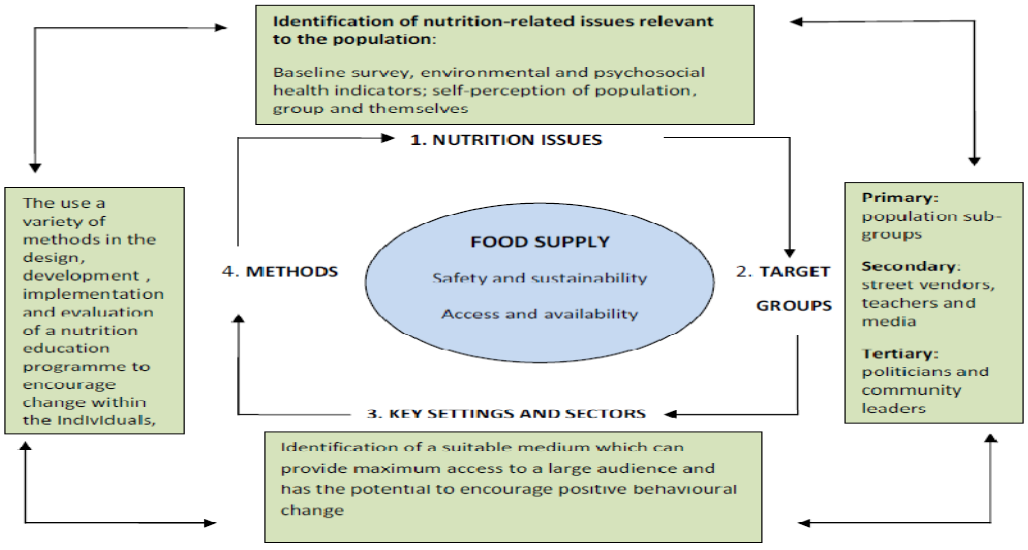


Figure 3.2: A framework for nutrition education programmes (FAO, 1997b).

A fourfold strategy namely, Participatory Action Research (PAR), nutrition communication, supportive activities and evaluation, used in Thailand in 1998 to address malnutrition, enabled the participants to identify nutritional problems and then proceeded to work with development agents to develop a community-based intervention programme. This intervention included a variety of supportive nutrition communication media and activities that was suited practically with village life and people's interests (Tontisirin, Attig, Winichagoon and Yhoung-Aree, 2000). An intervention in rural China in 1995 with the purpose to change nutrition and food hygiene behaviour showed great changes as compared with a control district. The implementers linked the success of the intervention to the support experienced from the community leaders. The focus of this intervention was primarily on the women who had control over food selection and preparation. A comprehensive communication strategy using media programmes and interpersonal communication was implemented to achieve the success (Tontisirin *et al*, 2000).

3.6 Planning and development of NEP

Andrien (1994) affirms that planning is essential for the successful implementation of a nutrition education intervention. A framework has been developed which separates the process into four phases: conceptualisation, formulation, implementation and evaluation (see Figure 3.3).

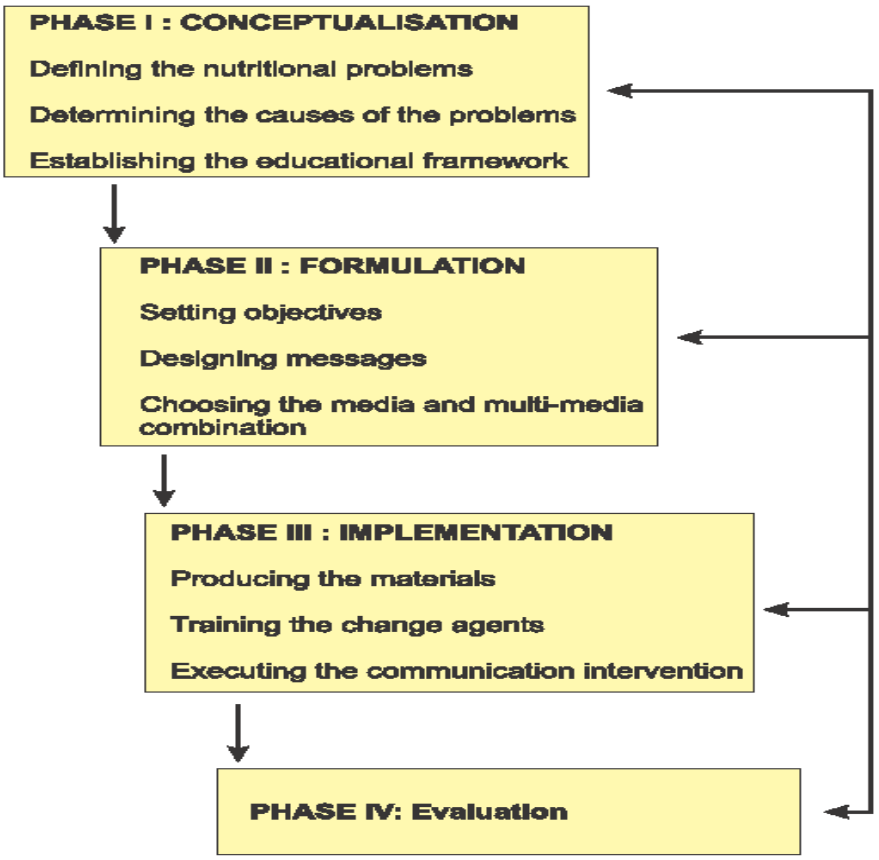


Figure 3.3: A framework for preparation, formulation, implementation and evaluation of NEP (Andrien, 1994).

3.6.1 Phase 1: Conceptualisation (preparation)

3.6.1.1 Defining the nutritional problems

The scope of a nutritional problem is determined on the basis of the assessment of nutritional status of the target community. The assessment of nutritional status of a group or groups within a community requires a single or a combination of direct and or indirect methods depending on the purpose of the assessment. Direct methods are: dietary surveys, identification of clinical signs, laboratory tests and anthropometric measurements. Indirect methods include analysis of existing health statistics relevant to the community, assessment of environmental factors such as socio-economic

factors, sanitation and water supply, access to health services and cultural factors (Andrien, 1994). The main nutritional problems in developing countries were discussed in Chapter 2.

3.6.1.2 Determining the causes of the nutritional problems

Due to the fact that the cause of nutritional problems in a community is the result of the complex interaction between socio-economic, biological and environmental factors, it is important to carry out a causal analysis (Andrien, 1994). This approach will form the basis of a successful design and implementation of nutrition education. Andrien (1994) suggests that the researcher needs to establish an interdisciplinary and intersectorial group within the community who will then compile a list of the known or alleged factors that affect the nutritional status of the community. The group also identifies the causes of the problem and decides on which factors to act upon based on the cost, the acceptability and the presumed efficiency. However, planning a successful nutrition intervention not only requires identification of existing nutrition problems, but also an indication of the current knowledge of the participants (Matji, 2008 and Parmenter and Wardle, 1999).

3.6.1.3 Establishing the educational framework

Once the causes of the nutritional problems have been established, the researcher can examine the external and internal factors. External factors may include: economic (e.g. family income), social (e.g. current legislation), climatic (e.g. rainfall patterns) or geographic (the soil quality and composition). Andrien (1994) states that external factors are fundamental in planning a nutrition education intervention as they may avert or encourage the adoption of behaviour. Internal factors are motivation, knowledge, self-confidence, decision and skill. Motivation arises from the perception of the seriousness of the problem and the perceived consequences of maintaining or changing the behaviour. When there is sufficient motivation to alter behaviour, it is important to establish the current knowledge in order to know what changes to make. For individuals lacking self-confidence it is very difficult to alter behaviour. An individual who is self-confident may not necessarily change behaviour due to other priorities and decision-making is then driven by an individual's system of values and

that of the individual's reference group. Skills are needed once an individual has decided to adopt the behaviour. Knowing what to do and how to do it will empower an individual to make a change in the long term (Andrien, 1994).

Establishing an educational framework also requires an investigation into the channels of communication used in a community. Communication takes place through a variety of channels including interpersonal and mass-media based. Within a community, these channels may also include influential people or institutions (Andrien, 1994).

Various methods can be applied to obtain the necessary information on external and internal factors and suitable communication channels. These are a literature review, interviews in a central location (e.g. in the market place), in-depth individual interviews, focus groups and through observation. A Knowledge-Attitude-Practices (KAP) survey can also be used. However, the questionnaires used in this survey need to be carefully formulated (Andrien, 1994). The use of measuring instruments with little consideration of validity and reliability has resulted in nutrition knowledge being poorly assessed. This is evident in inconsistent reports on eating behaviour and its relation to nutrition knowledge (Parmenter, Waller and Wardle, 2000). According to Hendrie, Cox and Coveney (2008), the conceptualisation of nutrition knowledge is often considered to be one-dimensional and the tools used to assess this knowledge are not always assessed for validity and reliability.

A new knowledge measuring instrument should only be developed if an existing one cannot be found (Parmenter and Wardle, 2000). The authors also indicate that researchers often develop their own questionnaires to provide for the fact that the items included could be exactly relevant to the study. According to Katzenellenbogen and Joubert (2007), variables included in the questionnaire should be strictly based on the scope of the study and only questions necessary for achieving the stated objectives should be included. For the purpose of this study, a nutrition knowledge questionnaire to determine the nutrition knowledge of child care workers of immune compromised children was developed and tested.

The target population should always be kept in mind when formulating questions. Subject specific terminology should be avoided if the target population consists of people with limited knowledge of the subject (Katzenellenbogen and Joubert, 2007). Closed questions encourage a quick and more standardised data collection, but may restrict responses or may hinder the respondent in giving a truthful response (Katzenellenbogen and Joubert, 2007). Supply-type items take more time to complete and process (Nunnally, 1972) and the spelling ability of the correspondents could establish subjectivity (Grondlund, 1993). Selection-type format is easy to complete, less time consuming and the scoring and processing of the questionnaires are simpler (Babbie, 1975 and Grondlund, 1993).

Content and face validity of developed questionnaires can be ensured by allowing an expert panel to assess the items (Whati, Senekal, Steyn, Nel, Lombard and Norris, 2005). Content validity is evaluated by careful, logical analysis of the content by subject experts (Grondlund, 1993). Babbie (1975) states that during this process items should be reviewed in terms of accuracy, relevancy, clarity and suitability.

The use of two groups known to differ in nutrition knowledge can be used to determine construct validity (Parmenter and Wardle, 1999).

An instrument used in research is reliable if measurements taken on different occasions produce the same result (Turconi, Celsa, Rezzani, Biino, Sartirana and Roggi, 2003). The researchers' further state that there are two approaches to reliability measures. These approaches are internal consistency and temporal stability (test re-test reliability).

Andrien (1994) confirms that there is no single method that is best to collect data in order to establish an educational framework or identifying the issues, as each method has its advantages and disadvantages and it depends on the situation, objectives of the study and the available resources.

3.6.2 Phase 2: Formulation

3.6.2.1 Setting objectives

The key objective of a nutrition intervention is the enhancement of the nutritional status of the target group which can be accurately assessed by dietary, biochemical, clinical and anthropometric indicators. Educational objectives should bring about change in behaviour, level of motivation, knowledge, self efficiency, in preferences and skills. For an intervention to be effective, the communication objectives must focus on exposing the target group to the messages and on the retention of the messages by the group (Andrien, 1994).

3.6.2.2 Designing messages

According to Andrien (1994), the message is the formulation of a notion or idea to be conveyed to a specific target group, the media is the channel of communication through which the message is conveyed, and the support materials are the materials on which the message is conveyed. Support materials can include posters, radio programmes, pamphlets and booklets. When developing messages it is important to carefully consider the words to be used, the choice of media, the most suitable media-mix, the materials, the images and the colours.

In designing messages, the following guidelines should be kept in mind (FAO, 1995):

- Include only one key idea into a message and keep it short and uncomplicated.
- Give consistent, comprehensive information.
- Repetition is important.
- Suggest specific behaviour change.
- Make use of a theme.
- The message should be presented by a trustworthy source.
- Make use of positive expressions, avoid negative statements.

- Use humour that is not insulting to anyone.

The impact of a message can be enhanced considerably by visuals or images. The images selected must be able to draw attention, be clearly understood, relevant to the topic and acceptable to the target group (Andrien, 1994).

3.6.2.3 Choosing the media and multi-media combination

Face-to-face communication has been the traditional approach. Furthermore, evaluations of nutrition education confirmed that programmes which resulted in behaviour change depended on the social milieu and interpersonal interaction during which the participants had the opportunity to practice the new adopted behaviours and learned to resolve their own nutrition problems (FAO, 1997a). Mass media approaches, on the other hand, are based on marketing and communication models which are inclined to deal with simple messages or a distinct food or behaviour. The use of mass media has been successfully used in raising awareness of a nutrition issue and most commonly as part of a multi-media approach in order to support other strategies or face-to-face communication (FAO, 1997a and Behr and Ntsie, 2008).

The selection of the most suitable channel of communication (media) is based on several criteria (Andrien, 1994 and DoH, 2000):

- The cost of using the media, buying and producing the material.
- Accessibility of the target group to the media and their preference.
- Ease of use of the media.
- Credibility of the media.
- Community participation is encouraged.
- Frequency of emission of the message.
- Relation of the media to the objectives of the intervention.

Andrien (1994) substantiates that the media selected should be complementary and not competitive. A media mix should be chosen that enhances and strengthens the

message. Therefore, the best approach is to choose a number of corresponding media to capitalise on the potential for a successful intervention. Table 3.2 indicates the advantages and disadvantages of different channels of communication.

Table 3.2: Comparison of the different media used in nutrition education (Andrien, 1994 and DoH, 2000)

Advantages	Disadvantages
Face-to-face	
Provides detailed information Provides credibility Motivates individuals Support positive action Allows for personalising Allows for immediate feedback on new messages Follow-up is easy Reliable Encourages participation from the target group	Time consuming Expensive Reaches small numbers of individuals May not be acceptable to many individuals Requires training in practical skills and continuous support of field workers
Mass media	
Cost effective per contact Reaches large numbers of individuals More acceptable for many individuals May stimulate self initiated change Provides frequency of messages Provides timely information Important messages can be reinforced by through face-to-face communication and print channels	May have limited distribution in rural areas Dilution of content Follow-up is difficult Difficult to obtain feedback from the target group Weak engagement of the target group Difficult to streamline content for specialised target groups Unreliable

3.6.3 Phase 3: Implementation

3.6.3.1 Producing the materials

The development of materials calls for the collaboration of a number of individuals with various skills and experience. This multidisciplinary team may consist of a nutritionist who will be responsible for the message content, a graphic designer and a technician who may be involved in the production of the material (Andrien, 1994). The materials also need to be pretested. This can be done through focus groups or self-administered questionnaires. Pretesting should focus on the criteria of attention, understanding, personal relevance, reliability or credibility and acceptability (FAO, 1997a). The selection of the production unit depends on cost and availability of resources (Andrien, 1994).

3.6.3.2 Training the change agents

Implementers of the strategy need to be adequately trained. Assessment of the training needs, followed by the translation of these needs into training objectives and then finalising the training sessions content, methods, materials and evaluation procedures are the steps to follow (Andrien, 1994). Once this important task has been finalised, implementation of the strategy can begin.

3.6.3.3 Executing the communication intervention

The successful implementation of the intervention depends on how well this step is coordinated. It has been emphasised that no one medium or channel can notably change nutrition-related habits and therefore the use of various media that complement each other is used (Andrien, 1994).

3.6.4 Phase 4: Evaluation

Monitoring and evaluation have two important functions, namely to improve and develop programme activities as these are implemented, and to measure the outcome of a planned activity in other words to determine whether the objectives have been achieved (Andrien, 1994).

3.7 Tools for nutrition education

Living Standard Measures (LSM) can be used as a tool for NE as it provides information about people and local resources which can assist in dividing the total population into sub-groups. Age, educational level, occupation, economic class and use of media are used to identify specific segments in the total population. The nutrition educator can then develop different nutrition education messages for each group (FAO, 1997a).

In South Africa, FBDGs are used as a nutrition education tool. These guidelines were developed according to the FAO/WHO 10-step process for developing FBDGs (WHO, 1998). Food Based Dietary Guidelines are qualitative, action-orientated statements that express dietary goals in terms of foods, rather than nutrients (Vorster, Love and Brown, 2001). The FBDGs are stated in Chapter 4 as they were used to develop the nutrition education material for this study.

The Plate **The Four Food Groups** **The Food Pyramid**

Figure 3.4: Examples of NE tools used showing The Plate, Four Food Groups and the Food Pyramid (The United States Department of Agriculture (USDA), 2005).

Foregoing the development of the SA FBDGs, the Three, Four and Five Food Groups were used as tools for NE in South Africa. As a rule, the Three Food Groups were used for poorer people and those with inadequate education. The Four Food Groups and Five Food Groups were used generally with more affluent and educated people (DoH, 1999). Criticisms regarding the use of food groups are that these tools do not match the existing FBDGs; household food security is not necessarily taken into account when these tools are used and it implies that a meal is not balanced unless it contains foods from all the food groups (Behr and Ntsie, 2008). Furthermore, legumes are grouped with meat, poultry and fish items implying that these foods are nutritionally comparable. Food groups also do not refer to the use of beverages, sweets and alcohol.

Food guides are a visual presentation of dietary goals and guidelines and can be developed in a variety of graphic forms (Behr and Ntsie, 2008). The forms include: the food pyramid, the food wheel, plate and standards blocks (see Figure 3.4). For this approach to be effective, the guide should match the dietary guidelines, acknowledge commonly consumed foods and beverages and the illustrations used should be clearly understood (FAO, 1997a). Currently South Africa does not have a food guide.

The MyPyramid Food Guidance System (Figure 3.5) used in America is based on the total diet approach. However, concerns have been raised such as encouraging overconsumption of foods with insignificant nutritional value and the emphasis on including a variety of foods resulting in selecting a variety within a food group, rather than focusing on overall variety (ADA, 2007). Research conducted by the Centre for Nutrition Policy and Promotion at the United States Department of Agriculture (USDA) (2005), indicated that although the MyPyramid Food Guidance System enjoyed high levels of recognition, it was viewed as a general guideline and a need exists to make the recommendations more concrete and applicable to the consumer. Suggestions were made to colour code food groups depicted in the aid for easier recall. The graphics should be simplified and the messages should be individualised according to age and gender (USDA, 2005).

Figure 3.5: The MyPyramid Food Guidance System (USDA, 2005).

Food labels provide important information on the nutrient composition of food and can assist consumers to make informed food choices. When used in conjunction with dietary guidelines it can be a powerful nutrition education tool (Latham, 1997).

3.8 Impact of nutrition education

Nutrition education benefits the community as a whole as well as individuals within the target community. A community member as an individual can benefit in the following ways from a NEP (Ladzani, Steyn and Nel, 2000):

- Improved use of available resources as a NEP can influence the individual to make use of ground for agricultural development, thereby addressing household food security.
- Since each parent or caregiver will gain skills and knowledge to improve the quality of food consumed.
- The prevalence of malnutrition in children will be reduced as decreased micronutrient deficiencies are evident due to the fact that food security is addressed.
- Providing adequate dietary intake, children's immune systems are strengthened resulting in decreased medical costs.

