

IMPACT OF A NUTRITION EDUCATION PROGRAMME ON THE NUTRITION KNOWLEDGE OF GRADE R LEARNERS IN DURBAN

By

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DECLARATION

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ABSTRACT

AIM: The aim of the study was to identify the need, develop, implement and determine the effect of a Grade R Nutrition Education Programme (NEP) in order to make recommendations to the South African Department of Basic Education (DBE) to include an effective NEP in the pre-primary school education curriculum.

OBJECTIVES: The objectives for this study is in two phases, The objective of the baseline study was to assess the need for nutrition education (NE) in Grade R in suburban areas of Durban and identify the most suitable nutrition education tools (NETs) for this age group.

For the intervention study the objectives were 1) to develop a nutrition knowledge questionnaire (NKQ) to determine the existing nutrition knowledge of Grade R learners in suburban government and private schools in Durban, 2) to develop a nutrition education programme (NEP) for Grade R based on the South African Food-Based Dietary Guidelines (FBDGs) and the food groups, 3) to implement the NEP in Grade R in a government and private school, 4) to determine the effect of the NEP on the retention of FBDGs (Section one) and food group (Section two) knowledge, and 5) to compare the results between the control group (CG) and the government (EGG) and private (EPG) experimental school groups, and between genders.

METHODS: A self-administered nutrition education needs questionnaire was completed by 20 Grade R teachers in Durban suburban schools.

Nutrition education material was identified based on the results from the pilot study and a Nutrition education programme developed. The classroom-based intervention study involved 120 Grade R learners in three schools, two experimental schools: government (n=37) and private (n=40), with a control school (n=43), with 35 percent (n= 42) male and 65 percent (n=78) female participants, ranging in age from five to seven years. A validated questionnaire assessed baseline nutrition knowledge of these children. A qualified foundation phase teacher was trained to implement the NEP. The experimental school groups received eight one hour nutrition education (NE) lessons over an eight week period; the control group did not receive any NE. During the lesson firstly theory was covered then the children worked on the related fun activities in the Healthy Eating Activity Book (HEAB) and lastly involved in the nutrition educational games. These included a food group plate puzzles, a NEP board game, a card game and 'My little story books'. A post-test determined the impact of the intervention.

RESULTS: The baseline study confirmed the need for NE in Grade R and identified suitable NETs that were used in the intervention.

At pre-test, the nutrition knowledge of Grade R children in the two experimental groups (EG) and one CG was very similar with knowledge of FBDGs greater than knowledge relating to the food groups.

Both Grade R EGs showed a significant increase in knowledge for the whole test immediately after the intervention with the CG, achieving similar post-to pre-test results. The intervention had a significant impact on nutrition knowledge of Grade R children in both experimental schools (EGG $p=0.004$ and

EPG $p=0.001$). The EPG were most knowledgeable regarding FBDGs with no significant difference in knowledge of the EGG. Food group knowledge in all schools was poor at baseline and the NEP resulted in the EGG obtaining the highest post-test results. Post-intervention for the whole test the EGG were marginally (0.80 percent) more knowledgeable than the EPG.

The knowledge of boys and girls were very similar in pre-and post-test results. However, the boys were fractionally more knowledgeable than the girls in relation to the whole post-test. In Section two, relating to food group knowledge, girls were slightly more knowledgeable than boys although both genders lacked knowledge in relation to which foods belonged to a particular food group.

CONCLUSION: The primary aim of formal NE was met as the statistical significance between the CG and experimental group post-test results was evident in the majority of Section one questions and in all questions in Section two. The NEP resulted in similar increase in knowledge of Grade R learners in the government and private experimental school groups in Durban. In addition, the boys and girls showed a minimal difference in nutrition knowledge.

Key words: pre-primary children, nutrition knowledge, nutrition education, nutrition education tools

LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
AND	Academy of Nutrition and Dietetics
ASGISA	Accelerated Shared Growth Initiative
B	Billion
BFHI	Baby Friendly Hospital Initiative
BMI	Body Mass Index
BMIFA	Body Mass Index-for-Age
Ca	Calcium
CAPS	Curriculum and Assessment Policy Statement
CATCH	The Child and Adolescent Trial for Cardiovascular Health
CBN	Community-Based Nutrition
CBNP	Community-Based Nutrition Programme
CDI	Child Development Index
CDG	Care Dependency Grants
CDL	Chronic Diseases of Lifestyle
CG	Control Group
CGS	Child Growth Standards
CHF3	Health through Farming, Food, and Fitness Program
CHO	Carbohydrates
CMH	Colour Me Healthy
CPI	Consumer Price Index
CRC	Convention on the Rights of the Child
CRVS	Civil and Registration and Vital Statistics Systems
CS	Community Survey
CSG	Child Support Grant
CTD	Connecting the Dots...Healthy Foods, Healthy Choices, Healthy Kids
DBE	Department of Basic Education
DHIS	District Health Information system
DoE	Department of Education