On a community level, if the nutrition education is provided through schools and clinics, this in turn creates employment for health practitioners resulting in the growth and development of a community. The community also develops into a productive workforce due to the availability of good quality and quantity food (Sherman and Muehlhoff, 2007 and Ladzani *et al.*, 2000). Sherman and Muehlhoff

(2007) reported a marked improvement in children's alertness and motivation in Zambian Primary School after the implementation of a NEP. Results indicated that learners were more aware of the importance of eating regularly, dietary diversity, an adequate fruit and vegetable intake as well as the importance of legumes and fish. Personal hygiene practices such as hand washing also improved.

3.9 Conclusion

Nutrition education has been utilised globally and in South Africa to address nutrition related problems. The purpose of NE is not only to impart knowledge but to bring about behaviour change (Boyle, 2003). The need to integrate various models and theories emphasises the complexity of bringing about behaviour change during a nutrition intervention (Contento *et al.*, 1995). It is also suggested that considering health indicators as well as epidemiological factors within target groups allows for NE to become more people and health focused rather than disease focused. Due to rapid social and economic changes worldwide NE is a way to prevent rather than to cure malnutrition (FAO, 1997b). The research methods applied to conduct this study will be discussed in Chapter 4.

CHAPTER 4

RESEARCH DESIGN AND METHODS

4.1 Introduction

The FAO framework referred to in Chapter 3 is the strategy used to develop the nutrition education material and the process is discussed in this chapter.

The methods used in this study are described in detail in this chapter. The study was divided into three phases, namely Phase I: baseline survey (conceptualisation), Phase II: development of the nutrition education material (formulation), and Phase III: production of the materials (first step in implementation) (Andrien, 1994).

4.2 Objectives of the study

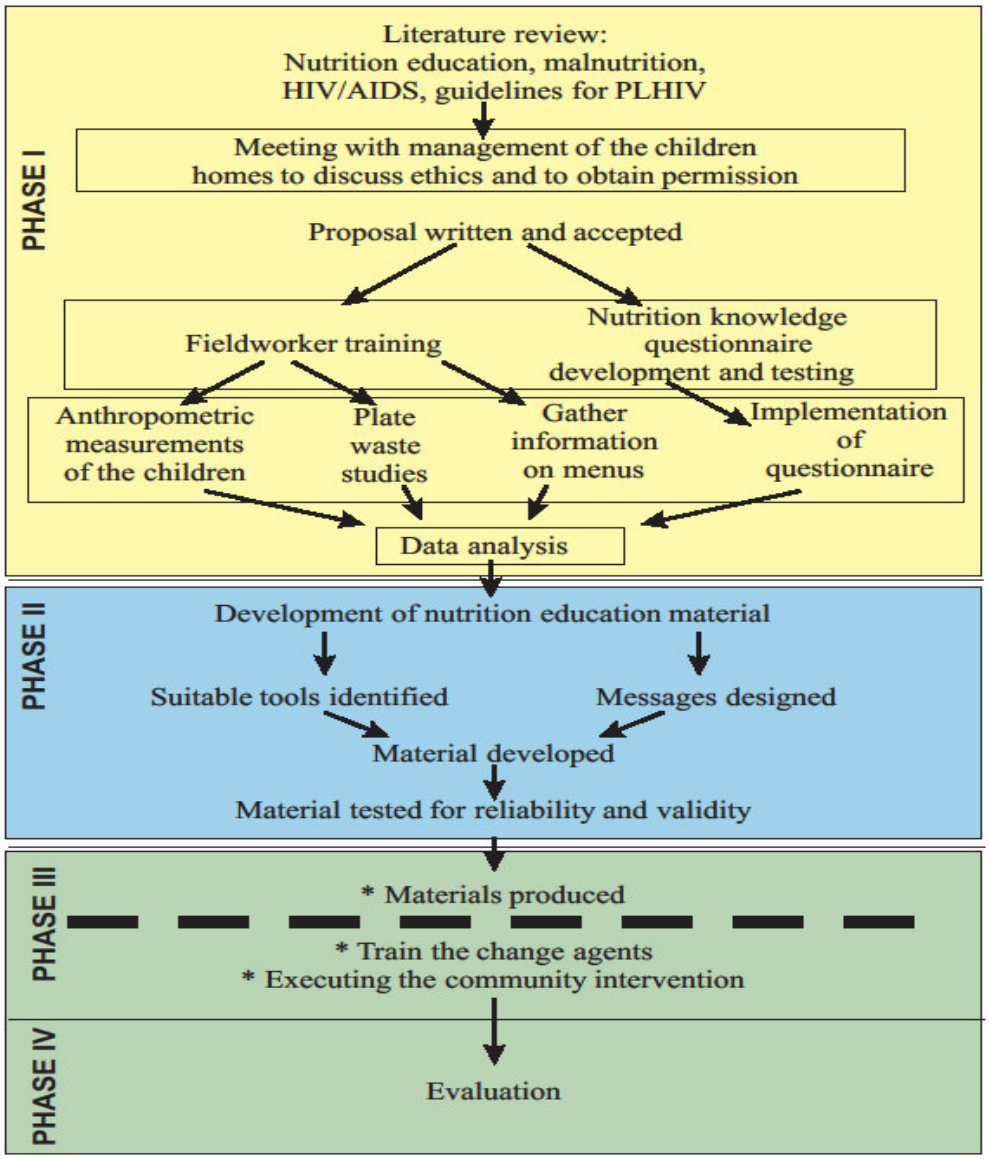
The purpose of this study was to develop reliable and valid nutrition education material for the child care workers of immune compromised children resident in children's homes in the Durban area in order to maintain the child's immune system, to sustain healthy levels of physical activity and to optimise their quality of life.

The specific objectives included:

- To conduct anthropometric measurements to determine the nutritional status of the children currently residing in the children's homes.
- To analyse the dietary intake of the children.
- To determine the current nutrition knowledge of the child care workers through the use of questionnaires.
- To develop nutrition education material by designing appropriate messages to address the nutritional needs of the immune compromised children.
- Select suitable media and images.
- To produce the educational material and test it for validity and reliability.

4.3 Conceptual framework of the study

Figure 4.1 illustrates the conceptual framework of the study. The researcher was responsible for all the steps identified in the framework. These steps are discussed in this chapter.



* The research reported in this dissertation included the step in PHASE III during which the materials were produced. The following steps, namely training the change agents and executing the community intervention will form part of a Doctoral qualification.

Figure 4.1: The conceptual framework for the study

4.4 Phases of the study

4.4.1 Phase I: Baseline survey

During this phase of planning a nutrition education intervention, also referred to as the "educational diagnosis", the researcher should aim to identify the factors on which action must be taken clearly. The purpose is to adjust the relevant behaviours (Andrien, 1994).

A situational analysis was conducted in order to obtain information regarding the nutritional status of the children, the nutrient composition of the meals served in the children's homes and the current nutrition knowledge and kitchen hygiene practices of the child care workers.

4.4.1.1 Ethics

Basic ethics codes of behaviour as stipulated by the South African Medical Research Council were adhered to. These included (MRC, 2002):

- The participants must be treated fairly and with respect, their freedom of choice must be protected during the research.
- The researchers must be competent, professional, honest and fair.
- Confidentiality should be respected in all circumstances.

The proposal was also accepted by the ethics committee of the Durban University of Technology.

Taking the above guidelines into consideration, the intentions and motives for the research were presented at a meeting with the managers of the various children's homes on 20 February 2008. Aspects such as the competence of the supervisor and researcher, integrity, sensitivity and confidentiality of the information obtained were discussed. Permission was obtained from the Senior Manager: Residential Services on 12 March 2008 to enter the children's homes in order to observe practices, weigh and measure the children and to interview the child care workers (Annexure A). Participation by the child care workers and children was strictly on a voluntary basis. The purpose of the study was explained to all the participants. Confidentiality was

applied in that all the children and child care workers participating were allocated subject numbers and no names appeared in the data.

4.4.1.2 Sampling selection and procedure

This was an independent research project which was planned, implemented and evaluated by the researcher.

The residential care settings who participated in this study included all three of the children's homes in Durban managed by the Child Welfare Organisation. These homes are officially registered with the Department of Social Development as children's homes in terms of the Child Care Act of 1983 and the three children's homes were thus purposively selected. The study population included all the children in the homes as well as the child care workers employed permanently or part-time.

Each children's home consists of several houses in which up to fifteen children can reside (see Figure 4.2). These houses are equipped with a dining room and a kitchen (See Figures 4.3, 4.4 and 4.5). Child care workers are assigned to the houses and they work shifts to ensure that one is on duty at a time. The child care workers live in the house with the children when on duty supervising home work and social activities. The child care worker also takes responsibility for cooking and serving the meals as indicated on the cycle menu. The children may assist with this task. Dishwashing and general cleaning are done by the children, supervised by the child care worker.

Figure 4.2: A house housing 15 children at the Children's Home

Figure 4.3: A typical layout of the dining room and lounge area in the house

Figure 4.4: The dishwashing area in the kitchen of the house

Figure 4.5: The food preparation area in the kitchen

Three meals are served in the homes. A cycle menu is planned by the residential manager and then implemented by the CCWs. In all three homes the composition of the menus are similar. The composition of the meals is discussed in more detail later in this chapter.

Figure 4.6 illustrates the composition of the sample included in the study (this sample illustrated here excluded HIV-positive children):

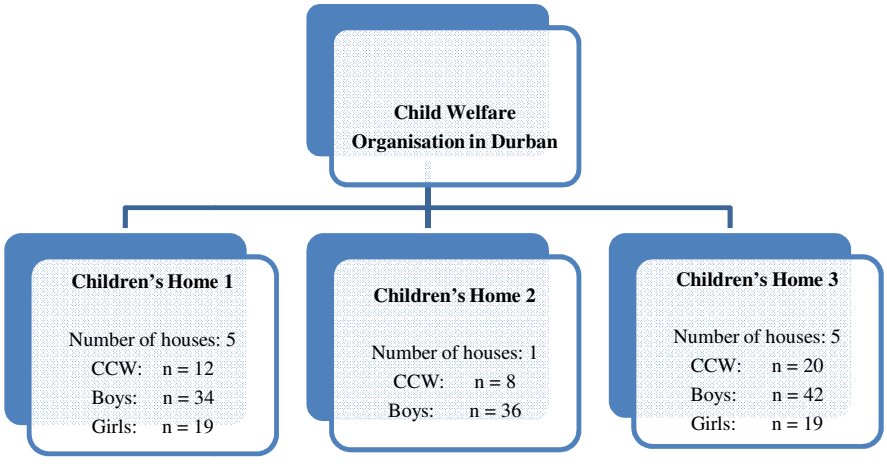


Figure 4.6: The study population included in the research project

The total purposive sample thus included: boys (5–19 years) n = 112, girls (5–19 years) n = 38 and CCWs n = 40.

The sample of HIV-positive children included boys (5–19 years) n = 3 and girls (5–19 years) n = 6.

The inclusion criteria included:

- All the children residing in the homes at the time of the study.
- Boys and girls.
- Age group: 6–19 years.
- All the child care workers employed permanently and on a part-time basis caring for the children.

In this study the following were excluded:

- Children aged 0–5 years.
- Children not residing in the children homes.

4.4.1.3 Fieldworker training

Third year students registered for the National Diploma: Consumer Sciences: Food and Nutrition were recruited to assist with the fieldwork. Fieldworker training was conducted on 4 June 2008. This three hour training session covered anthropometric measurements and recording these measurements accurately on a form (Annexure B). The fieldworkers participated in a practical session weighing and measuring. This session was supervised by the researcher (Annexure C).

A second training session on weighed dietary intake records was conducted on 9 June 2008. During this training session the fieldworkers were instructed on the steps to be followed during the process and the correct recording of the information. The method used is discussed later in this chapter.

4.4.1.4 Measuring instruments

a) Anthropometric measurements

The physical measurements obtained for this study to determine nutritional status were weight and height. The purpose of the measurements was explained to the children by the researcher. The researcher used an electronic, calibrated scale (Beuer, Germany) to measure weight. The children were weighed without shoes and in light clothing. The scale was placed on a flat, level surface in a private area. Before each child was weighed, the scale was readjusted to a zero reading. The child stood on the middle of the scale's surface looking straight ahead and was standing relaxed, but still. The fieldworkers made sure that the child was not holding onto anything. Once the child was settled and reading on the scale was stable, it was recorded to the nearest 0.1kg. The process was repeated with each child. An average of the two readings was calculated.

A stadiometer was used to measure height. The stadiometer was placed on a stable level surface. The children were measured without shoes or any head-coverings. The child was standing upright facing the front with arms at their sides. The child's legs were straight with their heels, knees, buttocks and shoulder blades touching the vertical surface of the stadiometer. The field worker made sure that the child's chin was level with the floor and that he/she was looking straight ahead before the measurement was recorded by placing their hand under the child's chin. Once the child was in position, the field worker lowered the head piece on top of the child's head making sure that it pushed through the hair. The measurement was read to a fieldworker who recorded it to the nearest 0.1cm. Two readings were taken and the average of the readings was calculated.

b) Dietary intake measurements

As illustrated by Figure 4.7, various methods were applied by the researcher to establish an accurate record of dietary intake. These are discussed in more detail in this section.

Figure 4.7: Various methods applied by the researcher to establish dietary intake.

• **Menus**

As discussed in Chapter 2, dietary intake measurements are usually done by FFQs and 24 Hour Recalls. For the purpose of this study, the researcher use plate waste studies for the following reasons:

- The children in all three the children's homes ate a similar menu.
- They only consumed food as indicated on the menu and no additional food was purchased as these children did not receive any pocket money.

Seven day cycle menus were collected from the children's homes. Weekly adapted menus were also considered as food donations were often received. Portion sizes of the menu items not weighed for example bread, margarine, brewed tea, polony and jam were established by means of observation and these portion sizes were confirmed by the CCW and the food buyer during interviews. The CCW's also stated that, regardless of the age of the child, the same portion sizes are dished up. This is a common practice throughout the various establishments and the reason for this is that the CCW's do not want the younger children to feel left out. Furthermore, it was also observed that all the food dished up was consumed by the children.

Breakfast consisted of a starch portion, milk and sugar. The lunch packed for school consisted of several slices of bread, margarine and a spread similar to the lunch

consumed when returning from school. Spreads used are mostly jam and peanut butter planned for 3 times per week. On certain days (at least twice per week) polony or vienna sausages are allowed. The care givers reported that some of the children chose not to take lunch to school. Sometimes leftover food was consumed for lunch. Dinner consisted of a protein rich dish, for example a meat or chicken stew, legume stew or sour milk, accompanied by a starch portion and a vegetable portion. The vegetable portion was either a cooked vegetable or a salad. A similar pattern was followed during weekends; however a dessert was included on a Saturday and Sunday. A fruit was included as an afternoon snack three times per week or more often when donations are received.

- **Plate waste studies**

As no standard guideline existed for the portion sizes served in the children's homes and the CCWs could not inform the researcher of the exact portion sizes, the researcher decided to conduct plate waste studies.

The sample size of the plates to be weighed was calculated using a power calculation and thus 100 plates out of a population of 150 children were used for this measurement. The following formula was used (Cole, 2006):

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

Where Z is the Z value (e.g. 1.96 for 95% confidence level) , p is the percentage picking a choice, expressed as decimal (.5 used for sample size needed) and c represents the confidence interval, expressed as decimal = .06 (three units on both sides of the normal) .

Food intake was measured on three occasions and observed during one lunch and tea time period. Measurements of plate waste were conducted on all the menu items served during the dinner period. Weighing stations were set up in each kitchen and

one trained fieldworker was allocated to each to observe and weigh the food portions. The fieldworker remained there for the duration of the dinner period. The plates used for dinner service were numbered. An electronic food scale (Micro CW weighing scale) was used to weigh each plate. This weight was recorded on a standard form (Annexure D). The plate remained on the scale and as each food item was added to the plate, the weight was recorded. Once the plate was returned to the kitchen after the child finished eating, it was weighed with the leftover food and the weight was recorded. The researcher supervised that no food was thrown out before the second measurement.

c) Development and validation of a self-administered nutrition knowledge questionnaire

The purpose of the nutrition knowledge questionnaire was to determine the current nutrition knowledge of the CCW's. The questionnaire included multiple-choice questions about the FBDG, National Guidelines on Nutrition for PLWHA, TB, and other Chronic Debilitating Conditions, Guidelines for the Management of HIV-infected Children and guidelines for food safety and hygiene practices and was intended for self completion by the respondents. The knowledge of the CCW on food sources of nutrients was also tested and these questions were linked to the food sources suggested in the National Guidelines on Nutrition for PLWHA, TB, and other Chronic Debilitating Conditions for a healthy immune system. For example, the HIV and AIDS guideline "eat meat, fish and poultry and eggs daily" was linked to the important role adequate animal protein intake plays in maintaining a healthy immune system (Hendricks, *et. al.*, 2007). Another example would be for the guideline "eat plenty of vegetables and fruit every day" where the importance of certain vitamins and minerals would be emphasised as it plays a role in maintaining a healthy immune system (Naude, Labuschange and Labadarios, 2008).

The decision to develop, rather than use an existing questionnaire was based on factors such as the knowledge of the child care workers, the length of the test (i.e. the test should not be too time consuming to complete) and the familiarity of the food items included (i.e. the use of pilchards on the menu). Some questions were taken

from existing questionnaires, for example from the nutrition knowledge questionnaire validated by the MRC (Whati *et al.,* 2005) and a nutrition knowledge questionnaire validated in the United Kingdom (Parmenter and Wardle, 1999). Questions were also formulated after studying the menus, observing practices in the children's homes and a study of the literature.

The questions were drafted by the researcher, a dietitian, and reviewed for content and face validity by a registered dietitian as well as an experienced researcher in the field of nutrition. A total of 44 items were originally included. The questions were reviewed in terms of accuracy, suitability and clarity. Suggested changes were made. A total of 25 questions remained after assessment by the experts. A section on personal data was included separately.

A total of 15 of the 25 questions from the questionnaire were administered to a sample group (n=10) of the CCW to evaluate the internal consistency of the questionnaire. These questions were randomly chosen. These CCW's were selected as they were part of the group of CCW's in the sample population. This process was repeated four times with one week intervals. After data analysis the internal consistency was not established and to determine the problems experienced, it was decided to conduct focus group discussions.

Two focus groups each consisting of the same ten respondents was held and the respondents' comments were qualitatively analysed. During these focus group discussions the respondents were asked whether the questions were meaningful to them and how to phrase the questions to ensure they are understandable and acceptable.

According to the recommendations from the focus group discussions, adjustments were made to the questions. These questions were once more tested for internal consistency by administering the questionnaire again to the same sample of the target group three times with one week intervals.

The final questionnaire (Annexure E) was divided into two main sections. Section A contained three categories of questions, namely, awareness of Food Based Dietary Guidelines and HIV and AIDS dietary guidelines, knowledge of food sources

relating to these guidelines and food safety and hygiene practices. Section B included information on personal data (refer to Table 4.1).

Table 4.1: The content of the final questionnaire.