DoH	Department of Health
DUT	Durban University of Technology
EAR	Estimated Average Requirement
EC	Eastern Cape
ECD	Early Child Development
EDLW	Every Day, Lots of Ways
EG	Experimental group
EGG	Experimental government group
EPG	Experimental private group
EU	European Union
FAO	Food and Agriculture Organisation
FBDG	Food-Based Dietary Guideline
FCG	Foster Care Grants
Fe	Iron
FRC	Faculty Research Committee
G8	Group of 8
GCIS	Government and Communication Information System
GDP	Gross Domestic Product
GHS	General Household Survey
GNI	Global Nutritional Index
GPI	Gender Parity Index
H/A	Height-for-Age
HEAB	Healthy Eating Activity Book
HFS	Household Food Security
HIV	Human Immunodeficiency Virus
HNS	Health of the Nation Study
HOD	Head of Department
HPS	Health Promoting School
HSRC	Human Science Research Council
ICCIDD	International Council for Control of Iodine Deficiency Disorders
ICN	International Conference on Nutrition

IDA	Iron Deficiency Anaemia
IDD	Iodine Deficiency Disease
IES	Income and Expenditure Survey
IFFS	Integrated Food Security Strategy
IFSNP	Integrated Food Security Nutrition Programme
IMR	Infant Mortality Rate
ISASA	Independent Schools Association of Southern Africa
INP	Integrated Nutrition Programme
INS	Integrated Nutrition Strategy
ISRDP	Integrated Sustainable Rural Development Programme
IVACG	International Vitamin A Consultative group
KAB	Knowledge-Attitude-Behaviour
KI	Kindergarten Initiative
KZN	KwaZulu-Natal
LBW	Low Birth Weight
LCS	Living Conditions Survey
LED	Local Economic development
LIFD	Low-income food deficit
LO	Life Orientation
LTFU	Lost to follow up
M	Million
MARG	Medical education for children/adolescents for realistic prevention of obesity and diabetes and for healthy ageing
MDGs	Millennium Development Goals
MDGR	Millennium Development Goal Report
MF	Micronutrient Forum
MI	Micronutrient Initiative
NBDS	National Burden of Disease Study
NCDs	Non-communicable diseases
NCS	National Curriculum Statement
NDP	National Development Plan

NE	Nutrition Education
NEBS	Nutrition Education in Basic Schools
NEP	Nutrition education programme
NEQ	Nutrition education questionnaire
NET	Nutrition Education Tool
NFCS	National Food Consumption Survey
NFCS:FB-1	National Food Consumption Survey: Fortification baseline-1
NFSI	Nutrition-Friendly Schools Initiative
NFFP	National Food Fortification Programme
NGP	New Growth Path
NI	Nutrition intervention
NIDS	National Income Dynamics Study
NIS	National Iodine Survey
NKQ	Nutrition knowledge questionnaire
NNW	National Nutrition week
NPC	National Planning Commission
NPNS	National Pre-school Nutrition Survey
NSNP	National School Nutrition Programme
NSP	Nutrition Supplementation Programme
NSW	New South Wales
OBE	Outcomes Based Education
PE	Physical education
PEB	Plattform Eeinarhruny und Bewegung
PEM	Protein Energy Malnutrition
PERSEO	Pilot study for Health, Physical Exercise and against Obesity
PFBGDs	Paediatric Food-Based Dietary Guidelines
PMTCT	Prevention of mother–to-child transmission
PPP	Purchasing power parity
PSNP	Primary School Nutrition Programme
Q	Question

RDP	Reconstruction and Development Programme
RMC	Research Medical Council
RMS	Rapid mortality system
RTHC	Road to Health Chart
SA	South Africa
SACMEQ	Southern and Eastern Consortium for Monitoring Educational Quality
SADHS	South African Demographic and Health Survey
SANHANES-1	South African National Health and Nutrition Examination Survey-1
SASA	South African Schools Act
SAVACG	South African Vitamin A Consultative Group
SCT	Social Cognitive Theory
SD	Standard Deviation
SES	Socio-economic status
SFA	Saturated fatty acids
SFP	School feeding programmes
SGB	School Governing Body
SNA	School Nutrition Association
SNE	Society of Nutrition Education
SOCPEN	Social Security Agency
SOFI	State of Food Insecurity
SPSS	Statistical Package for Social Sciences
SRD	Social Relief of Distress
Stats SA	Statistics South Africa
SUN	Scaling up Nutrition
TB	Tuberculosis
TEENS	Teens Eating for Energy and Nutrition at School
US	United States
U5MR	Under-five mortality rate
UI	Urinary Iodine
UK	United Kingdom

UN	United Nations
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Programme
UNSCN	United Nations Standing Committee on Nutrition
UPL	Upper poverty line
URP	Urban Renewal Programme
US	United States
USAID	U.S. Agency for International Development
VAD	Vitamin A Deficiency
VADDs	Vitamin A Deficiency Disorders
Vit.	Vitamin
VMD	Vitamin and Mineral Deficiencies
W/A	Weight-for-Age
WFP	World Food Programme
W/H	Weight-for-Height
WHO	World Health Organisation
ZHC	Zero Hunger Challenge
Zn	Zinc

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LIST OF ANNEXURES

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CHAPTER 1: THE PROBLEM AND THE SETTING

1.1 INTRODUCTION

This chapter provides a general orientation to the setting of this South African study relating to the impact of a nutrition education programme (NEP) on the nutrition knowledge of Grade R children in the two categories of schools: public (government) and independent (private) as defined in the South African Schools Act (SASA) of 1996 (The Independent Schools Association of Southern Africa (ISASA), 2013). The schools participating in the study were situated in two different socioeconomic suburbs, Glenwood and Berea, in the city of Durban, in the eThekweni metropolitan municipality, in the province of KwaZulu-Natal (KZN) on the east coast of South Africa (SA).

In 2011, KZN was the province with the second largest population (10.3M). The majority group (73.80 percent) was Black African with smaller percentages of Indians (16.70 percent), Whites (6.60 percent) and Coloureds (2.50 percent). A variety of languages are spoken in South Africa and in KwaZulu-Natal the majority (62.20 percent) speak IsiZulu, followed by English (26.50 percent) and to a lesser extent IsiXhosa (3.90 percent), Afrikaans (1.70 percent) and IsiNdebele (1.10 percent). Residing in the eThekweni municipality were 3.5M people in 956 713 households, with an average household size of 3.4, and 40.00 percent were headed by females (Statistics South Africa (Stats SA), 2014).

Globally, there is an increased impetus to reduce malnutrition with the world uniting and investing in nutrition for the benefit of international wellbeing as it is placed on the agendas of the Group of 8 (G8), United Nations (UN) Zero Hunger Challenge (ZHC) and Scaling up Nutrition (SUN) (UN Children's Fund (UNICEF), 2013b: iv).

UNICEF (2013b: 3-4) postulates that a child's nutritional standing is a direct result of three factors, namely food, maternal and child-care, and a healthy environment. These are affected by a country's political, socio-cultural and economic context. The Food and Nutrition Division of the Food and Agriculture Organisation (FAO) affirm the importance of good nutrition during childhood with nutrition education (NE) in schools making a vital contribution to the long term economic development of society (FAO, 2005). At home and at school, pre-primary school children have to eat what is served with limited food choice. Urban school children purchasing food of poor nutritional value from street vendors for consumption during school hours is increasing (FAO, 2007). Academic literature suggests that nutrition knowledge gained from NE is important as it can empower a young child to make healthier choices (Matvienko, 2007: 284; Zarnowiecki et al., 2011: 1284). However, Phometsi, Kruger and van Riet, (2006: 536) reported that making sound choices will be affected by economic, psychological and social factors.

Fundamental human rights relating to food and nutrition are stipulated in international legislation. The right to food is mentioned in the Universal Declaration of Human Rights (1948, Article 25), in the preamble of the UN FAO constitution (1965) and in Objective 7.4 of the World Food Summit Plan for

Action of 1996 (FAO, 2014). Closely linked is the right of children to attain a good standard of health and nutrition as stated in Article 25 of the UN 1989 Convention on the Rights of the Child (CRC) and in the Rights and Welfare of the Child in the African Charter (Article 14(1)) (Hall, Nannan and Sambu, 2013: 95). Education is a recognised basic human right in the CRC (Article 28) 1989 and is essential to the health and development of all children (Williamson, 2005: 261).

These three human rights are also enshrined in the Bill of Rights (1996) in the Constitution of SA which addresses the child's basic rights of education (Section 29 (1)(a)), nutrition and basic health services (Section 28 (1)(c)) and adequate food and water (Section 27 (1)(b)) (SA Government Information, 1996).

Children's rights are violated even in urban areas, the setting for this study. Here malnutrition increases faster than in rural areas with the number of poor urban dwellers escalating. Unsanitary conditions and unsafe drinking water which intensify with natural disasters continue to affect those living in urban slums. Urban poverty in slums prevents children from receiving pre-primary education which impacts on a child's development (UNICEF 2012: 3-5, 7-8).

The UN Millennium Development Goals (MDGs) of 2000 outline eight measurable goals for the improvement of humankind by the target date 2015. Critical aspects of these goals focussed on the basic human rights of children which needed to be realized. The first six MDGs as shown in Table 1.1 are child-related and the last two ultimately impact on the wellbeing of children (UNICEF 2013d).

Table 1.1: Millennium Development Goals (UNICEF, 2013d)

MILLENNIUM DEVELOPMENT GOALS (MDGs)	
MDG 1	Eradicate extreme poverty and hunger by half
MDG 2	Universal primary school education completed by all girls and boys
MDG 3	Promote gender equality and empower women
MDG 4	Reduce child mortality by two-thirds
MDG 5	Improve maternal health
MDG 6	Combat HIV and AIDS, malaria and other diseases
MDG 7	Ensure environmental sustainability
MDG 8	Develop a global partnership for development

1.2 BACKGROUND TO THE PROBLEM

1.2.1 Malnutrition in children globally and in South Africa

Many factors impact on the health of children including nutrition with far-reaching effects on the individual, subsequent generations and the economy (Hall, Nannan and Sambu, 2013: 97, 99). It is a child's first 1000 days that are the most critical with regard to meeting the nutritional requirements for which he/she is solely reliant on others (UNICEF, 2013b: 3)

Over-and undernutrition are both forms of malnutrition (Pridmore and Carr Hill, 2009: 13) which will be discussed in greater detail in Chapter 2. Overnutrition is reflected in overweight and obesity whilst undernutrition, a cause and materialization of poverty, is evident when underweight and stunting presents (Darnton-Hill et al., 2006: S56) as well as the issues of wasting and micronutrient deficiencies (Provo, 2013: 40). Generally, undernutrition is a problem considered by governments to be of low priority (Pridmore and Carr Hill, 2009: 8). Annually however, in excess of 10M children under the age of five die with 6M of these deaths occurring as a result of infectious diseases with malnutrition and undernutrition as a causative factor (Darnton-Hill et al., 2006: S54).