Section	Description of the section	Questions	Total number of questions
Section A	**I**. Recommendations pertaining to The Food Based Dietary Guidelines and HIV and AIDS guidelines	1, 3, 4, 7, 10, 13, 14, 16, 17, 19 , 20, 21, 22	13
	II. Food sources of nutrients relating to HIV and AIDS	2, 5, 6, 8, 9, 11, 12, 15, 18,	9
	III. Food safety and hygiene practices	23, 24, 25	3
Section B	Personal information	1, 2, 3, 4, 5, 6 ,7	7

The finalised questionnaire was then administered to the second year Food and Nutrition students (n=31) (knowledgeable group) and second year Maritime Studies students (n=41) (non-knowledgeable group) twice with a two week interval. These groups were selected to make sure that one group had a greater knowledge of nutrition. Other variables such as age and socio-economic status were also reasonably similar in both these groups. It was established in similar studies (Parmenter and Wardle, 1999) that two weeks are long enough for the students to have forgotten their first responses, but yet not too long for a significant change to take place in nutrition knowledge. The first administration was to test for construct validity and the second administration to establish the test re-test reliability of the questionnaire. After this process, no changes were made to the questionnaire.

d) Implementation of the nutrition knowledge questionnaire

The final questionnaire was self-administered as the respondents (n = 40) were literate and were familiar with answering questions. Care was taken during the implementation of the questionnaire to prevent respondents influencing each other. This was done by instructing the respondents not to speak to each other, as well as positioning their chairs and tables some distance away from each other all facing the same direction as if writing a test.

4.4.1.5 Data analysis

a) Anthropometric measurements

The anthropometric measurements were captured and analysed by the researcher using the World Health Organisation's AnthroPlus version 1.0.2. (2010) Statistical software. The following indices were included: height-for-age (stunting), weight-for-age (underweight) and BMI- for-age (overweight and wasting).

The WHO growth standards for school-aged children and adolescents (WHO, 2008) were used to compare the anthropometric indicators. Height and weight measurements were categorised according to the z-scores as indicated in Table 4.2. Age was calculated in years from the date of birth to the actual date the child was weighed and measured.

Table 4.2: WHO Growth indicators and z-scores (WHO, 2008)

Z-score	**Growth indicators**			
	Height-for-age	**Weight-for-age**	**BMI-for-age**	**Weight-for-height**
Above 3	(see * below)	(see ** below)	Obese	Obese
Above 2			Overweight	Overweight
Above 1			Possible risk of overweight (see *** below)	Possible risk of overweight (see *** below)
0 (median)				
Below -1				
Below -2	Stunted (see **** below)	Underweight	Wasted	Wasted
Below -3	Severely stunted (see **** below)	Severely underweight	Severely wasted	Severely wasted

* A child who falls in this range is very tall. If the parents are both of normal height, this child should be referred as it may be an indication of an endocrine disorder

** A child whose measurement falls in this range may have a growth problem. Use the BMI-for–age to further assess

*** A plotted point above 1 indicates possible risk, however, a trend towards the 2 z-score line shows a definite risk

**** It is possible for a stunted child or severely stunted child to become overweight.

b) Dietary intake measurements

- **Dietary analysis of menus**

All seven days of the cycle menus were analysed by means of the Food Finder® Version 3 computer software program developed by the MRC and are based on the SA Food Composition Tables (Langenhoven, Kruger, Gouws and Faber, 1991). Average portion sizes were used as established by the plate waste studies method as well as observation of practices, interviews with the central buyer and focus group discussions with the CCWs. The data were captured by the researcher with the assistance of a trained post graduate nutrition student. The nutrient and energy intakes were analysed and compared to the DRIs, specifically the EAR and AI where the EAR were not available. The data were analysed to determine the adequacy of energy and nutrient intake. The minimum, median and maximum intakes with standard deviation were determined and compared to 100% of the DRI's. The macro-nutrient contributions were calculated as percentages of the total energy intake and compared with the joint WHO/FAO Expert Consultation recommendations (Nishida, Uauy, Kumanyika and Shetty, 2004).

- **Plate waste studies**

The researcher used the plate waste studies to calculate an average portion size per house and then per total sample for each menu item served. These average portion sizes were used in analysing the nutrient and energy content of the menus. Table 4.3 reflects the three meals and the menu items per meal for which average portion sizes were calculated. This is the typical menu pattern followed in all three children's homes.

Table 4.3: The meals and menu items for which average portion sizes were calculated

Meal	**Menu items**
Breakfast	Starch portion, milk and sugar
Packed school lunch/lunch	Bread, margarine and a spread* or Vienna sausages or polony **
Supper	Starch portion, protein portion and a vegetable portion *** Tea/coffee with milk and sugar

* Spreads included jam and peanut butter
** Viennas and polony are planned for twice per week
*** The vegetable portion included a salad **or** a cooked vegetable

Fruit was usually included three times during the week, but if a donation was received, it was included more often.

c) Development of the nutrition knowledge questionnaire

Data was captured on an Excel® spreadsheet by the researcher and analysed with the assistance of a statistician. To evaluate the internal consistency of the questionnaire the Cronbach's α value was determined when selected questions were administered to a sample group of CCWs. A value ranging from 0 to 1, with a minimum Cronbach's α value of 0.7 is generally accepted as an indication of internal consistency.

To evaluate the outcome of the focus groups, data were transcribed and similar recommendations were grouped together to determine the actual changes to be made to the questionnaire.

Pearson's correlation coefficient was used to measure test-retest reliability on the scores of the knowledgeable and the non-knowledge group who completed the questionnaires twice. The acceptable range of values for r were -1 to 1, where a value of $r = 1$ is evident of a perfect positive correlation and $r = -1$ a perfect negative correlation. A p-value ‹ 0.05 indicated a statistically significant result.

d) Nutrition knowledge questionnaire

The data on the completed questionnaires were captured on an Excel® spreadsheet by the researcher. The data were analysed with the assistance of a statistician for descriptive statistics (means, standard deviations and frequencies). Tables and graphs were drawn up with the percentages of the various variables included on the questionnaire.

4.4.2 Phase II: Development of the nutrition education material (NEM)

The problems identified in Phase I through the implementation of the questionnaires and other methods as indicated in Figure 4.7 directed to a great extent the design of messages in Phase II. As discussed in Chapter 3 and reflected in Figure 3.3, it is important to, before planning nutrition education messages, first define clear objectives. The messages and the materials used should be tested in the field and the analysis of possible channels of communication to select suitable media is important to ensure a successful intervention (Andrien, 1994).

4.4.2.1 Objectives of the nutrition education material

a) General objective

The main purpose of the NEM was to address the lack of knowledge of the CCWs and nonexistence of practices by CCWs to promote good nutrition as it relates to maintaining a healthy immune system of children in their care.

b) Specific objectives

The specific objectives of the nutrition education material were therefore to:

1. Provide information on healthy eating for CCWs caring for immune compromised children.
2. Improve the knowledge on practices regarding food safety and hygiene.

The following steps were followed by the researcher to achieve the stated objectives:

1. Various communication media were analysed to select the most suitable media to convey the messages.

2. The criteria to develop the messages were indentified and investigated and used to design appropriate messages and images.

3. The material was tested in the field for reliability and validity.

4.4.2.2 Selection of suitable media to use for NEM

After investigation of the literature and existing media used in nutrition education, the researcher devised questions to determine the most suitable media. The questions included several options of possible media as well as image, colour and language preferences. The questions used were phrased as follow:

1. What type of education material would you find most useful for your working environment?

2. Do you prefer images/pictures/illustrations or do you prefer words only?

3. Should the pictures be in colour or black-and-white?

4. What language do you prefer?

During the implementation of the final nutrition knowledge questionnaire (n=40), a short, additional questionnaire was attached addressing the media questions (Annexure E).

4.4.2.3 Message design and development of the material

The results of the nutrition knowledge questionnaires and the results of the dietary intake measurements were considered. The results were compared with existing nutrition guidelines pertaining to HIV and AIDS. This resulted in the development of a set of nine fridge magnets with various messages. The developed NEM will be further discussed in Chapter 5.

The guidelines used to compare the results were the SA FBDGs (Voster, Love and Browne, 2001), National Guidelines on Nutrition for people living with HIV, Aids, TB, and other Chronic Debilitating Conditions (DoH, 2007a) and Guidelines for the Management of HIV-infected Children (DoH, 2005). Gaps in nutrition knowledge and practices were identified and the messages were designed to specifically address these gaps.

The messages developed were based on the SA FBGDs and Guidelines for the Management of HIV-infected Children which are as follows:

- Enjoy a variety of foods.
- Be active.
- Drink adequate amounts of clean, safe water.
- Make starchy foods the basis of most meals.
- Eat plenty of vegetables and fruits everyday.
- Eat dry beans, peas, lentils and soya regularly.
- Chicken, fish, meat, milk or eggs can be eaten daily.
- Eat fats sparingly.
- Use salt sparingly.
- If you drink alcohol, drink sensibly.

Dietary guidelines are very broad and the purpose is to address current nutrition-related public health issues. As stated by Voster, Love and Brown (2001), these guidelines will have to be modified for groups with special dietary needs. Therefore, the researcher also referred to the adapted guidelines as available in existing nutrition education material published by the Department of Health and the Nutrition Department of the South African Sugar Association (DoH, 2007a and DoH, 2005).

The adapted guidelines considered were similar to the FBDGs with only a few changes. The differences noted included those relating to animal protein intake and the use of alcohol. These guidelines differ from the SA FBDGs in the following ways:

- Chicken, fish, meat, milk or eggs should be eaten daily.
- Do not take alcoholic drinks.

The adapted guidelines also included aspects relating to food safety and hygiene.

Dietary guidelines should also be accompanied by a visual tool which can assist to explain the guidelines further (FANTA, 2008). To make the messages more visual, images were used that were designed and tested by the Vaal University of Technology (VUT). Because these images were not validated in the community in question, they had to be re-tested. If no suitable images existed to explain a message, new images were designed and tested. The researcher consulted the same graphic designer who designed the VUT images as to ensure consistency. The researcher dictated to the graphic designer as to which images were preferred.

Once the original messages were developed and the images selected, an experienced researcher in the field of nutrition assessed the material for face validity. The recommendations were discussed with the researcher and the necessary changes were made to the messages and images.

4.4.2.4 Testing reliability and validity of the messages and material

The purpose of the study was to develop reliable and valid nutrition education material for CCWs caring for immune compromised children. To test the material developed a questionnaire was administered to a sample group (n=23) to measure the extent of how well the target population will understand the material. This was a self-administered questionnaire as all the respondents could read and write (Annexure F). The questionnaire consisted of two sections. In the first section the respondents had to explain in their own words what the images show. The responses were assessed using the descriptions as indicated in Table 4.4. For example, responses such as “children playing” or “healthy children” for Image 1 were considered as the correct

or likely response and for Image 4, “meat, tinned fish, chicken and egg” was taken as correct.

Table 4.4: The images used for the fridge magnets and the correct or likely responses that were taken as correct

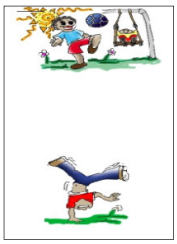
Image	**Correct/likely response**
Image 1: 	Children playing, healthy children, children playing outside
Image 2: 	A refrigerator with fruit and vegetables, store fruit and vegetables in the fridge
Image 3: 	A variety of fruit and vegetables, or name individual fruit and vegetables.

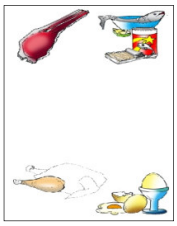
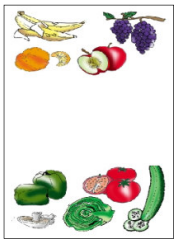
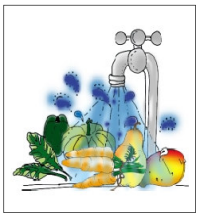
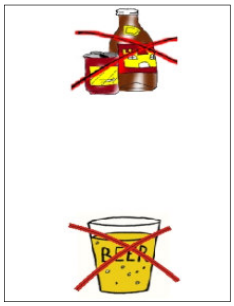
Image 4: 	Protein-rich foods, or name individual foods.
Image 5: 	A variety of fruit and vegetables, or name individual fruit and vegetables.
Image 6: 	Fruit and vegetables being washed with running water
Image 7: 	Do not drink alcohol, a glass with beer, a bottle with alcohol, the cross means not allowed

Image 8: 	A person washing dishes, hot water, soapy water
Image 9: 	Hands are washed under running water, sore is covered with a plaster

The second section required the images to be matched with a message. The acceptable range was taken as 80–100% correct/likely responses and borderline represented 60-79% correct/likely responses (Gaede and Oldewage-Theron, 2007).

The researcher captured the data on Excel® spreadsheets. This was analysed for descriptive statistics with the assistance of a statistician. The results were presented as percentages calculated in tables. No changes were made after the testing.

Once the images and the nine messages were tested and accepted, the production process began.

4.4.3 Phase III: Production of the materials

4.4.3.1 Production of the material

During this phase it was important to find a balance between quality and price. The font and image size was considered as to make it easy for the CCW to read the magnets on the fridge. The size of each magnet was 55mm across (width) and 95mm down (length). The researcher established by observation that this size was suitable for visual impact if used as magnets on a refrigerator. The printers planned the layout

and size of the magnets on an A4 size page and this was confirmed by the researcher. Once the magnets were printed, they were cut by machine. All the images on the magnets were printed in full colour.

4.5 Conclusion

The FAO framework (Figure 3.3 in Chapter 3) was used as the basis for the process followed to develop material. The researcher found this to be a very useful tool and it was a logical and systematic approach to developing nutrition education material.

The third and fourth phases identified in the FAO framework for developing nutrition education material are planned to be concluded for a doctoral study.

The results of this study will be presented in Chapter 5 according to the methods described in this chapter.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter includes the results from the data collected and analysed as stated in Chapter 4.

5.2 Phase I: baseline survey results

5.2.1 Anthropometric measurements results

The anthropometric indices for HIV-negative children (Table 5.1) indicated that 10.7% of the boys and 15.8% of the girls aged five to 19 were stunted and 3.6% and 2.6% were severely stunted respectively (height-for-age <-2SD on the WHO cut-off points). The majority of the boys (85.7%) and girls (81.6%) were of normal height-for-age. Eighty-one point two percent of the boys and only 39.5% of the girls were within the normal BMI-for-age range. One point eight percent of the boys and 2.6% of the girls were wasted. However, 15.2% and 39.5% of boys and girls respectively were at risk of being overweight (BMI-for-age >+1SD). Similarly, 1.8% of the boys and 15.8% of the girls were overweight (BMI-for-age >+2SD). Two point six percent of the girls were obese (BMI-for-age >+3SD) compared to none of the boys.

Table 5.1: Growth indicators for HIV-negative children age 5–19 years

Z-score	Classification	Boys (n=112) % (n)	Girls (n=38) % (n)
	Stunting (Height-for-age)		
< -3 SD	Severely stunted	3.6 (4)	2.6 (1)
< - 2 SD	Stunted	10 .7 (12)	15.8 (6)
>-1SD to +3 SD	Normal height-for-age	85.7 (96)	81.6 (31)

Z-score	Classification	Boys (n=112) % (n)	Girls (n=38) % (n)
	Wasting/Thinness (BMI-for-age)		
< -3 SD	Severely wasted	0	0
< -2 SD	Wasted	1.8 (2)	2.6 (1)
>-1SD to <+1SD	Normal	81.2 (91)	39.5 (15)
>+1 SD	Possible risk of overweight	15.2 (17)	39.5 (15)
>+2 SD	Overweight	1.8 (2)	15.8 (6)
>+3SD	Obese	0	2.6 (1)

As indicated in Table 5.2, 15.4% of the boys (5 to 10 years) were underweight (weight-for-age <-2SD) and 7.7% were severely underweight (weight-for-age <-3SD). However, the majority of the boys (76.9%) and all the girls in this age group were in the normal weight-for-age category.

Table 5.2: Growth indicators for HIV-negative children age 5–9 years

Z-score	**Classification**	**Boys (n=13) % (n)**	**Girls (n=6) % (n)**
	Underweight (Weight-for-age)		
< -3 SD	Severely underweight	7.7 (1)	0
< - 2 SD	Underweight	15.4 (2)	0
>-1SD to +3 SD	Normal weight-for-age	76.9 (10)	100 (6)

The anthropometric indices (Table 5.3) for the HIV-positive children (n=9) showed that one boy and two girls (66.6%) aged 5 to 19 were stunted (height-for-age <- 2SD) and one of the girls was severely stunted (height-for-age <-3SD). Two boys (66.6%)

and three girls (50.0%) were normal for height-for-age. None of the boys were wasted, however, one of the girls was wasted and one was severely wasted (BMI-for-age <-2SD). Three of the girls were at risk of being overweight (BMI-for-age >+1SD). None of the children were overweight or obese.

Table 5.3: Growth indicators for HIV-positive children age 5–19 years

Z-score	Classification	Boys (n=3) % (n)	Girls (n=6) % (n)
	Stunting (Height-for-age)		
< -3 SD	Severely stunted	0	16.7% (1)
< - 2 SD	Stunted	33.3 (1)	33.3% (2)
>-1SD to +3 SD	Normal height-for-age	66.2% (2)	50.0% (3)
	Wasting/Thinness (BMI-for-age)		
< -3 SD	Severely wasted	0	16.7% (1)
< -2 SD	Wasted	0	16.7% (1)
>-1SD to <+1SD	Normal	0	16.7% (1)
>+1 SD	Possible risk of overweight	0	50.0% (3)
>+2 SD	Overweight	0	0
>+3SD	Obese	0	0

None of the boys aged 5 to 9 years were reported to be HIV-positive. The results in Table 5.4 indicate that all the HIV-positive girls fell within the normal weight-for-age category.

Table 5.4: Growth indicators for HIV-positive girls age 5–9 years

Z-score	Classification	Girls (n=2) % (n)
	Underweight (Weight-for-age)	
< -3 SD	Severely underweight	0
< - 2 SD	Underweight	0
>-1SD to +3 SD	Normal weight-for-age	100 % (2)

5.2.2 Dietary intake measurements

5.2.2.1 Plate waste studies

The average portion sizes established through plate waste studies were used in the dietary analysis of the menus and are illustrated in Table 5.5. The average portion size for samp and beans and stiff pap were established to be 305g and 300g respectively. An average of 300g was analysed for these items. Average vegetable portions were 38.7g (butternut) and 41.5g (coleslaw). In the dietary analysis an average portion of 40g was used. The average portion size for rice was recorded as 253g and for analysis 250g was used. Protein sources weighed were pilchard stew and beef curry with vegetables. These average portion sizes were established to be 135g and 136.5g respectively. One hundred and thirty five grams were analysed for protein sources.

Table 5.5: Average portion sizes of menu items established through plate waste studies

Children's Home	Number of plates (n = 100)	Average portion size of menu item	Average portion size of menu item	Average portion size of menu item
Children Home 1		**Samp and beans with beef bones**	**Butternut, boiled with sugar**	**Coleslaw**
House 1	8	305g	37g	42g
House 2	9	270g	33g	35g
House 3	11	288g	40g	38g
House 4	9	310g	43g	49g
House 5	9	294g	38g	39g
House 6	8	363g	41g	46g
Average portion size		**305g**	**38. 7g**	**41.5g**
Children Home 2		**Rice**	**Beef curry with vegetables**	
House 1	9	307g	167g	
House 2	10	280g	155g	
House 3	10	181g	84g	
House 4	7	244g	140g	
Average portion size		**253g**	**136.5g**	
		Tinned pilchard stew	**Stiff pap**	
Children Home 3	10	135g	300g	
Average portion size		**135g**	**300g**	

Apart from plate waste studies, as stated in Chapter 4, the researcher also observed menus and practices, interviewed the central buyer and held focus groups with the CCWs to determine average portion sizes of menu items not weighed. Table 5.6 shows the results of these observations and interviews.