In developing and developed countries, mainly women are affected by the coexistence of macronutrient overnutrition and micronutrient undernutrition and the incident rate is increasing (Provo, 2013: 43). The double burden of disease is a result of infectious (or communicable) diseases related to undernutrition and chronic diseases of lifestyle (CDL) related to overnutrition (Provo, 2013: 40; Vorster and Bourne, 2008: 240). Malnutrition is the main contributor to the double burden of disease as overweight and undernutrition which often coexist in one household or in an individual (Rossouw, Grant and Viljoen, 2012) and is a common occurrence in schools in low-income areas (Draper et al., 2010: 1). Provo (2013: 41) declares that the double burden of disease warrants NE as one of the educational strategies to address these conditions.

The FAO (2014) statistics revealed that globally 842M (12.00 percent) people were undernourished during 2011-2013, an improvement on previous figures, and in SA this was under 5.00 percent. Worldwide research has highlighted the negative influence of undernutrition on school-going children in respect of school performance, attendance and intelligence (Grantham-McGregor et al., 2007). Undernutrition in children less than five years old is as a direct result of a combination of a scarcity of healthy food, lack of knowledge on the part of the caregiver and the occurrence of childhood illnesses. In addition, undernutrition contributes to the death from infectious diseases of more than fifty percent of children in this age group (Darnton-Hill et al., 2006: S55). The three main measures of undernutrition are stunting (low height-for-age) allied to chronic undernutrition, wasting (low weight for height) indicative of acute malnutrition, and underweight (low weight-for age), an indicator of stunting and wasting (UNICEF, 2013b). These indicators are based on the World Health Organisation (WHO) Child Growth Standards (CGS) (Hall, Nannan and Sambu, 2013: 99,100).

Globally in 2012, 162M children (25.00 percent) under five-years-old were estimated to be stunted which equates to one in four children. These numbers have decreased over the years as 180M were found to be stunted in 2005 (UNICEF, 2013a). The prevalence of stunting in SA is of medium severity when compared globally (Human Sciences Research Council (HSRC), 2013b: 3). The global burden of stunting in Africa is particularly high in 22 countries contributing to 90.00 percent of the global stunting burden. The prevalence of stunting in the eastern region of Africa was found to be the highest (Provo, 2013: 40).

Table 1.2: Stunting prevalence in African countries (Provo, 2013: 43)

Country *	Stunting prevalence
Egypt	30.7
Sudan	37.9
Ethiopia	44.2
Uganda	38.7
Kenya	35.2
Rwanda	44.3
Tanzania	42.5
Madagascar	52.8
Malawi	47.8
Mozambique	43.7
South Africa	23.9
Zambia	45.8
Angola	29.2
Democratic Republic of Congo	43.4
Cameroon	43.4
Nigeria	41.0
Ghana	28.6
Niger	54.8
Mali	27.8
Chad	38.8
Burkina Faso	35.1
Cote d'Ivoire	39.0

* In bold the committed Scale Up Nutrition (SUN) countries

In SA, stunting is higher amongst boys and in rural areas (Hall, Nannan and Sambu, 2013: 99,100) although urbanisation is resulting in increasing numbers in these areas (Provo, 2013: 43). The reduction in the incidence of stunting is also evident in SA with 30.00 percent (1993) compared to 22.00 percent in the 2012 SA National Health and Nutrition Examination Survey-1 (SANHANES-1) (Hall, Nannan and Sambu, 2013: 100). Stunting together with underweight has a severe impact on their health, cognitive and physical development of children (Darnton-Hill et al., 2006: S56). In the 2008 National Income Dynamics Study (NIDS) in SA, 12.50 percent (250 000) of children in the five to six year age group were estimated to be stunted and 4.10 percent (82 000) severely stunted (Hall, Nannan and Sambu, 2013: 99,100).

Wasting is an indicator of serious malnutrition and more prevalent in rural areas and in poor households (Hall, Nannan and Sambu, 2013: 100). The 2012 global under-five underweight figures confirm that 15 percent (99M) of these children are underweight and its prevalence is diminishing. In 2005, 113M children were underweight (UNICEF, 2013a). Nevertheless the probability of most African countries halving the occurrence of underweight in children (MDG 1) is low (Provo, 2013: 40). Estimates from the 2008 NIDS established that 8.60 percent (172M) of SA children between five to six years old were underweight and 2.50 percent (51 000) were considered severely underweight. However, the underweight rate has declined to 5.20 percent for children under five, established in the 2012

SANHANES-1 report. Underweight is therefore classified as low severity for this age group (Hall, Nannan and Sambu, 2013: 100).

The 2012 Child Development Index (CDI) indicates the wellbeing of children under five. The CDI measures the mortality, primary school enrolment and underweight rates. The SA CDI scores revealed that over the years (1995-2010) little improvement was made with regards to these rates (Cobham, Molina and Garde, 2012: 4).

Wasting, a result of insufficient nutrition and infection is also known as acute malnutrition. Children suffering from wasting are at an increased risk of developing severe acute malnutrition and die (Hall, Nannan and Sambu, 2013: 100). The majority (70.00 percent) of affected children under-five are found in Asia. In 2012, globally there were 51M children under the age of five suffering from wasting with 5.1M in the Eastern and Southern regions of sub-Saharan Africa. In 2012, severe wasting was estimated at 17M (less than 3.00 percent) children under-five and 1.8M (2.50 percent) were situated in the eastern and southern sub-Saharan Africa (UNICEF, 2013a). Yet central Africa is found to have the highest prevalence (5.60 percent) of severe wasting (Provo, 2013: 40). Statistics released by UNICEF (2013c) for South Africa, report wasting at 5.00 percent (2007-2011) with a decrease in wasting since 2005. The prevalence severity of wasting was classified as low (HSRC, 2013b: 3).

In 2013, globally 43 percent of children suffered from anaemia with the prevalence in high-income regions at 11.00 percent. Various factors can cause anaemia with the primary cause being iron deficiency. Children in SA when compared to those in Africa, fared better even though the occurrence in southern Africa stood at 46 percent (HSRC, 2013b: 3-4).

A 20.00 percent decrease in Vitamin A Deficiency (VAD) in children less than five years old has been observed between 2005 and 2012. Nevertheless, in SA VAD remains a severe problem for 43.60 percent of this age group (SANHANES-1) as well as for those children between 1-6 years old in India (56.70 percent), Malawi (59.20 percent) and Zambia (54.10 percent) (HSRC, 2013b: 3-4).

FAO 2012 statistics indicate that in developing countries about 3.5M children under five die annually due to malnutrition and undernutrition (Kraemer et al., 2012: 40). The Medical Research Council (MRC) of SA established that there has been an annual ten percent reduction in the under-five mortality rate (U5MR) since 2009 and in 2011 the mortality rate was 42 per 1 000 live births (Hall, Nannan and Sambu, 2013: 95). In 2013, there were 62 countries worldwide listed by the FAO as low-income food deficit (LIFD) countries with 39 of them in Africa. This list is based on the 2010 Global Nutritional Index (GNI) used to assess the overall nutritional standing of countries surveyed. The three GNI indicators used were food security, nutritional deficit and nutritional excess with SA being ranked 146 out of 192 countries (FAO, 2014).

The 2002 and 2011 General Household Survey (GHS) data comparison indicated that in SA there has been a 16.00 percent decrease in the number of children in households where child hunger was reported. In 2011, this indicator revealed that African children (2.4M) were the ones to suffer hunger the most, and KZN had the highest number of children (682 000) and a reasonably high rate (16.20 percent) of reported child hunger (Hall, Nannan and Sambu, 2013: 98). Early nutrition in childhood and in-utero has a significant impact on brain development, physical growth, and muscle mass as well as metabolic processes, with long- term implications (Swart and Dhansay, 2008: 379).

The Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) epidemic is vast in Africa and most severe in sub-Saharan Africa although growing rapidly in Eastern Europe and Asia (Levine, Foster and Williamson, 2007: 4). Stats SA (2013c) released figures indicating that mid-year 2013 the SA population stood at close to 53M and 5.3M people were living with HIV, an increase in excess of 1.2M, since 2002 (Hall, Nannan and Sambu, 2013: 96).

The incidence of HIV is exacerbated by poverty (UNICEF, 2013c) and has a negative impact on food security (Ruiters and Wildeschutt, 2010: 12). HIV is related to the majority (70.00 percent) of maternal deaths in SA. Here, nearly 16.00 percent of HIV positive people were between the ages of 15 and 49 with mother-to-child transmission resulting in 50.00 percent of deaths in children under five. Since 2002, KZN has had the highest levels of HIV-prevalence in excess of 35.00 percent (Hall, Nannan and Sambu, 2013: 96).

For children affected by HIV and AIDS there are dire economic and educational consequences impacting on the child's nutritional status (Levine, Foster and Williamson, 2007: 7). Children, particularly girls, of poor rural and urban families affected by HIV and AIDS may attend school infrequently or arrive late or may be unable to continue their schooling. This is mainly due to educational costs, family responsibilities including care-giving, children's illness and infection, family death and mourning periods. These children and especially the vast number of AIDS orphans, suffer from emotional turmoil and psychological distress which negatively impacts on a child's capability to learn and is worsened by poor nutrition and hunger (Figure 1.1, Levine, Foster and Williamson, 2007: 7). In addition, AIDS-related teacher absenteeism negatively impacts on the educational system (Kelly, 2007: 71-85).

The WHO estimates that globally there are over 1 Billion (B) people who are overweight, and of these, at least 30.00 percent are obese. Over the past 20 years in low-and middle-income countries the overweight/obesity rate has trebled and if the trend continues, 28.00 percent of adults in sub-Saharan Africa will be overweight/obese by 2030 (Provo, 2013: 40, 41). Ten percent of school children globally are overweight (Steyn et al., 2009: 146) and the annual rate continues to rise with an alarming 44M (7.00 percent) of under fives in 2012 being overweight, according to UNICEF (2013a).