Table 5.6: Average portion sizes of menu items established by interviews and observation

Menu item	Average portion size served per child per day as planned on the weekly menus
Milk – full cream (served with porridge and hot beverage)	170g
Granulated sugar (served with porridge and hot beverage)	60g
Bread, white or brown	264g
Margarine, hard	45g
Spread (jam or peanut butter)	30g
Vienna sausage or polony	35g
Fruit (served three times a week)	120-150g

5.2.2.2 Dietary analysis of menus

Table 5.7 shows that all the girls (5–19 years) met 100% and more of the DRI for energy, carbohydrate and protein. The total carbohydrate intake (334.70g/day) was three times more than the recommended intake of 100g/day. Similarly, the protein intake was 346.34% of the DRI for girls aged 4-8 years, 193.53% for girls aged 9–13 years and 143.04% for girls aged 14–18 years. However, none of the groups met the DRI for dietary fibre as the intake for 4–8 years was 78.69% of the DRI and 75.65% for age groups 9–13 years and 14–18 years.

Table 5.7: Mean energy and macro-nutrient intake analysis for girls (5-19 years) of the 7 day cycle menu

		Girls 4-8 years (n=3)		**Girls 9-13 years (n=18)**		**Girls 14-18 years (n=17)**	
Nutrients	**Mean intake ±SD**	%DRIs	DRIs	%DRIs	DRIs	%DRIs	DRIs
Energy Kilojoules (kJ)	10374.66 ±2005.05	150.44	*6896.00	119.28	8698.00	104.31	9946.00
Total carbohydrate g/day (EAR)	334.70 ±77.24	334.70	100.00	334.70	100.00	334.70	100.00
Total protein g/day (RDA)	65.80 ±12.88	346.34	19.00	193.53	34.00	143.04	46.00
Dietary fibre g/day (AI)	19.67 ±2.99	78.69	25.00	75.65	26.00	75.65	26.00

* Energy requirement for girls 3-8 year old

Table 5.8 indicates that overall the girls met 100% or more of the DRIs for most of the micronutrients except for calcium and iodine. Only 83.57% (girls 4-8 years) and 51.43% (girls 9-13 years and 14-18 years) of the DRI for calcium was met. For iodine, 83.02% (girls 4-8 years), 73.92% (girls 9-13 years) and 56.80% (girls 14-18 years) of the DRI was met.

In the age group 9-13 years only 82.95% of vitamin C and 86.26% of pantothenate of the DRI was met. However, in the age group 14-18 years, the DRI for vitamin C (57.77%), vitamin B6 (82.43%), biotin (82.20%), vitamin E (83.64%) and vitamin K (80.59%) were not met.

Table 5.8: Mean micro-nutrient intake analysis for girls (5–19 years) of the 7 day cycle menu

		Girls 4-8 years (n=3)		**Girls 9-13 years (n=18)**		**Girls 14-18 years (n=17)**	
Nutrients	**Mean intake ±SD**	%DRIs	DRIs	%DRIs	DRIs	%DRIs	DRIs
Calcium mg/day (AI)	668.57 ±173.08	83.57	800.00	51.43	1300.00	51.43	1300.00
Iron mg/day (EAR)	9.19±1.87	224.04	4.10	161.23	5.70	116.33	7.90
Zinc mg/day (EAR)	9.17±2.94	229.21	4.00	131.00	7.00	122.27	7.50
Magnesium mg/day (EAR)	294±78.34	267.48	110.00	147.12	200.00	98.98	300.00
Phosphorus mg/day (EAR)	1048±212.73	258.89	405.00	99.38	1055.00	99.38	1055.00
Selenium mcg/day (EAR)	111.42±26.55	484.45	23.00	318.35	35.00	247.61	45.00
Iodine mcg/day (EAR)	53.96±25.30	83.02	65.00	73.92	73.00	56.80	95.00
Vitamin A mcg/day/REE (EAR)	581.24 ±142.83	211.36	275.00	138.39	420.00	119.84	485.00
Vitamin B12 mcg /day (EAR)	3.07±3.05	306.71	1.00	204.67	1.50	153.50	2.00
Vitamin C mg /day (EAR)	32.35 ±40.95	147.03	22.00	82.95	39.00	57.77	56.00
Thiamin mg/day (EAR)	1.03±0.24	206.00	0.50	147.14	0.70	114.44	0.90
Riboflavin mg/day (EAR)	0.97±0.25	194.29	0.50	121.43	0.80	107.94	0.90
Niacin mg/day (NE/day) (EAR)	11.38±3.95	189.71	6.00	126.48	9.00	103.48	11.00
Vitamin B6 mg/day (EAR)	0.82±0.23	164.86	0.50	103.04	0.80	82.43	1.00

		Girls 4-8 years (n=3)		Girls 9-13 years (n=18)		Girls 14-18 years (n=17)	
Folate mcg/day (FE/day) (EAR)	445.65±99.16	278.53	160.00	178.26	250.00	135.04	330.00
Pantothenate mg/day (AI)	4.31±1.71	143.76	3.00	86.26	4.00	86.26	5.00
Biotin mcg/day (AI)	20.55±7.61	171.25	12.00	102.75	20.00	82.20	25.00
Vitamin D mcg/day (AI)	5.71±2.11	114.17	5.00	114.17	5.00	114.17	5.00
Vitamin E mg/day (EAR)	10.04±3.26	167.29	6.00	111.52	9.00	83.64	12.00
Vitamin K mcg/day (AI)	60.44±32.90	109.90	55.00	100.74	60.00	80.59	75.00

Boys aged 4–13 years met 100% and more of the DRI for energy, yet the age group 14–18 years met only 78.37% of the energy recommendations (refer to Table 5.9). The results also indicated that the carbohydrate intake was three times more than the recommended intake per day. All the groups met the DRI for protein. None of the groups met 100% of the requirement for dietary fibre. Boys aged 14–18 years met only 51.76% of the requirement for dietary fibre, boys aged 9-13 years only 63.45% and 4-8 years only 78.69%.

Table 5.9: Mean energy and macro-nutrient intake analysis for boys (5-19 years) of the 7 day cycle menu

		Boys 4-8 years (n=4)		**Boys 9-13 years (n=46)**		**Boys 14-18years (n=62)**	
Nutrients	**Mean intake ±SD**	%DRIs	DRIs	%DRIs	DRIs	%DRIs	DRIs
Energy Kilojoules (kJ)	10374.66 ±2005.05	141.81	*7316.00	108.39	9572.00	78.37	13238.00
Total carbohydrate g/day (EAR)	334.70 ±77.24	334.70	100.00	334.70	100.00	334.70	100.00
Total protein g/day (RDA)	65.80 ±12.88	346.34	19.00	193.53	34.00	126.54	52.00
Dietary fibre g/day (AI)	19.67 ±2.99	78.69	25.00	63.45	31.00	51.76	38.00

* Energy requirement for boys 3-8 year old

Similarly to the girls, Table 5.10 shows that overall the boys met 100% or more of the DRIs for most of the micronutrients except for calcium and iodine. Only 83.57% (boys 4-8 years) and 51.43% (boys 9-13 years and 14-18 years) of the DRI for calcium was met. For iodine, 83.02% (boys 4-8 years), 44.97% (boys 9-13 years) and 56.80% (boys 14-18 years) of the DRI was met.

In the age group 9-13 years, only 82.95% of the DRI for vitamin C was met. However, in the age group 14-18 years, inadequate intake of magnesium (86.54% of DRI), vitamin A (92.26% of DRI), vitamin C (51.35% of DRI), riboflavin (88.31% of DRI), niacin (94.86% of DRI), vitamin B6 (74.94% of DRI), pantothenate (86.26% of DRI), biotin (82.20% of DRI), vitamin E (83.64% of DRI) and vitamin K (80.59% of DRI) were evident.

Table 5.10: Mean micro-nutrient intake analysis for boys (5–19 years) of the 7 day cycle menu

		Boys 4-8 years (n=4)		**Boys 9-13 years (n=46)**		**Boys 14-18 years (n=62)**	
Nutrients	**Mean intake ±SD**	%DRIs	DRIs	%DRIs	DRIs	%DRIs	DRIs
Calcium mg/day (AI)	668.57 ±173.08	83.57	800.00	51.43	1300.00	51.43	1300.00
Iron mg/day (EAR)	9.19±1.87	224.04	4.10	155.76	5.90	119.35	7.70
Zinc mg/day (EAR)	9.17±2.94	229.21	4.00	131.00	7.00	107.88	8.50
Magnesium mg/day (EAR)	294±78.34	267.48	110.10	147.12	200.00	86.54	340.00
Phosphorus mg/day (EAR)	1048±212.73	258.89	405.00	99.38	1055.00	99.38	1055.00
Selenium mcg/day (EAR)	111.42±26.55	484.45	23.00	278.56	40.00	247.41	45.00
Iodine mcg/day (EAR)	53.96±25.30	83.02	65.00	44.97	120.00	56.80	95.00
Vitamin A mcg/day/REE (EAR)	581.24 ±142.83	211.36	275.00	130.62	445.00	92.26	630.00
Vitamin B12 mcg /day (EAR)	3.07±3.05	306.71	1.00	204.67	1.50	153.50	2.00
Vitamin C mg /day (EAR)	32.35 ±40.95	147.03	22.00	82.95	39.00	51.35	63.00
Thiamin mg/day (EAR)	1.03±0.24	206.00	0.50	114.44	0.90	103.00	1.00
Riboflavin mg/day (EAR)	0.97±0.25	194.29	0.50	121.43	0.80	88.31	1.10

		Boys 4-8 years (n=4)		Boys 9-13 years (n=46)		Boys 14-18 years (n=62)	
Niacin mg/day (EAR)	11.38±3.95	189.71	6.00	126.48	9.00	94.86	12.00
Vitamin B6 mg/day (EAR)	0.82±0.23	164.86	0.50	103.04	0.80	74.94	1.10
Folate mcg/day (EAR)	445.65±99.16	278.53	160.00	178.26	250.00	135.04	330.00
Pantothenate mg/day (AI)	4.31±1.71	143.76	3.00	107.82	4.00	86.26	5.00
Biotin mcg/day (AI)	20.55±7.61	171.25	12.00	102.75	20.00	82.20	25.00
Vitamin D mcg/day (AI)	5.71±2.11	114.17	5.00	114.17	5.00	114.17	5.00
Vitamin E mg/day (EAR)	10.04±3.26	167.29	6.00	111.52	9.00	83.64	12.00
Vitamin K mcg/day (AI)	60.44±32.90	109.90	55.00	100.74	60.00	80.59	75.00

The intake of total fat is 31.15% (Table 5.11), the protein 10.78% and carbohydrate 58.07% of the total energy. The total dietary fibre intake was 19.67g/day and fruit and vegetable intake was 68.64g/day.

Table 5.11: The macro-nutrient, dietary fibre and fruit and vegetable intake compared with the joint WHO/FAO Expert Consultation recommendations (Nishida, Uauy, Kumanyika and Shettey, 2004).

Nutrient/ Food	Menu contribution	WHO/FAO goals
Total fat as a % of TE	31.15%	15–30%
Total protein as a % of TE	10.78%	10–15%
Total carbohydrate as a % of TE	58.07%	55–75%
Total dietary fibre (g/day)	19.67%	27- 40 g/day
Fruit and vegetable (g/day)	68.64%	≥ 400 g/day

5.2.3 The demographic data of the child care workers

Table 5.12 reflects the personal and demographic data of the respondents. Most of the CCW were female (95.0%). The majority (76.0%) were aged between 18 and 34 years. Very few (8.0%) completed a Diploma in Child and Residential Care, while a large percentage (43.0%) completed short courses offered by the NACCW while employed at the children's homes. Of the 40 CCWs, 75.0% (n = 30) completed Grade 12, 17.0% (n = 7) Grade 11 and 8.0% (n = 3) Grade 10. The years of

experience working as a CCW ranged from <1 year (8.0%) to >10 years (20.0%). A large percentage of the respondents (45.0%) had experience of 2 to 5 years and 28.0% worked as a CCW for 6 to 10 years.

Table 5.12: Demographic data of the CCWs

Variable	Number (n = 40)	Percentage of total
AGE		
18–24 years	11	28.0%
25–34 years	19	48.0 %
35–44 years	6	15.0%
45–54 years	3	8.0%
55–64 years	1	1.0%
EDUCATION		
Grade 10	3	8.0%
Grade 11	7	17.0%
Grade 12	30	75.0%
Certificate (NACCW)	17	43.0%
Diploma	3	8.0%
FEMALE	38	95.0%
MALE	2	5.0%
YEARS EXPERIENCE AS A CCW:		
< 1 year	3	8.0%
2–5 years	18	45.0%
6–10 years	11	28.0%
> 10 years	8	20.0%

5.2.4 Development of the nutrition knowledge questionnaire

The nutrition knowledge questionnaire developed for CCWs were tested for validity and reliability before implementation, Table 5.13 indicates the internal consistency of the questionnaire was low when it was first implemented with an average Chronbach's α score of 0.266. The internal consistency improved after changes were made and the analysis of the second implementation showed an average Chronbach's α score of 0.796 and, therefore, the questionnaire was used without further changes.

Table 5.13: Differences in Chronbach's α scores for test 1 and test 2

QUESTION	FIRST TEST (Chronbach's α)	SECOND TEST (Chronbach's α)
(4.1)	-0.049	0.906*
(4.5)	0.333	1.000*
(6.1)	-0.148	0.900*
(6.3)	0.500	0.698
(6.5)	-0.237	0.750*
(6.6)	0.271	0.765*
(7)	0.471	0.765*
(8)	0.502	0.905*
(9)	0.059	0.474
(11)	0.438	0.596
(14)	0.341	1.000*
MEAN	0.266	0.796*
* α > 0.7 - statistical significant improvement		

Table 5.14 shows the knowledgeable group scored consistently significantly higher than the non-knowledgeable group on all three sections of the questionnaire (p<0.05). This was further supported by the low r-values showing a weak positive correlation. The questionnaire therefore met the criterion for construct validity.

Table 5.14: Differences in knowledge scores between the nutrition expert group and non-expert group as well as Pearson's correlation coefficient

Knowledge Section	Nutrition expert group (n = 30)		Nutrition non-expert group (n=40)		r -values
	Mean %	SD	Mean %	SD	
1. Dietary recommendations (Number of questions : 13)	94.62*	7.76	47.31	24.74	0.023
2. Food sources of nutrients (Number of questions : 9)	91.23*	13.07	64.61	17.25	0.074
3. Food safety and hygiene Practices (Number of questions : 3)	98.9*	1.56	58.33	24.52	0.303
*$p<0.05$ – statistical significant difference in knowledge $r = 1$ – a perfect positive correlation					

5.2.5 Nutrition knowledge of the child care workers

- **Knowledge pertaining to the Food Based Dietary Guidelines and HIV and AIDS guidelines**

Table 5.15 shows the summary of results pertaining to the FBDGs and HIV and AIDS guidelines. The majority of the respondents (72.5%) knew that starchy foods should form part of every meal (Q 1) and 65.0% were aware of how many glasses of water should be drunk per day (Q 3). A minority of the respondents (25.0%) could identify the correct serving size for vegetables (Q 7). Very few (17.5%) knew how many portions of fruit and vegetables should be eaten daily (Q 13). The concept of a well balanced diet (Q 14) was only known by 12.5%, whereas 47.5% knew that a variety of foods should be included in the diet (Q 10). A majority (55.0% and 82.5%) of the respondents were aware of the importance of physical activity and how it fits into a healthy lifestyle (Q 20 and 22). A minority (40.0% and 12.5%) knew about the guidelines on the use of alcohol by a healthy person and a PLHIV respectively (Q21). Only 10.0% of the respondents could answer the question "what should you eat for a healthy immune system" correctly (Q 17).

Table 5.15: Knowledge on the Food Based Dietary Guidelines and HIV and AIDS guidelines

Description of question	Question number	Number of CCWs who answered correctly (n = 40)	% of CCWs who answered correctly
You should have starches or "carbohydrates "with every meal	1	29	72.5
How much water should you drink per day	3	26	65.0
From which food group should you eat most every day?	4	10	25.0
How much pumpkin should be dished-up per plate	7	10	25.0
The key to a healthy way of eating	10	19	47.5
How many fruits and vegetables should be eaten per day?	13	7	17.5
What is a well balanced diet	14	5	12.5
You should always add extra salt to cooked food at the table before you eat it.	16	34	85.0
What you should eat for a healthy immune system	17	4	10.0
What is a healthy snack	19	26	65.0
What being physically active means	20	22	55.0
Drinking wine, beer and cider everyday if a person is healthy is acceptable as long as it is in moderation	21	16	40.0
If you are eating a healthy diet, there is no need for you to be physically active	22	33	82.5
Drinking alcohol when a person is HIV-positive	21	5	12.5

- **Knowledge pertaining to food sources of energy and nutrients**

Figure 5.1 indicates the majority of the respondents (97.5% and 85.0%) were certain that samp, stiff pap and rice are good sources of carbohydrates. A minority also considered cheese (22.5%), margarine (12.5%) and tinned fish (20.0%) as a source of carbohydrates. Sixty-five percent (65.0%) were not sure whether tinned fish is a source of carbohydrates.

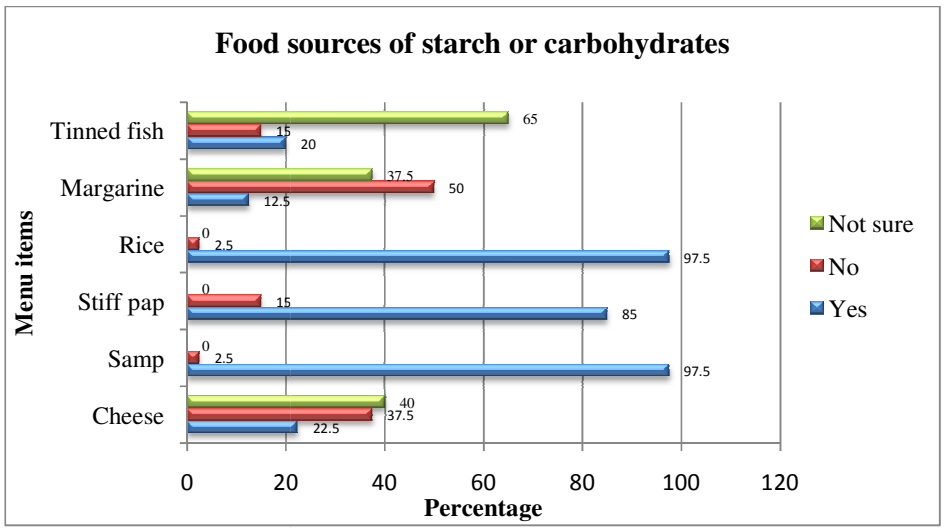


Figure 5.1: Knowledge of CCWs of food sources of starch or carbohydrates

The majority of the respondents indicated that cheese (87.5%), chicken (87.5%) and tinned fish (65.0%) are good sources of protein as shown in Figure 5.2. The results further show that a majority (82.5%) consider fruit as a source of protein. More than one third of respondents (37.5%) were not sure whether stiff pap is a source of protein and a large percentage (57.5%) were not sure about rice.