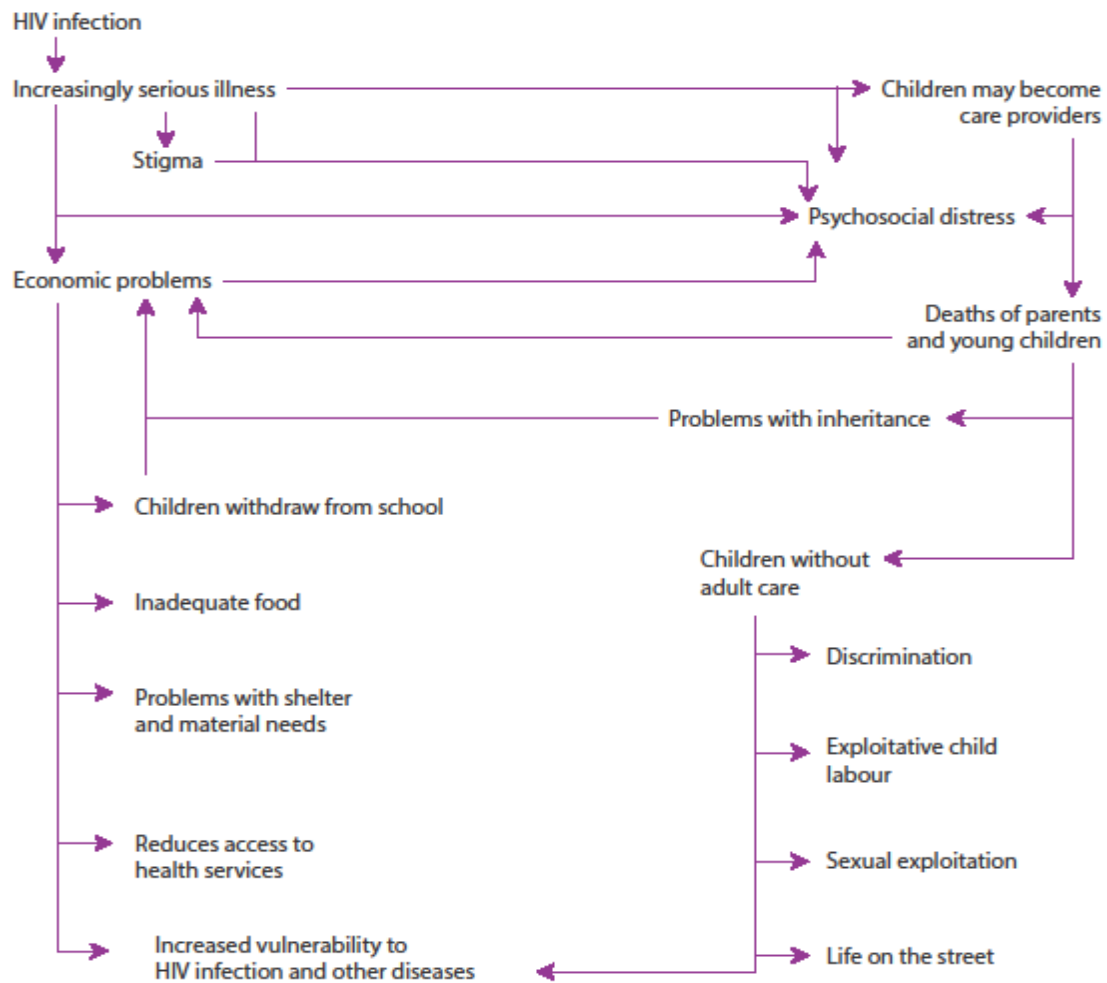


Figure 1.1: The cascading impact of HIV and AIDS on children (Levine, Foster and Williamson, 2007: 7)

The data from the 2012 SANHANES-1 when compared to the 2003 South African Demographic and Health Survey (SADHS) indicates that overweight and obesity have risen significantly to 39.20 percent in SA females (HSRC, 2013a: 2). Overweight and obesity are significant problems affecting 17.00 percent of children between the ages of one and nine years and significantly affecting more girls than boys with the highest incidence in two to five year olds (Steyn et al., 2009: 146; HSRC, 2013b: 1). For the majority of children, these two conditions of overnutrition are attributed to unhealthy eating habits and insufficient physical activity (Sharma, 2011; 208S) which result in CDL (Steyn et al., 2009: 145).

Worldwide in 2005, these lifestyle diseases were the cause of 35M deaths, twice the number of deaths as a result of infectious diseases and nutritional deficiencies. It is in the low and middle-income countries that the CDL death rate is high, with four out of every five CDL deaths occurring in these countries. In SA in 2005, the National Burden of Disease Study (NBDS) estimated that 37.00 percent of the 500 000 deaths were as a result of CDLs in comparison to the 21.00 percent from infectious diseases (Steyn et al., 2009: 145). Shariff et al. (2008: 120) and Steyn et al. (2009: 145) mention that

worldwide research has indicated a rapid increase in the occurrence of childhood overweight and obesity, in both developed and developing countries. The associated health consequences for a child persist into adult life with the adverse risk of the development of chronic diseases.

The results of a study in 2003 involving 5200 Canadian children aged 10-11 years old has confirmed the link between the overall quality of a child's diet and academic performance. Poor nutrition will therefore impact on the ability of a child to reach full cognitive development which will impact on future income potential. These attainments affect the socioeconomic status of their progeny and will also affect future generations. An inadequate dietary intake also hinders the healthy development of a child (Florence, Asbridge and Veugelers, 2008: 213-214).

The income of a household has a direct bearing on the food security standing of all members of the household at all times in respect of the quantity and quality of foods for a healthy life (Jacobs, 2010: 50; HSRC, 2013a: 2). Altman and Ngandu (2010: 64) indicated that in SA in 2004 on average four to six people were supported financially in a low-income household. SANHANES-1 (HSRC, 2013a: 2) indicates food security in 45.60 percent of the population, a substantial increase (20.60 percent) since 1999, as illustrated in Table 1.3.