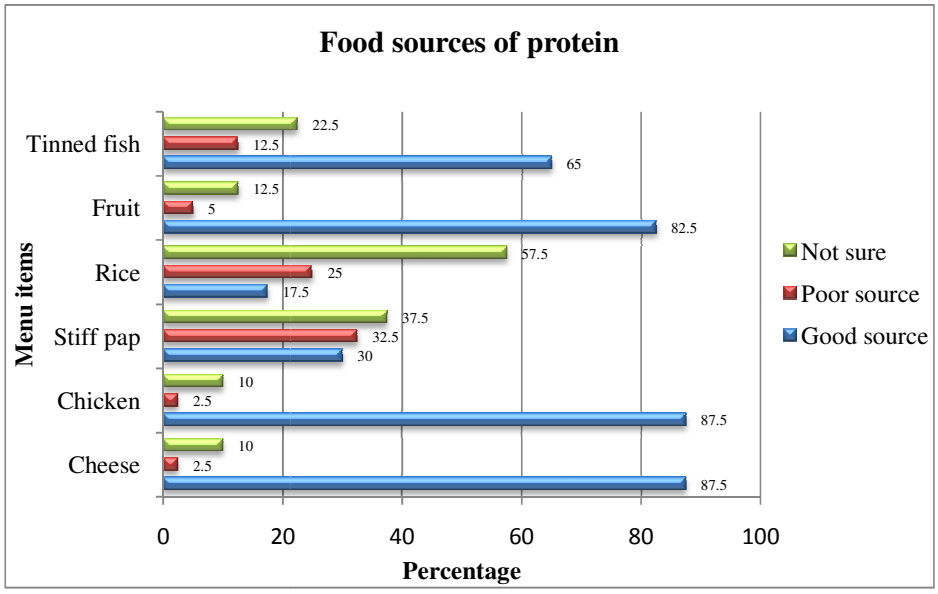


Figure 5.2: Knowledge of CCWs of food sources of protein

Figure 5.3 shows that although 55.0% agreed that canned beans, peas or lentils are considered as suitable substitutes for chicken, almost one third (30.0%) were not sure.

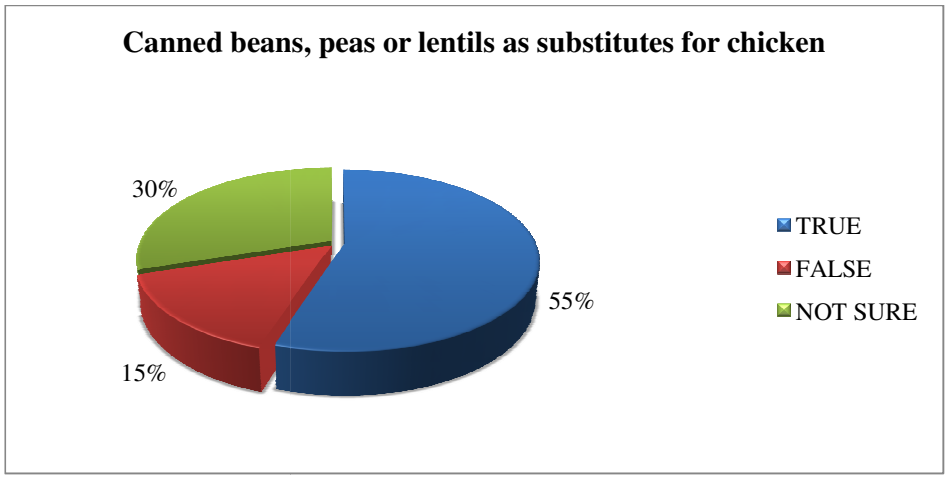


Figure 5.3: Knowledge of CCWs of canned beans, peas or lentils as suitable substitutes for chicken

Figure 5.4 indicates that a minority of the respondents (30.0%) knew that bread, samp, rice, porridge, margarine and cooking oil are good sources of energy and that more than one third (35.0%) incorrectly identified spinach, carrots and tomatoes as the best sources of energy.

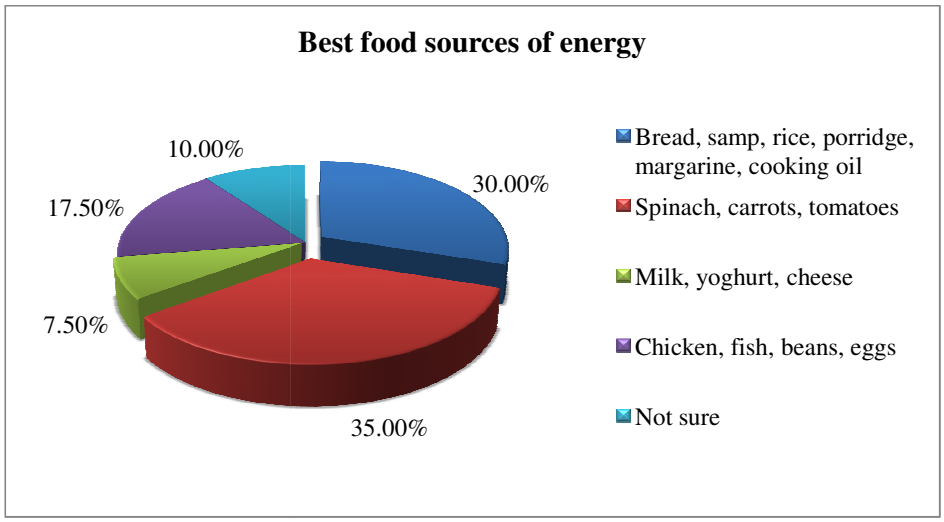


Figure 5.4: Knowledge of CCWs of the best food sources of energy

The majority of the respondents (65.0%) knew that egg can be used as a suitable substitute for meat and chicken as indicated in Fgure 5.5.

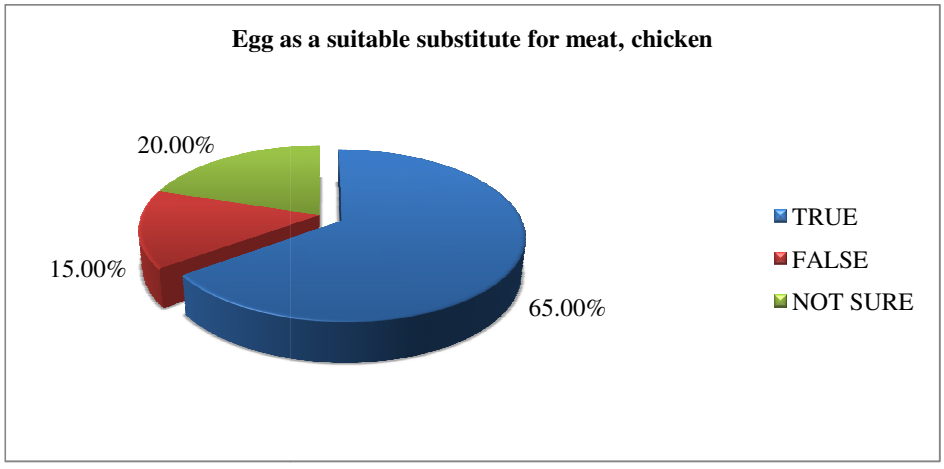


Figure 5.5: Knowledge of CCWs of egg as a suitable substitute for meat, chicken

Fifty percent of the respondents stated that sugar is a good source of energy (Figure 5.6), while 37.50% were not sure.

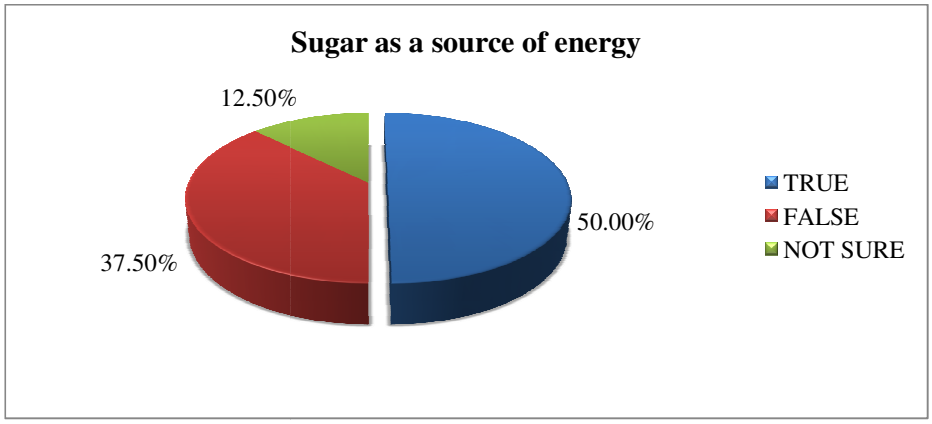


Figure 5.6: Knowledge of CCWs of sugar as a source of energy

As shown in Figure 5.7, 57.5% of the respondents were aware that tinned fish is a suitable substitute for meat and chicken and almost a third (30.0%) disagreed.

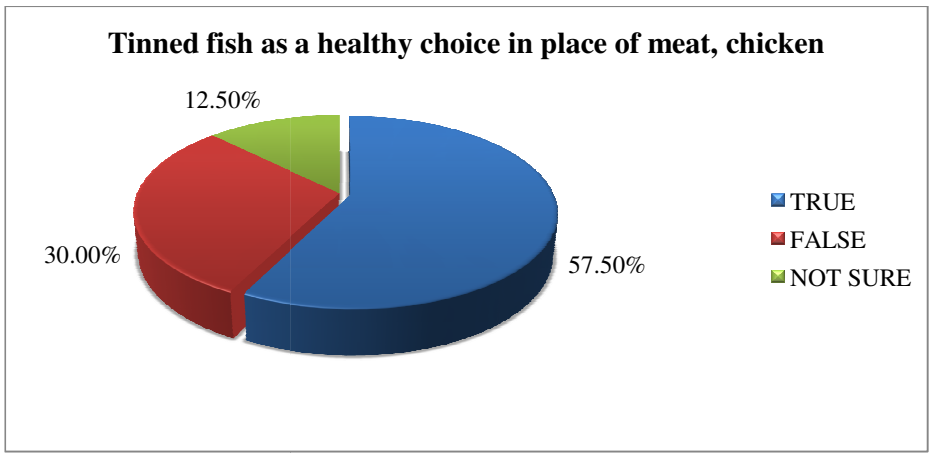


Figure 5.7: Knowledge of CCWs of tinned fish as a suitable substitute for meat, chicken

In Figures 5.8 and 5.9 it is clear that the respondents were aware of the nutrients found in fruit and vegetables as 77.5% correctly answered that fibre, vitamin A and vitamin C are the nutrients found in large amounts in this food group and 62.5% stated that carrots, spinach, butternut and sweet potatoes have the most vitamin A.

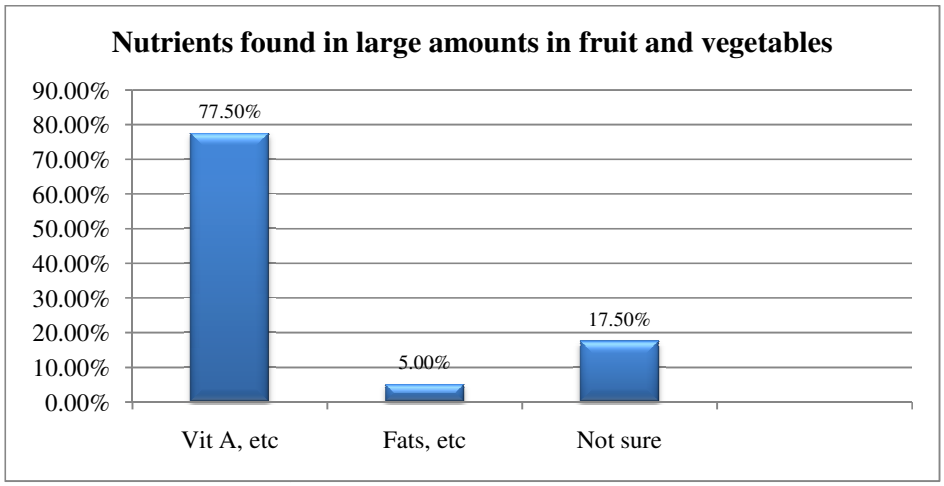


Figure 5.8: Knowledge of CCWs of nutrients found in fruit and vegetables

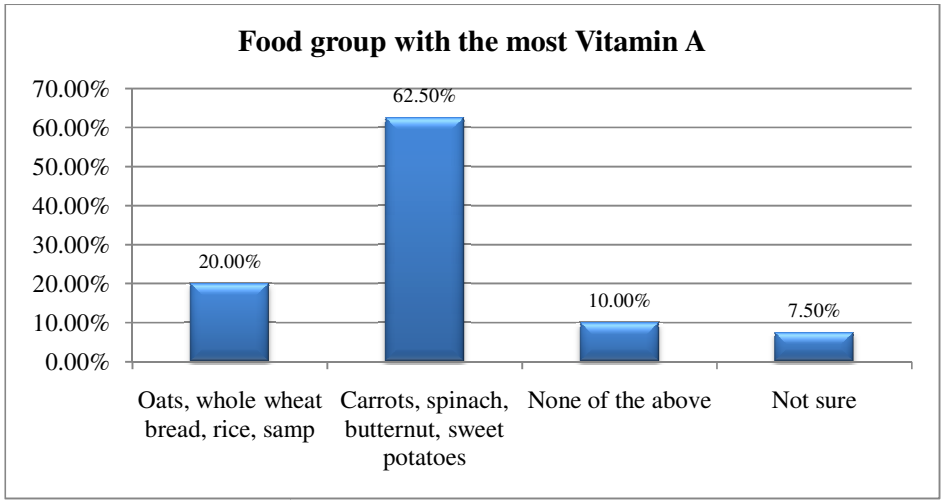


Figure 5.9: Knowledge of CCWs of food group with the most vitamin A

- **Knowledge pertaining to food safety and hygiene**

The majority of the respondents (Table 5.16) were aware of acceptable food safety and hygiene practices as 97.5% indicated that fruit and vegetables should be washed prior to eating, peeling or cutting it (Q 23). On the other hand, only 42.5% knew the steps to be taken to prevent cross contamination during food preparation (Q 24) and only 35.0% could identify the correct steps to follow when washing plates and other dishes (Q 25).

Table 5.16: Knowledge of CCWs on aspects relating to food safety and hygiene

Description of question	Question number	Number of CCWs who answered correctly (n=40)	% of CCWs who answered correctly
Fresh fruit and vegetables should always be washed thoroughly before eating, peeling or cutting it	23	39	97.50
Steps to take to prevent food from being contaminated during preparation	24	17	42.50
Steps to follow when washing plates and utensils	25	14	35.00

5.3 Phase II: Development of nutrition education material

5.3.1 Selecting the media data

A short questionnaire determining the educational material the CCWs will require in the work environment reflected the following results. A large majority (95.0%) of the respondents identified calendars to be useful in their place of work (Table 5.17). Seventy five percent stated that they can use posters, 77.50% selected pamphlets and 82.50% of the respondents chose fridge magnets. A large percentage (65.0%) also selected workbooks.

Table 5.17: The type of education material indentified by the CCW to be useful in their working environment

Education material	Number of CCWs who selected this option (n=40)	% of CCWs
Posters	30	75.00
Pamphlets	31	77.50
Calendars	38	95.00
Manuals	9	22.50
Workbooks	26	65.00
Fridge magnets	33	82.50
Desk calendars	5	12.50
Other:		
Notes/handouts	2	5.00

Ninety-five percent of the respondents indicated both images and text as the preferred format of the NEM (Figure 5.10) with a preference to coloured drawings (55%) and coloured photos (40%) (Figure 5.11).

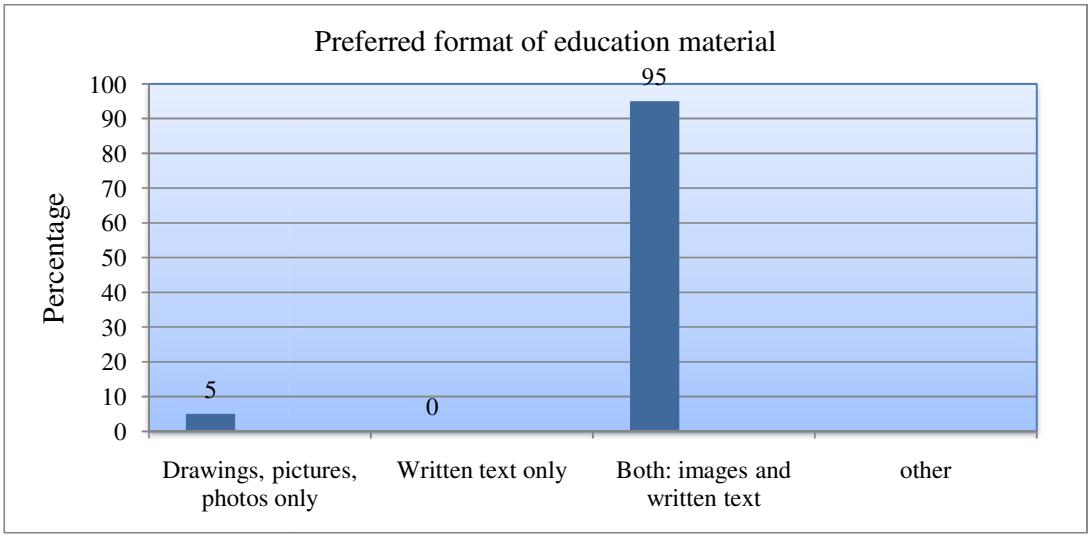


Figure 5.10: Preferences of CCWs regarding the format of the education material

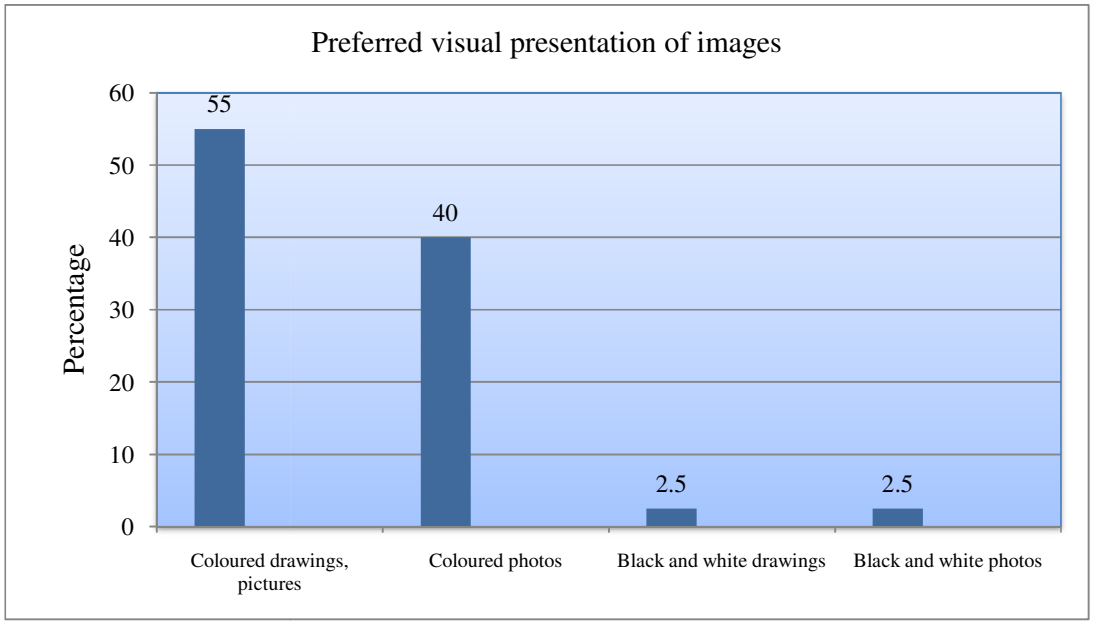


Figure 5.11: Preferences of CCWs regarding the visual presentation of the images

The majority (70%) of the respondents selected English as the preferred language for the written text, while 15% indicated Zulu as a language of choice and only 7.5% selected Xhosa. Seven and a half percent stated that it did not matter which language was used (see Figure 5.12).

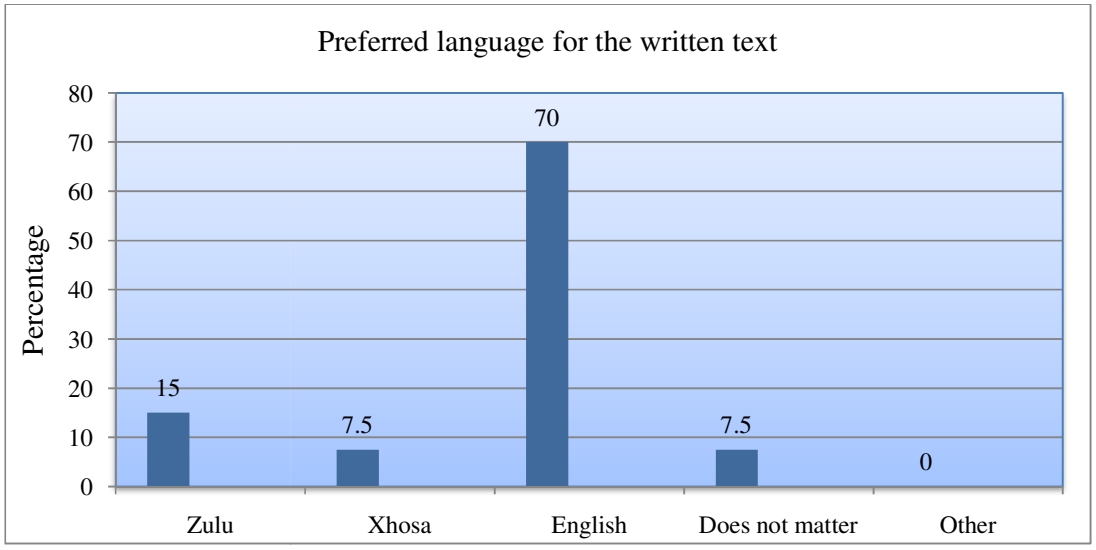


Figure 5.12: Preferences of the CCWs regarding the language used for the written text

Besides considering the above information collected, the environment in which the CCW worked was also considered to determine the most suitable media option. When visiting the houses on various occasions the researcher observed that each kitchen was equipped with a refrigerator which the CCW used regularly. This observation also played a role in selecting the media for the messages.

Calendars developed by the Vaal University of Technology (VUT) were distributed in the children's homes in 2009 and 2010. Since the DoH has existing posters and pamphlets addressing healthy eating for PLHIV, the researcher decided that refrigerator magnets will be a suitable media to support the current available education material.

Refrigerator magnets would be very visible and the CCW would have immediate access to the material every time they use the refrigerator. English was selected as the language to be used for the written text and each message should also be supported by an image in full colour. The refrigerator magnets are also not dated and can, therefore, be used for an extended period of time.

The refrigerator magnets developed adhered to the guidelines stipulated by the FAO (1995) that repetition of a nutrition message is important and it should be consistent, short and uncomplicated.

5.3.2 The first draft copy of the refrigerator magnets

The first draft copy of the education material is depicted in Figure 5.13. After the first draft copy of the refrigerator magnets was assessed by a nutrition expert, changes were made to the messages and images. The reasons for the changes included:

1. The message: "A variety of foods provides everything for a healthy immune system" was replaced with: "Wash fruit and vegetables before preparing and eating" as the data indicated that the CCWs were well aware of the importance of variety in the diet, but they lacked knowledge on food safety and hygiene practices.

2. The images accompanying the messages “Buy fruit and vegetables fresh and always store in a cool place”, “Wash dishes and kitchen utensils with hot soapy water” and “Prevent cross contamination during food preparation by covering wounds and washing hands” were changed as there was no logical fit between the image and the written text.

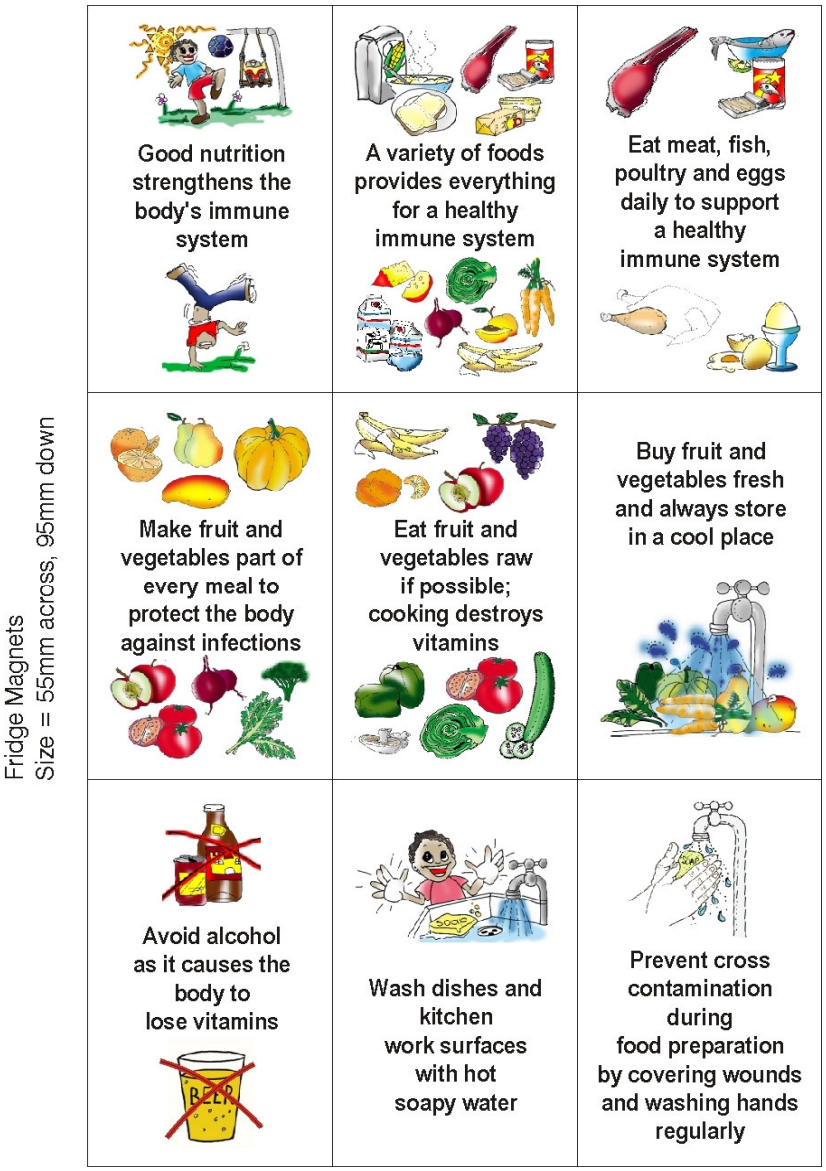


Figure 5.13: The first draft copy of the refrigerator magnets

5.3.3 Testing the nutrition education material for validity and reliability

To test the material developed a questionnaire was administered to a sample group (n=23) of CCWs to measure the extent of how well the target population will understand the material. As Table 5.18 shows, the majority of the respondents were able to correctly identify what the images show. The responses for Image 1 (95.7%), Image 2 (95.7%), Image 3 (91.3%), Image 4 (82.6%), Image 6 (100%) and Image 9 (95.7%) were within the acceptable range. This accounts for 66.7% of the total images. For Images 5 and 7 (78.3%), and Image 8 (73.9%) the responses fell into the borderline category.

Table 5.18: Responses on the question: "what do the following images show?" (n=23)

Image	% correct/likely responses	% incorrect/unlikely responses	% undecided responses
1	95.7	0	4.3
2	95.7	0	4.3
3	91.3	8.7	0
4	82.6	4.3	13.1
5	78.3	17.4	4.3
6	100	0	0
7	78.3	4.3	17.4
8	73.9	17.4	8.7
9	95.7	4.3	0

The majority of the respondents (Table 5.19) were able to correctly match the image with a message.

Table 5.19: Responses to matching an image with a message (n=23)

Image	% correct responses	% incorrect responses
1	91.3	8.7
2	95.7	4.3
3	78.3	21.7
4	91.3	8.7

Image	% correct responses	% incorrect responses
6	91.3	8.7
7	95.7	4.3
8	95.7	4.3
9	100	0

5.3.4 The developed and tested nutrition education material

To address the gaps identified in the nutrition knowledge of the CCWs and observations made the following messages were developed to specifically address good nutrition and acceptable hygiene practices to support a healthy immune system. As depicted in Figure 5.14, five nutrition related messages were developed and 4 messages regarding food safety and hygiene practices.

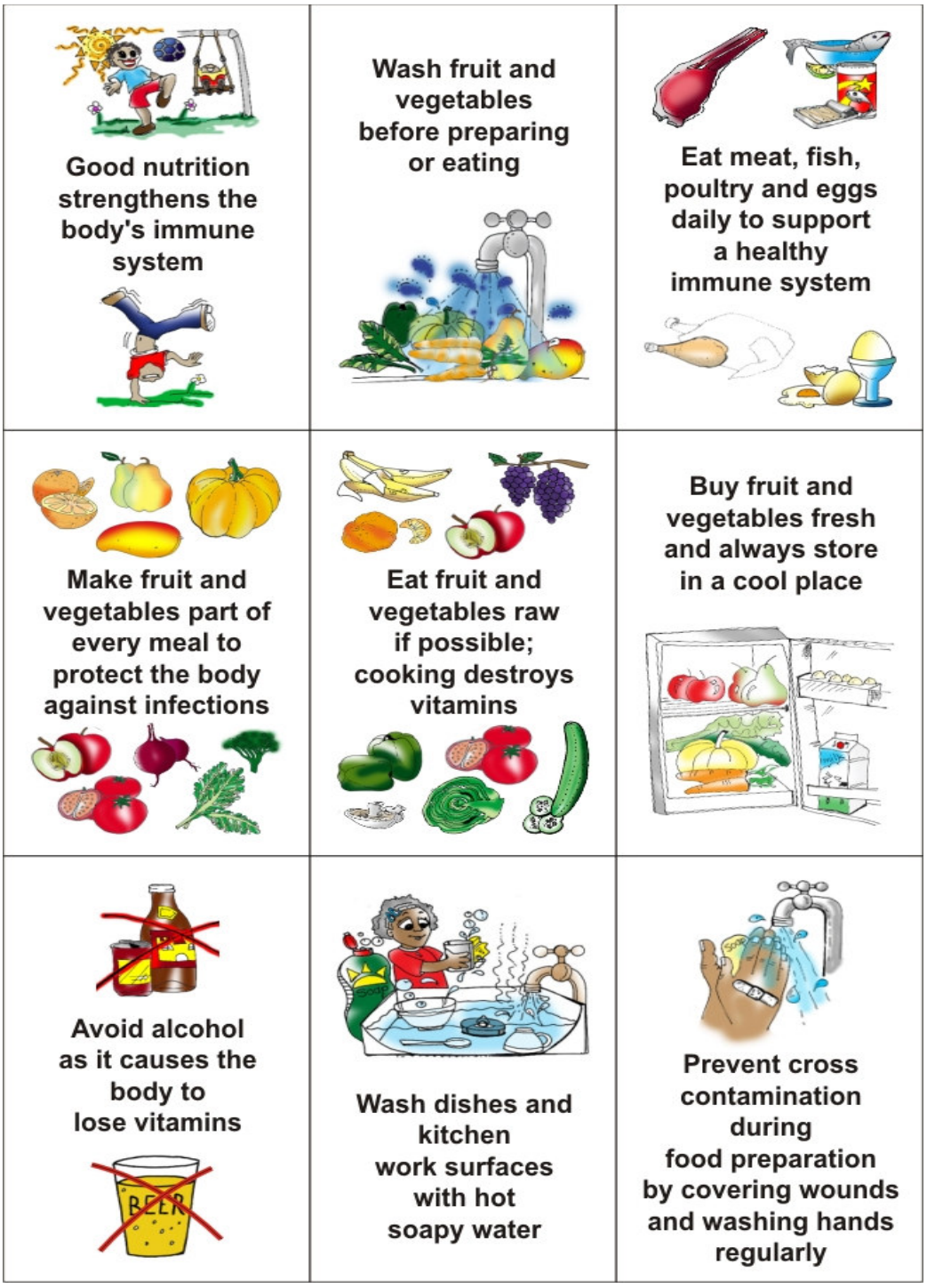


Figure 5.14: The final copy of the developed nutrition education material

5.4 Phase III: Production of the material

The nine magnets were fitted onto an A4 size page and forwarded to professional printers who then produced 100 sets of the magnets. These magnets will be used for inclusion in the implementation phase that will form part of the DTech studies upon completion of the MTech qualification.

5.5 Discussion of results: Phase I

5.5.1 Anthropometric measurements

The anthropometric measurements indicated that the majority of the HIV-negative boys and girls were of normal height-for-age and weight-for-age. The results also showed that possible risk of overweight and overweight were more prevalent in girls whereas underweight was more prevalent in boys. The consumption of excessive energy as indicated by the dietary analysis and the large portion sizes recorded in the plate waste studies, coupled with inactivity which consequently results in decreased energy expenditure, can be a cause of overweight and the increased risk to overweight. Furthermore, a shift from traditional foods high in fibre towards foods containing high saturated fatty acids, vegetable oils, brick margarine and highly refined foods as evident on the menu and recorded through observations and discussions with the CCWs could also explain the prevalence of overweight amongst girls. The dietary analysis also indicated a higher than recommended intake of total fat. A high intake of dietary fat is likely to increase body weight by passive overconsumption of energy (Seidell and Visscher, 2004).

The findings showed similar results to that of the NFCS (2005) with stunting at 18% and overweight and obesity at 10% and 4% respectively amongst the respondents aged one to nine years nationally. The report also indicated that the prevalence of overweight and obesity increases to 16% in 13-year olds and 26.4% in 19-year-olds (Labadarios *et al*., 2008). A study in an orphanage in Ghana also suggested that 5.0% of the children were at risk of overweight (Sadik, 2010). Barker (2007) noted that protective adjustment in a nutrient-poor environment apparently results in metabolic programming, resulting in the conservation of energy. The author states that if at a later stage in the person's life, there is an adequate or excessive energy intake; the

individual is more prone to the development of obesity. The children in the children's homes most often come from an environment in which adequate food intake lacked. The large portion sizes served to the children regardless of their age results in an excessive energy intake as indicated by the results of the dietary analysis and in turn these children may develop overweight.

The anthropometric indices indicated that the prevalence of underweight was higher than the national average of 10.3% (Labadarios *et al.*, 2008). One of the homes consisted of only street children (all boys) that were brought there for rehabilitation. In this study, the high prevalence of underweight (15.4%) and severely underweight (7.7%) was amongst boys. The reason for this could be that the boys recently admitted into care did not have adequate access to food of suitable energy density and micronutrient prior to admittance thus the high prevalence of underweight in this group.

The results indicated that a third of the HIV-positive children were stunted and 16.7% was severely stunted. A study conducted by Eley, *et al*. (2006) at The Red Cross Children's Hospital in Cape Town found that more than 50.0% of the HIV-positive children were stunted and that one in five of the children (20.0%) developed wasting during the course of the disease and that 6.7% were severely wasted. The prevalence of wasting amongst HIV-positive girls in this study was also similar to the study by Eley, *et al.* (2006). HIV-positive children have increased energy needs even in the asymptomatic stage which increases during periods of infections. Furthermore, these children may also experience reduced appetite even in the absence of opportunistic infections. This results in the characteristic wasting associated with HIV and AIDS.

5.5.2 Dietary intake measurements

5.5.2.1 Plate waste studies

The portions sizes recorded were large for the starch servings and very small for vegetables servings. One serving of starch (for example cooked maize or samp) is considered as 65g or half a cup. The children are served an average size of 250-300g per serving. This is 3 to 4 servings at a time. The average serving size of the

vegetable portion is 40g. Only one or maybe two portions of vegetables are served during supper. The poor nutrition knowledge of the CCWs with regards to the recommended number of fruit and vegetables portions required per day, as well as the poor knowledge of adequate serving sizes of vegetables contributed to the inadequate intake. The CCWs reported that three fruit serving are planned for the week, but this may be more if donations are received. The dietary analysis of the menus supported these findings with a high intake of carbohydrates and a low intake of vegetables.

5.5.2.2 Dietary analysis of menus

Findings of the menu analysis indicated that both girls and boys consumed three times more carbohydrates than the recommended intake. This is supported by the large portions of starch served to the children and the many servings of bread allowed per day, regardless of age and gender. The DRIs for girls and boys were met for energy and protein in all the age groups except boys aged 14-18 years did not meet the DRI for energy. However, the comparison of the actual intake of the macro nutrients with the WHO guidelines indicated that the protein (10.78%) and carbohydrate (58.07%) is within the recommendations of 10-15% and 55–75% respectively. This comparison also showed that the total fat intake of 31.15% was above the recommended intake of 15-30%. The study in an orphanage in Ghana showed that the mean levels of energy, carbohydrate and fat for the same age groups as this study were below the RDA while the protein intake was sufficient (Sadik, 2010).

None of the age groups met the DRIs for fibre. The comparison of the intake with the WHO guidelines also indicated that the total dietary fibre intake was only 19.67g/day and not 27–40g/day. The actual fruit and vegetable intake was considerable lower than the average of 219.7g per day consumed by South Africans in 2001 (Steyn, Bradshaw, Norman, Joubert, Schneider and Steyn, 2006). The actual fruit and vegetable intake was a mere 68.64g/day instead of ≥ 400g/day as recommended. The fibre intake is not met due to the lack of fresh fruit and vegetable intake. Although vegetables are planned as a menu item for supper, the serving size is too small and

only one vegetable is prepared and served during the meal. The CCWs also did not plate the correct serving sizes for vegetables.