Table 1.3: Scores for food security, at risk of hunger and experience of hunger (food insecurity) using data from four national South African surveys (Adapted from HSRC, 2013a: 2)

Variable	NFCS 1999 (n=2735)	NFCS 2005 (n=2413)	SASAS 2008 (n=1150)	SANHANES 2012 (n=6306)
	%	%	%	%
Food Security	25.00	19.80	48.00	45.60
At risk of hunger	23.00	27.90	25.00	28.30
Experience of hunger	52.30	52.00	25.90	26.00

Key: NFCS, National Food Consumption Survey; SASAS, South African Social Attitudes

Globally women suffer from acute poverty and by implication food insecurity which has a direct impact on the nutrition status of children. Seventy percent of the inhabitants of sub-Saharan Africa live on less than United States (US) \$2 a day (Ruiters and Wildschutt, 2010: 10-11). Fifty-seven percent of the SA population lives in poverty (Labadarios, Dhansay and Hendricks, 2008: 151) with 26.00 percent in 2012 experiencing hunger (SANHANES-1) a significant decline (26.30 percent) since 1999 (HSRC 2013a: 2). Nevertheless, those at risk of hunger have increased slightly (5.30 percent) over the years (Table 1.3) and food insecurity still remains a major concern in SA (HSRC, 2013a: 2, 6).

It is reported that KZN is the third poorest province in SA with the majority of households being highly food insecure (72.00 percent). The level of food insecurity differs considerably between urban (19.00 percent) and rural households (34.00 percent) established by the Living Conditions Survey 2008/2009

provided by Stats SA (Stats SA, 2012). Food-insecure households are increasing in urban areas especially in the informal settlements (Ruiters and Wildschutt, 2010: 14, 18, 20). In 2008, R136 was the lowest monthly amount spent on food per adult in seriously hungry households (Jacobs, 2010: 50). At the 2005 food prices it cost R262 per adult per month for a diet providing the bare minimum in nutrients and calories (Altman and Ngandu, 2010: 64). Research by Altman and Ngandu (2010: 64) established that the average income of two-thirds of SA working households does not allow these households to be food and nutrition secure. In KZN, data provided by the 2011 Census indicates that the average monthly household income varied considerably with 16.90 percent earning between R19 601-R38 200, while 14.30 percent earned in the range of R9 601-R19 600, 6.20 percent had an income of R4 801-R9 600 and 4.20 percent between R1-R4 800. Nevertheless there was no monthly income for 17.10 percent of the KZN households (Stats SA, 2014).

It is acknowledged by Contento (2011: 27) that there are many factors that influence food choices. Common barriers to pre-school healthy eating were established in the 2012 Irish National Pre-school Nutrition Survey (NPNS), conducted by the Irish Universities Nutrition Alliance. The barriers included: the food likes and dislikes of a child; the convenience of food preparation, caregivers, the cost and availability of food, food advertising and allergies (Walton, 2012: 42).

The economic downturn in 2008-2009 and the sharp food price inflation hike during 2007 and 2009 severely affected the incidence of household hunger (Jacobs, 2010: 39, 42-43). In 2014, food prices continued to rise with an unchanged annual food inflation rate of 8.80 percent and the Consumer Price Index (CPI) in May 2014 was at 6.60 percent, the highest in five years (Stats SA, 2014).

The UNICEF conceptual framework outlines the multiple basic (societal), underlying (household or community) and immediate (individual) causes of malnutrition in children which are interrelated and diverse, as evident in the framework in Figure 1.2 (UNICEF, 2013b). These different levels of causation impact on a child's health, nutrition and chances of survival (Pridmore and Carr Hill, 2009: 15) with severe short-term and long-term consequences which affect future generations (UNICEF, 2013b).

Illness and disease as well as inadequate food and nutrition intake are the immediate causes of malnutrition. Nutritional improvement interventions to address immediate causes have been implemented with success, for example, complementary feeding, breastfeeding and Vitamin (Vit.) A and Zinc (Zn) supplementation (UNICEF, 2013b). Nevertheless, insufficient nutritional intake and illness exist in a cyclic nature impacting negatively on a person's nutritional status (Hall, Nannan and Sambu, 2013: 99).