None of the groups met the DRIs for calcium and iodine. The lack of milk and milk products on the menu resulted in an inadequate intake of calcium. The children are allowed access to table salt during meal times, so although the analysis indicated a low intake of iodine, this may address the inadequate intake. The results clearly showed that micro nutrient inadequacies were more prevalent in the dietary intake of age groups 9-13 and 14-18 years in both girls and boys. Inadequate intake of magnesium, vitamin A, vitamin C, riboflavin, niacin, vitamin B6, pantothenate, biotin, vitamin E and vitamin K were evident in the age group 14-18 year. According to Manary and Solomon (2004), it is common that although the macronutrient intake is sufficient to meet or exceed the energy needs, micronutrient deficiencies may exist as the food consumed is of low nutrient density.

The results in this study are also supported by a study by Burgess-Champoux, Larson, Neumark-Sztainer, Hanna and Story (2009) who found that adolescents rarely met their dietary needs in terms of micronutrients. The researchers reported that it is common for adolescents to consume an energy dense diet which is of poor quality in terms of essential micronutrients. The reason for this is low meal frequency, skipping meals especially breakfast and a high intake of sweetened beverages (Burgess-Champoux *et al*., 2009; Wenhold, Kruger and Muehlhof, 2008). A recent study in America examining the diet quality trends amongst children in day care centres further support these findings. The researchers found that most of these children did not meet the American Dietary Guidelines. The diets of these children were inadequate in fruits and vegetables, calcium-rich foods and fibre (Story, Kaphingst and French, 2006). The inadequate intake of micro nutrients was also reported in the study in an orphanage in Ghana. The results of this study showed that a low mean intake of micro nutrients prevailed (Sadik, 2010). In addition, HIV contributes to an increased incidence and severity of under-nutrition and micronutrient deficiency. Low serum levels of vitamins A, E, B6, B12 and C, beta-carotene, selenium, zinc, copper and iron deficiencies are frequently documented during all stages of HIV-infection (Hendricks, Eley and Bourne, 2007) and

(Steenkamp, Dannhauser, Walsh, Joubert, Veldman, Van der Walt, Cox, Hendricks and Dippenaar, 2009).

Interviews with the CCWs confirmed the trend of children often skipping breakfast and also not taking their packed lunch to school. This may imply that these children are at risk of developing micro nutrient deficiencies.

The major source of micro nutrients are fruit and vegetables and an inadequate intake of this food group resulted in the micro nutrient intake that is not met in the older children. Furthermore, the inclusion of a greater variety of foods from all the food groups, including meat, fish, poultry, legumes and milk and milk products on the cycle menu which are also rich sources in micro nutrients will improve the intake.

5.5.3 The demographic data of the child care workers

The majority (76.0%) was aged between 18 and 34 years and completed Grade 12 (75%). Very few of the CCWs (8.0%) completed a relevant tertiary qualification. The experience working as a CCW was also wide ranging, namely <1 year to >10 years.

5.5.4 Development of the nutrition knowledge questionnaire

A self-administered questionnaire was developed and tested for validity and reliability. The reason for this was that the existing questionnaire was too long and was not applicable to the immediate environment in which the CCWs worked. The methods applied and the results in this process were similar to those reported by Turconi *et al.* (2003) and Parmenter and Wardle (1999) where Chronbach's α was used to test for construct validity and Pearson correlation was used to assess test-retest reliability of a dietary questionnaire.

5.5.5 Nutrition knowledge of the child care workers

Overall, it is evident from the results on nutrition knowledge that although the respondents' knowledge was fair on general nutrition guidelines, there are certain areas of concern. Firstly, knowledge on the importance of a variety in the diet is lacking. Secondly, the results indicate a very poor knowledge of the recommended

number of fruit and vegetable portions per day as well as correct serving sizes (17.5% and 25.0% correct answers respectively). This is evident in the small portions of vegetables served to the children during meal times (an average serving size of 40g) and the absence of adequate fruit and vegetables on the menu for breakfast and lunch. Thirdly, a very poor knowledge also exists regarding the role of healthy eating in maintaining and supporting the immune system (only 10.0% correct answers) and fourthly, the respondents lacked knowledge in the area of the use of alcohol by healthy individuals and PLHIV (40.0% and 12.5% correct answers respectively). Research has confirmed that nutrition knowledge is an important indicator of dietary intakes and adequate nutrition knowledge is imperative in improving dietary intake habits (Hendrie, Cox and Coveney, 2008).

Lastly, a limited knowledge on correct hygiene practices was noted. Although the data indicated that the majority of the CCWs were aware of the correct handling of fruit and vegetables (97.50% correct answers), in practice this was, however, not the case. The results also showed that the CCWs lacked knowledge on steps to prevent food contamination and had a very poor knowledge on the correct procedures for washing plates and utensils. The researcher observed that fresh fruit and vegetables were not always washed prior to use and the lack of appropriate cleaning materials. It is known that poor hygiene practices can result in unsafe food that can result in diarrhoea due to food-borne diseases (Egal and Valstar, 2007 and FANTA, 2008).

5.6 Discussion of results: Phase II

These messages developed were consistent with the guidelines stated by the FAO (1995) namely only one key idea should be included in a message and the information should be comprehensive. Furthermore, the messages should make use of positive expressions and suggest specific behaviour change.

5.7 Conclusion

The results analysed in this chapter indicate that undernutrition and overnutrition are prevalent in the children. Dietary analysis of the menus showed the DRIs for energy, carbohydrate and protein is met, but some of the micro nutrients are inadequate especially in the age group 9-18 years in both girls and boys. Although the CCWs

have an average knowledge of nutrition, there are many gaps resulting in poor dietary choices and hygiene practices in the day-to-day care of the children. The legislation clearly indicates that residential care should not only be considered as a last resort for children's care, but also as an intervention that requires more than merely addressing children's basic physical needs.

The purpose of the study was to develop reliable and valid NEM to be used by the CCWs caring for immune compromised children in order to improve dietary and hygiene practices. The NEM developed in this study adhered to the guidelines stipulated by the FAO to ensure effectiveness. Further conclusions will be drawn and recommendations made in Chapter 6.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The aim of this study was to develop reliable and valid nutrition education material for the child care workers of immune compromised children resident in children's homes in order to maintain the child's immune system and to optimise their quality of life. This was achieved through measuring the nutritional status of the children, analysing the dietary intake of the children and determining the nutrition knowledge of the CCWs through the implementation of a reliable and valid measuring instrument. The NEM were developed following the steps in a FAO framework for preparation, formulation, implementation and evaluation of a NEP. The NEM developed were also tested for validity and reliability. The development of nutrition education material for caregivers based on the research conducted will, therefore, ensure that specific problems are addressed and that the overall nutrition knowledge of the CCWs is improved so that the necessary change in behaviour can take place.

6.2 Limitations of the study

The CCWs were only available on a Monday morning during a general staff meeting. This resulted in limited time allowed for the researcher to implement questionnaires and to conduct focus group discussions as permission was granted to either do this prior to the meeting or after the meeting. Some of the CCWs arrived late for the meeting and after the meetings some of them often had to leave due to transport. The researcher then had to make individual appointments outside of the usual meeting time.

- Although a very small sample of the population was HIV-positive children, the researcher did not change the study as other immune compromised children may be present but were not identified. HIV-positive children are not separated from the other children and, therefore, form part of the group of children a CCW cares for.

- The researcher recognised the possibility that the children may get food from a friend at school, but this was not included for the purpose of this study as this was not identified as a common practice when the researcher spoke to the children or child care workers.

- The CCWs also worked shifts which meant that some of them were not always available during the Monday morning slot as they may have been off-duty. This resulted in the researcher making additional appointments during the week that were suitable to the CCWs when they were on-duty and that did not affect their day-to-day tasks at the children's home. This was especially important during the testing of the questionnaire as the same 10 CCWs had to participate.

- Some of the CCWs were also volunteers resulting in the composition of groups alternating and changing all the time. This required strict control and record keeping for the researcher.

- The managers of the children's homes did not have access to e-mail. This was problematic as they were not always available telephonically due to meetings and other activities. This made communication difficult especially if the researcher had to make appointments for visitations to the children's homes.

- Research was conducted during late afternoon and early evenings making it difficult for the field workers to get to the children's homes and back as these establishments was in the surrounding areas of Durban and not in Durban central. Transport to these areas is a problem after hours.

- Limited publications of studies pertaining to children in residential care are available for reference purposes.

6.3 Main findings of the study

Various nutrients are required to maintain the integrity of the immune system and the nutrient requirements for children living with HIV and AIDS are different from those for HIV-negative individuals. Although guidelines exist for the treatment and management of HIV-positive children, it was clear from the literature that exceptional measures are needed to ensure the health and well-being of the children. Although AIDS and orphanhood result in many challenges facing children, factors such as the knowledge and education level of their caregiver have a strong impact on the child's well-being. Furthermore, despite the high percentage of HIV-positive children resident in homes in South Africa, the literature indicated that knowledge about HIV and AIDS in the residential care settings was irregular and inadequate. This study revealed that very few of the CCWs had a tertiary qualification. Some of them attended short courses offered by the NACCW while employed at the children's homes. Most rely on the training provided by the children's homes and experience gained during employment to care for the children.

The anthropometric measurements indicated that the majority of the HIV-negative boys and girls were of normal height-for-age and weight-for-age. The results also showed that possible risk of overweight and overweight were more prevalent in girls whereas underweight was more prevalent in boys. For HIV-positive children, the results indicated a prevalence of stunting, wasting and a possible risk of overweight in mostly the girls.

Plate waste studies indicated that all the children in the homes are served the same portion sizes for the various menu items. Dietary analysis of the menus established that both girls and boys consumed three times more carbohydrates than the recommended intake. This may contribute to the prevalence of overweight and risk to overweight as indicated by the anthropometric results. The average vegetable portion size was recorded as only 40g which is far below the recommended daily intake. The nutrition knowledge questionnaire results highlighted this as an area of concern. Although the respondents displayed a good knowledge of the micronutrients in fruit and vegetables, the results indicated a very poor knowledge of the

recommended number of fruit and vegetable portions per day as well as correct serving sizes.

The DRIs for girls and boys were met for energy and protein in all the age groups except boys aged 14-18 years did not meet the DRI for energy. None of the age groups met the DRIs for fibre, calcium and iodine. Micronutrient inadequacies were more prevalent in the dietary intake of age groups 9-13 and 14-18 years in both girls and boys. Factors that may contribute to this is the lack of fruit and vegetable intake of the children and the knowledge of the CCWs with regards to the importance of encouraging children to eat a variety of foods. The importance of variety in the diet was highlighted as an area of concern in the nutrition knowledge results. A very poor knowledge existed regarding the role of healthy eating in maintaining and supporting the immune system. This further highlighted the need for NEM.

The respondents also lack knowledge of use of alcohol by healthy individuals and PLHIV. A limited knowledge existed with regards to safe food handling and hygiene practices. These results clearly guided the researcher as to what information should be included in the NEM.

Overall, the nutritional status of the children, the dietary assessment of the menus and the assessment of the nutrition knowledge of the CCWs indicated a need for addressing the nutrition knowledge of the CCWs, the nutritional quality and adequacy of the menus and the preparation methods of food, hence the development of NEM. The literature revealed that nutrition education has been implemented effectively globally and in South Africa to address nutrition problems relating to HIV and AIDS. The purpose of nutrition education is to change habits and nutrition-related behaviours that may contribute to poor food choices. For NEM to be effective, the communication objectives must focus on exposing the target group to the messages and on the retention of the messages by the target group.

Unsatisfactory progress on child nutrition from 1990 to 2007 is inadequate to meet the 2015 MDGs target, and will further deteriorate due to the current global economic turmoil resulting in higher food prices. Improving nutrition requires an integrated approach to health, care and food security.

Nutrition education and the transfer of relevant knowledge and skills, using appropriate communication strategies, to individuals involved in caring for HIV-positive children will greatly enhance their chances of survival.

The gaps identified in the study were addressed by the development of 5 nutrition related messages and 4 messages regarding food safety and hygiene practices. The messages were developed to address good nutrition and acceptable hygiene practices specifically to support and maintain a healthy immune system in a residential care setting. The research results indicated that refrigerator magnets were the most suitable media to convey these messages.

6.4 Conclusion

The study found that although guidelines do exist for the treatment and management of HIV-positive children, these guidelines are often not communicated effectively to CCWs resulting in poor dietary practices while caring for these children. In addition, children's homes' practices regarding HIV showed a tendency to be irregular and it only addressed partial components of the necessary range of HIV interventions, including nutrition-focus interventions. Furthermore, this study also established that malnutrition is apparent in the children's homes and that there were many gaps in the nutrition knowledge of the CCWs. These gaps included the role of good nutrition in the support and maintenance of the immune system and the importance of adequate intake of fruit and vegetables daily. The NEM developed in this study will address these gaps.

6.5 Recommendations

6.5.1 Recommendations for non-government organisations

- Nutrition considerations should be integrated into the strategic planning and programme development process at management level of these establishments in collaboration with NACCW as it did not prove to be an important component of the planned training programme. Nutrition should form an integral part of the training programmes planned for CCWs and should be ongoing during their employment. This is especially important since the majority of the CCWs do not

have a formal qualification and ongoing training is required to complete their day-to-day activities successfully.

- The CCWs employed by the organisations should be encouraged to register with the NACCW as to make use of opportunities for further professional development.

- Nutrition-focused interventions should be developed and implemented through a participatory approach with a multi-disciplinary team. Nutrition interventions should focus on the CCWs in order to acquire sufficient knowledge and skills to prepare food that provides a nutritionally balanced-diet and is safe to consume, with special attention to the specific needs of the children in their care.

- Food security should be emphasised as it not only addresses adequate availability of food supply to the children's homes and assured access to sufficient food for all, but its proper utilisation to provide an adequate and balanced diet. This can be achieved through the encouragement of sustainable development of vegetable gardens on the premises as the infrastructure already exists in the form of adequate and sufficient land. Partnerships with the Government Department of Agriculture, Forestry and Fisheries or The Department of Horticulture at universities can ensure training and professional advice.

- To improve menus these establishments' management should use registered nutritionists or dietitians as consultants to ensure adequate nutrient intake in all the age groups.

6.5.2 Recommendations for government departments

- Partnerships between government departments including the DoH and Department of Social Development and the child care centres should be encouraged to achieve a meaningful and clear understanding of the scientific facts about HIV and AIDS and also to support the training programmes planned by the child care centres. This will result in improved awareness and management of HIV and AIDS amongst CCWs.

- The DoH should closely monitor the implementation of policies and programmes such as the NSP for HIV and AIDS and Sexually Transmitted Infections and existing guidelines pertaining to HIV and AIDS. This will ensure that children are weighed regularly and menus adjusted to address the needs of the children.

- Very limited and fragmented data exist on the nutritional status of children in child care centres and it is, therefore, recommended that in order to promote children's health and nutrition in these centres, a national nutrition surveillance programme is implemented.

6.5.3 Recommendations for future research

- The purpose of this study was to develop NEM as indicated in Figure 4.1. Future research opportunities can include the training of the change agents, implementation of the developed NEM and the evaluation of the intervention.

- This study also highlights the need for the development and implementation of a comprehensive nutrition education programme focusing on general healthy eating and not only on immune compromised individuals.

- Further exploration of the impact of nutrition-focus interventions on the nutritional status of the children can be facilitated.

- A set of measuring devices for the purpose of accurate portion control to prevent the serving of portions that are too large (example starch portions) and too small (example vegetables portions) can be developed to facilitate the serving of appropriate amounts of food to the children.

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ANNEXURE A

12 March 2008

Dr. Carin Napier

Department of Food and Nutrition Consumer Science

Durban University of Technology

Steve Biko Campus

DURBAN

4001

Dear Dr. Napier

Re: **PROPOSED RESEARCH PROJECT:** [redacted]

Thank you very much for the presentation of your research proposal to myself and the Managers of our Children's Homes. We are excited about the project and feel that it would be a mutually beneficial one. We have therefore decided to accept your invitation to participate in the project.

Our participation however, is subject to the following conditions and should bind all researchers including students:

1. Confidentiality is of prime importance. All children, caregivers and Children's Homes must remain anonymous.
2. The rights of children not willing to participate in the project must be respected.
3. The daily programme of the children must not be disrupted and mutually acceptable times for your involvement will have to be determined.
4. Aspects of your research report involving the children/staff/Children's Homes must be discussed with this Society, prior to publication.
5. This Society will not be bound to implement recommendations arising from your research, but may in its discretion do so in the interests of the children and its services.
6. The Society will not be involved in any costs.
7. Nutrition education programmes for children and caregivers and other needs for education which emerge from the study, must be addressed with both the staff and children, as the issues may warrant.
8. A copy of the research report must be made available to [redacted], post the study.

[redacted] dcfws@global.co.za

[redacted]

Not for Profit Organisation [redacted]

As you are aware, the Society manages 4 Children's Homes, overseen by the Senior Manager: Residential Services[redacted] It would be appreciated if brief written feedback every 3 months on what has occurred and what has been planned for in the next period is made available to [redacted] All communication to do with the logistics of implementing the research project must be via the Mangers of the Children's Homes. Their details are: -

[redacted]

Thank you for including our facilities in your project.

We look forward to a productive and cordial working relationship with you.

Yours faithfully

[redacted]
Senior Manager: Residential Services

Email: residential@durbanchildren.org.za

ANNEXURE B

DURBAN UNIVERSITY of TECHNOLOGY

FOOD AND NUTRITION CONSUMER SCIENCES

Anthropometric Measurements

Section A:

1. Number/Name of the subject……

2. Community:……..…

3. Date of birth	Year	Month	Day

4. Gender	Male	Female

Section B:

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

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

ANNEXURE C

DURBAN UNIVERSITY of TECHNOLOGY

FACULTY: APPLIED SCIENCES

DEPARTMENT OF FOOD AND NUTRITION
CONSUMER SCIENCES

NATIONAL DIPLOMA: CONSUMER SCIENCES FOOD AND NUTRITION

Fieldworker Guide

1. INTRODUCTION

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

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

What is a Field Worker?

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

2. ENQUIRIES

The following staff members are concerned with field work:

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

Tel. No. : 031 373 2326

E-mail : carinn@dut.ac.za

Research Assistant : Mrs. T. Govender
S9 Level 3, Room 314

Tel. No. : 031 373 2961

E-mail : researchFN@dut.ac.za

3. FIELDWORK REQUIREMENTS

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

- Fieldwork marks adds up to **10%** of the final mark for **WIL**.
- Students can be expected to do any of the following tasks as part of their 10 hours:
    - Fieldwork in a community
    - Data capturing
    - Participating in a community upliftment project
    - Assisting with other research activities, e.g. Departmental Research Day

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

4. ASSESSMENT CRITERIA

SUBJECT: Work-integrated Learning

LECTURER/RESEARCHER ASSESSMENT: Academic Service Learning component

Student name:_____

Student number: _____

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

Number of hours completed: _____

General comments:

_____
_____
_____
_____

Researcher Signature: Date:

_____
_____

Print name: _____

5. FIELDWORKER CODE OF CONDUCT

5.1 BEHAVIOUR

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

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

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

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

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

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

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

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

   - wear neat, simple and comfortable clothes

- do not wear badges or emblems of organisations, churches, etc. as these may influence the way subjects answer.

- dress so that the subject will concentrate on the interview and not on the way you are dressed.

5.2 CONDUCTING THE INTERVIEW

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

1. How do I begin?

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

2. How do I conduct the interview?

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

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

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

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

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

- Keep the tone of the interview conversational. Be friendly and courteous. Do not make the subject feel as if he or she is taking an examination or is on trial be familiar with the questionnaire so that you can ask questions conversationally rather than reading them stiffly. The questionnaire is designed to keep the amount of writing to a minimum. However, if a subject gives a long response to an 'other' question, say, 'excuse me while I write that down'. Don't make the subject feel as though you have forgotten he is there.

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

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

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

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

3. How do I end the interview?

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

6. INTERVIEW EXAMPLE

24-HOUR FOOD RECALL QUESTIONNAIRE

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

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

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

S: I drink tea and then have porridge.

I: How do you take your tea?

S: With 2 sugars and a little milk.

I: How big is the spoon and is it level or heaped? (*Showing the teaspoon*).

S: It is like that spoon and I also have it heaped.

I: What type of porridge did you eat and how much did you have? (*Showing a bowl or cup*).

S: I had soft mealie meal porridge and I had about 2 of those cups to the fill in a bowl.

I: Do you put anything else in the porridge?

S: Yes, 2 spoons of sugar, like my tea, and a little margarine about 1 spoon.

I: At about what time was this meal?

S: At 6 am.

I: Where did you have this meal?

S: At home.

Time (approximately)	Place (Home, school, etc)	Description of food and preparation method.	Amount	Amount in g (office use Only)	Code (office use only)
From waking up to going to work, or starting day's activities					
6 am	**Home**	**Tea, rooibos**	**1 cup/mug**		
		With milk, full cream	**little milk – 2 tablespoons**		
		And sugar, white	**2 heaped tsp**		
		Soft mealie meal porridge	**2 cups**		
		With sugar, white	**2 heaped tsp**		
		And margarine, hard brick	**1 tsp**		

7. PORTION SIZES

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

FOOD	Smaller than smallest	Between small and medium	Between medium and large	Between large and very large	Larger than large/very large
potato and onion					
Spinach, potato	15 g	45 g	75 g		105 g
Tomato and onion gravy	10 g	30 g	60 g		100 g
Pumpkin	15 g	35 g	60 g		80 g
Carrots, potato	45 g	65 g	80 g		95 g
Green mealie	50 g	110 g	180 g		260 g
Beetroot salad	10 g	30 g	65 g		85 g
Fat cake	20 g	50 g	70 g		90 g
Bread	15 g	45 g	80 g		120 g
Margarine	2,5 g	7,5 g	12,5 g		17,5 g
Dumpling	20 g	70 g	125 g		175 g
Apple	70 g	130 g	195 g		265 g
Banana	40 g	60 g	95 g		130 g
Canned peaches	30 + 10 g	70 + 15 g	110 + 25 g		150 +35 g

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

8. Other Questionnaires

The researcher may also use any of the following questionnaires:

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

ANNEXURE D

PLATE WASTE STUDY

Date: _____ Children's home: _____

House no: _____

Evaluator : _____

Menu: _____

_____

	Weight of empty plate (g)	Weight of plate with added menu item 1 (g)	Portion size (g)	Weight of plate with added menu item 2 (g)	Portion size (g)	Weight of plate with added menu item 3 (g)	Portion size (g)	Weight of plate with added menu item 4 (g)	Portion size (g)	Weight of plate with added menu item 5 (g)	Portion size (g)	Weight of plate returned to the kitchen (g)	Plate waste (g)
Menu item													
Plate 1													
Plate 2													
Plate 3													
Plate 4													
Plate 5													

Plate 6													
Plate 7													
Plate 8													
Plate 9													
Plate 10													
Plate 11													
Plate 12													
Plate 13													
Plate 14													
Plate 15													
Av portion size													

Comments:

_____

_____

_____

_____

ANNEXURE E

NUTRITION KNOWLEDGE QUESTIONNAIRE FOR CHILD CARE WORKERS OF IMMUNE COMPROMISED CHILDREN IN CHILDREN'S HOMES IN THE DURBAN AREA

ABOUT THIS QUESTIONNAIRE

The purpose of this questionnaire is to assist the researcher in developing reliable and valid nutrition education material for child care workers. All the participants will remain anonymous.

INSTRUCTIONS

This questionnaire contains the following types of questions:

1. Multiple choice questions: choose the answer/answers that you think is the correct and tick in the block that is next to your answer.

2. True/false questions: choose the true or false and tick in the box.

DATE: DD MM YY

SUBJECT NUMBER:

NAME OF CHILDREN'S HOME: _____

PLEASE ANSWER ALL THE QUESTIONS EACH PAGE BEFORE MOVING ON TO THE NEXT PAGE.

DO NOT PAGE BACK!

1. You should have starches or "carbohydrates " with every meal because :

They are important for your health	
They can cause weight gain in small amounts	
They cause diseases	
None of the above	

2. Do you think the following foods are in the "starchy" or "carbohydrate" food group?

   Please tick next to each food item.

	yes	no	Not sure

Cheese			
Samp			
Stiff pap			
Rice			
Margarine			
Tinned fish			

3. How much water should you drink per day?

You don't have to drink water everyday	
1 to 3 glasses	
4 to 6 glasses	
7 to 9 glasses	

4. From which group of food should you eat most of every day?

Bread, samp, rice, porridge (cereal and starch group)	
Apples, bananas, spinach, carrots (fruit and vegetable group)	
Milk, yogurt, cheese (dairy group)	
Chicken, fish, beans, eggs	
Sweets, fats and cakes	

5. Do you think these items below are a good or poor source of protein?

   Please tick next to each food item

	Good source	Poor source	Not sure
Cheese			
Chicken			
Stiff pap			
Rice			
Fruit			
Tinned fish			

6. Canned beans, peas, or lentils are healthy choices to eat in place of meat or chicken:

True	False	Not sure

7. How much pumpkin should I dish-up per plate?

1 tablespoon	
Half a cup	
1 cup	
2 cups	
Not sure	

8. Which group of foods is the best source of energy ?:

Bread, samp, rice, porridge, margarine, cooking oil	
Spinach, carrots, tomatoes	

Milk, yogurt, cheese	
Chicken, fish, beans, eggs	

9. Egg is a healthy choice to eat in place of meat or chicken:

True	False	Not sure

10. The key to a healthy way of eating is to

Eat many different kinds of foods	
Eat some foods more than other foods	
Eat certain kinds of foods in moderation or small amounts	
All of the above	

11. Adding a lot of sugar in your tea and coffee will give you energy

True	False	Not sure

12. Tinned fish is a healthy choice to eat in place of meat or chicken:

True	False	Not sure

13. How many fruits and vegetables should be eaten per day?

1 fruit and vegetable per day	
3 – 4 fruits and vegetables a day	

5 or more fruits and vegetables a day	
There is no need to eat fruit and vegetables daily	

14. A well balanced diet

Consists mostly of meat, with smaller amounts of starch, fruits, vegetables, and dairy	
Consists mostly of vegetables, and smaller amounts of meat and dairy	
Consists mostly of starches, vegetables, fruits, with smaller amounts of meat and dairy products	
None of the above	

15. Which of the following nutrients are found in large amounts in fruits and vegetables?

Fibre, Vitamin A, Vitamin C	
Starches, fat, Vitamin D	
Fats, iron, calcium	
None of the above	

16. You should always add extra salt to cooked food at the table before you eat it.

True	False	Not sure

17. For a healthy immune system you should eat a diet that :

Consists mostly of meat, with smaller amounts of starch, fruits, vegetables, and dairy	
Consists mostly of vegetables, and smaller amounts of meat and dairy	
Consists mostly of starches, vegetables, fruits, with smaller amounts of meat and dairy products	
None of the above	

18. Which group of foods has the most Vitamin A?

Oats, whole wheat bread, rice, samp	
Carrots, spinach, butternut, sweet potatoes	
Chocolate cake, pies, baked pudding	
None of the above	

19. Which of the following is a healthy snack?

Cheese curls	
Peanuts and raisins	
Fried chips (hot chips)	
“Simba” Chips	

20. Being physically active means

Going to the gym	
Walking a lot	
Playing sports like soccer or netball	
All of the above	

21. A) Drinking wine, beer and cider everyday is acceptable as long as it is in moderation

True	False	Not sure

B) When I am not feeling well or are HIV- positive, it is OK to drink alcohol moderately

True	False	Not sure

22. If you are eating a healthy diet, there is no need for you to be physically active

True	False	Not sure

23. Fresh fruit and vegetables should always be washed thoroughly before eating, peeling or cutting it:

True	False	Not sure

24. To prevent food from being contaminated during preparation, you should:

Wash your hands regularly with hot, soapy water while preparing food	
Always use clean utensils, cutting boards and pots	
Both of the above statements are correct	

25. The following steps should be followed when washing plates and utensils after a meal:

Wash the plates and eating utensils with warm water and dry with a clean dish cloth	
Wash the plates and eating utensils with very hot soapy water, rinse and allow to air dry	
Scrape the left-over food into a waste bin, wash the plates and eating utensils with very hot soapy water, rinse in very hot clean water and dry with a clean dish cloth	

A FEW QUESTIONS ABOUT YOURSELF:

1. Are you

Male	
Female	

2. How old are you?

Less than 18	
18 - 24	
25 -34	
35 - 44	
45 - 54	
55 - 64	
65 - 74	

Older than 75	

3. What is the highest level of education you have completed?

Primary school	
Secondary school: State what grade? OR State what standard ?	
Technical or trade certificate: State the name of the qualification	
Diploma: State the name of the diploma:	
Degree: State the name of the degree	
Any other courses/workshops you attended (please specify):	

4. Do you have any health or nutrition related qualifications?

Yes (please specify)	
No	

5. How long have you worked as a child care worker in children's homes?

6. What is your job title?

7. Do you live on the premises of the children's home?

YES, when on duty	No, never

8. Are you involved in any of the following? (please tick)

Menu planning for the facility	
Purchasing and ordering of food	
Preparation of food	
Plating/ dishing up of food for meals	

Please answer the following question by ticking the relevant box:

1. Which of the following type of education material will you find useful in your workplace?

Posters	
Pamphlets	
Calenders	
Manuals	
Workbooks	
Fridge magnets	
Desk calender	
Other : (please write down)	

2. Do you like using education material with: (PLEASE CHOOSE **ONE** ONLY)

Drawings/pictures/photos only	

Words only	
Drawings/pictures/photos and words	

3. Do you like: (PLEASE CHOOSE **ONE** ONLY)

Coloured drawings/pictures	
Coloured photo's	
Black and white drawings/pictures	
Black and white photo's	

4. What language do you prefer? (PLEASE CHOOSE **ONE** ONLY)

Zulu	
Xhosa	
English	
It does not matter	
Other: (please write down)	

The end

Thank you very much for your time !

ANNEXURE F

QUESTIONNAIRE

Dear respondent, the purpose of this questionnaire is to measure how clear the images designed for the educational materials are so that we can improve them if needed.

Date: _____ Name: _____

Site/venue: _____

Personal details*:*

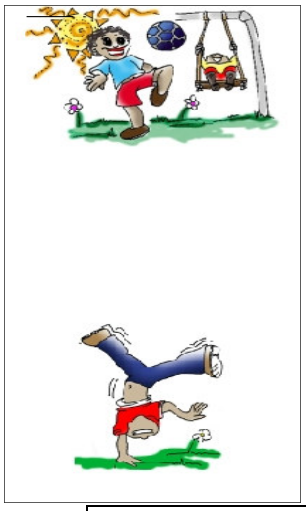
1. Are you

Male	
Female	

2. How old are you?

Less than 18	

18 - 24	
25 -34	
35 - 44	



45 - 54	
55 - 64	
65 - 74	
Older than 75	

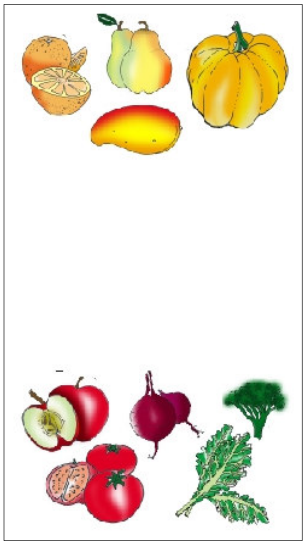
3. What is the highest level of education you have completed?

Primary school	
Secondary school What grade?	
Technical or trade certificate	
Diploma	
Degree	
Other (please specify:	

SECTION A

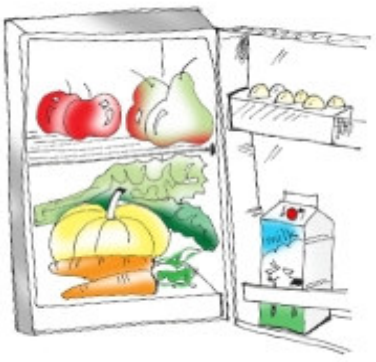
What do the following images show?

Figure 1



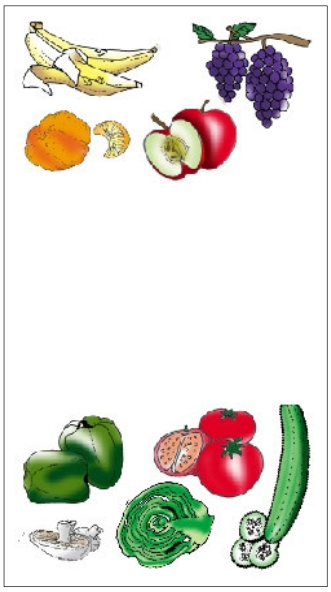
Please write your answer down:

Figure 2



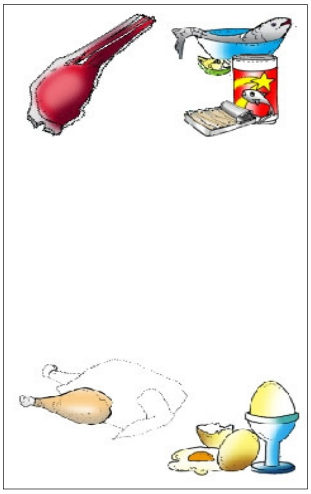
Please write your answer down:

Figure 3



Please write your answer down:

Figure 4



Please write your answer down:

Figure 5

Please write your answer down:

Figure 6

Please write your answer down:

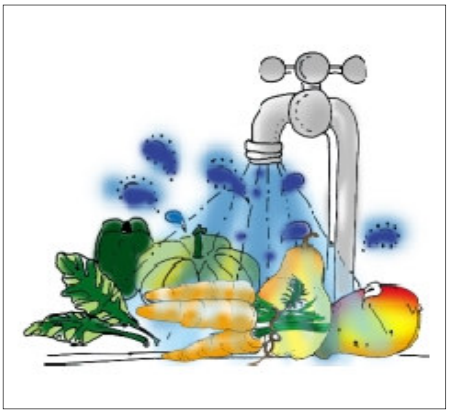


Figure 7

Please write your answer down:

Figure 8

Please write your answer down:

Figure 9

Please write your answer down:

THANK YOU FOR YOUR TIME!!

SECTION B

Match the images in column A with the messages in column B. Record your answers on *page 11* :

Column A **Column B**

Figure 1

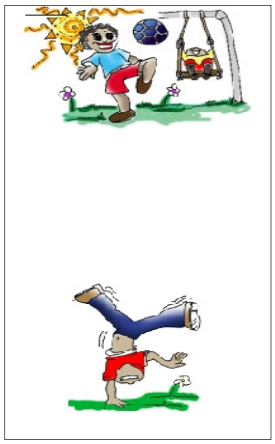


Figure 2

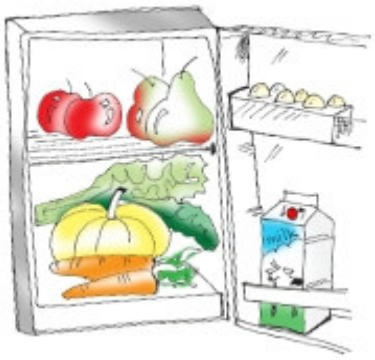


Figure 3

A. Prevent cross contamination during food preparation by covering wounds and washing hands regularly

B. Avoid alcohol as it causes the body to lose vitamins

C. Buy fruit and vegetables fresh and always store in a cool place

D. Make starchy foods the basis of every meal

E. Make fruit and vegetables part of every meal to protect the body against infections

F. Wash dishes and kitchen work surfaces with hot soapy water

G. Eat fruit and vegetables raw if possible; cooking destroys vitamins

H. Good nutrition strengthens the body's immune system

I. Eat meat, fish, poultry and eggs daily to support a healthy immune system

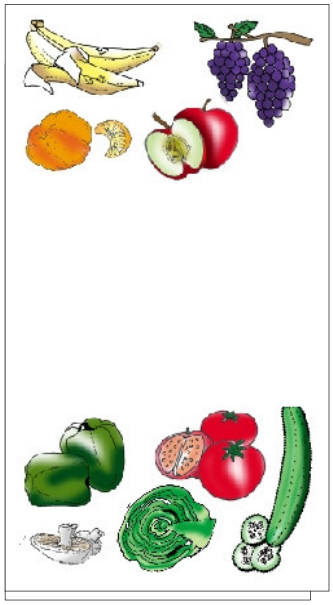
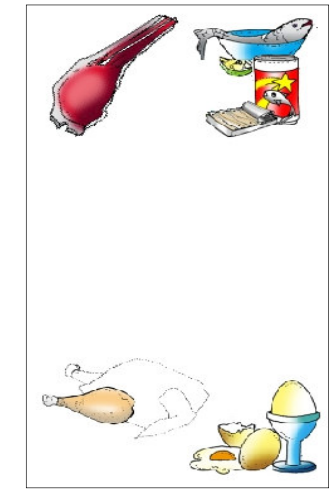
 **Figure 4**  **Figure 5**	J. Use salt sparingly K. Wash fruit and vegetables before eating, peeling or cutting

Figure 6

Figure 7

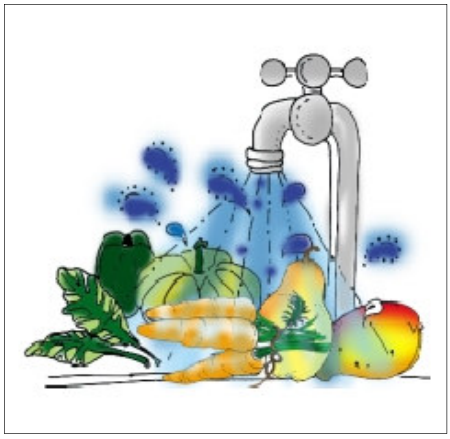


Figure 8

Figure 9

Write your answers here:

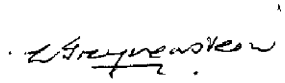
IMAGE	**MESSAGE (eg. A, B,C etc)**
Figure 1	
Figure 2	
Figure 3	
Figure 4	
Figure 5	
Figure 6	
Figure 7	
Figure 8	
Figure 9	

THANK YOU FOR YOUR TIME!!!

ANNEXURE G

This is to certify that the language editing of this Masters Degree written by Ms H Grobbelaar was done by Prof L A Greyvenstein.

Prof L A Greyvenstein is a member of the South African Translators' Institute, membership number: 1001691. She completed her primary, secondary and tertiary education, including a doctoral thesis, in English. She has done the English language editing of many proposals, dissertations, theses and scientific articles.



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