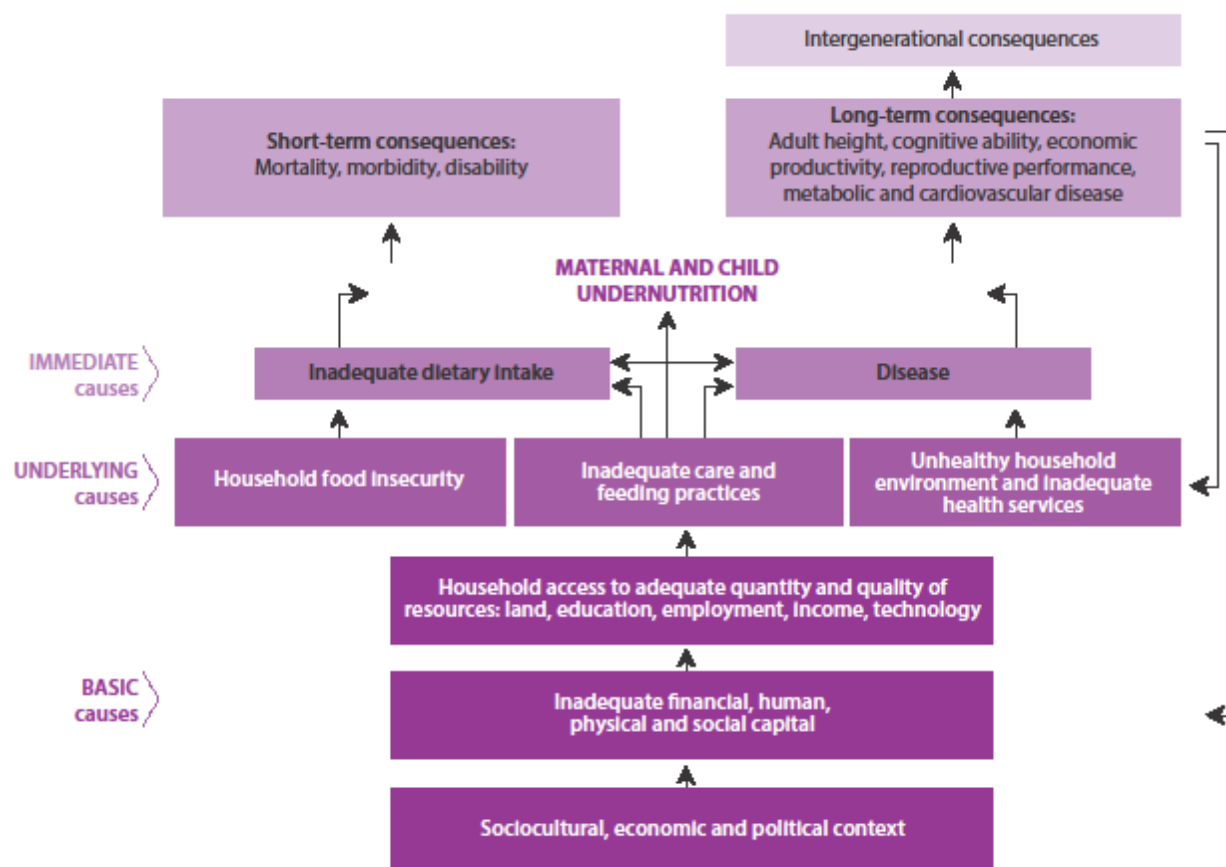


Figure 1.2: Conceptual framework of the determinants of child nutrition (UNICEF 2013b)

These immediate causes are influenced by underlying causes in the family or community with income poverty being the fundamental cause of malnutrition and death of children (Pridmore and Carr Hill, 2009: 19, 26). Poverty has a direct impact on inadequate access to food resulting in household food and nutrition insecurity, a lack of mother and child care, limited education as well as insufficient health services and an unhealthy environment at home (UNICEF, 2013b). Interventions to counteract these underlying factors relate to poverty reduction, agriculture and education initiatives as well as improving the generation of income and health systems (Pridmore and Carr Hill, 2009: 18).

Shariff et al. (2008: 120) posits that NE for school children is considered an important aspect in health promotion interventions to improve health status and the prevention of disease. The need for NE is evident from the SANHANES-1 low score nutrition knowledge results for 71.70 percent of children between 10 and 14 years old. Only 0.90 percent of these children were considered knowledgeable, obtaining a high score. Just over half of these children were able to choose alternative healthy foods and select those containing healthy fats (HSRC, 2013b).

The underlying causes are linked to the basic causes of malnutrition which are related to the social, political and economic aspects of the society structure. This context will have a direct influence on the resource capital available (UNICEF, 2013b) and its distribution (Hall, Nannan and Sambu, 2013: 99).

The UNICEF conceptual framework illustrating determinants of child undernutrition will be discussed in greater detail in the following chapter.

1.2.2 Demography of South African and KwaZulu-Natal children

SA is considered a middle-income country (Hall, Nannan and Sambu, 2013: 95). In mid-2011 the population comprised of approximately 50M people with 62.00 percent living in urban areas (UNICEF, 2013c). Newly released 2014 mid-year population figures estimated the population at 54M (Stats SA, 2014). In 2011, there were a total of 14.5M households with an average of 3.6 people per household (Stats SA, 2013c: 5). There was an estimated 18M children under 18 years of age (UNICEF, 2013c) with around 1M five-year-olds and 1M six-year-olds with a fairly equal gender split (Meintjies and Hall, 2013: 86).

In SA in 2011, 41.30 percent of five to six-year-olds lived with the biological mother and quite possibly with other adults in the household. In comparison, 23.20 percent lived with neither mother nor father, which however does not imply these children are orphans as 78.00 percent have one parent alive. In KZN, there were over 2M households (18.00 percent) comprising nearly 6.5M adults (20.00 percent) and 4.2M children (23.00 percent). The majority of KZN children (1.7M) between 0-9 years old lived with the mother, 1.2M lived with neither parents and only 5.00 percent (217 000) lived with the father. These statistics are fairly similar to the national averages however; the KZN average for children living with both parents (24.50 percent) is considerably lower than the national average of 32.60 percent (Meintjies and Hall, 2013: 87).

Figures released by Stats SA (2012) from the GHS (2011) indicated that approximately 21.00 percent of children (3.85M) in SA were orphans. In 2011, in the five to six year old age groups there were 60 000 double orphans, children bereft of both parents, a statistic that increased two-fold between 2002 and 2011, most likely due to AIDS. The greatest population of children in SA are in KZN and predictably this province exhibited the most orphans in 2011 in each of the three categories of maternal (190 000), paternal (658 000) and double orphans (304 000). The majority of all orphans as well as those in child-only households are found in the poorest 20.00 percent of households (Meintjies and Hall, 2013: 88).

In SA, the number of children in child-headed households decreased between 2002 (118 000) and 2011 (82 000) although not significantly, which is encouraging as ideally a child should be living with an adult over 18 years of age. Nevertheless, just fewer than ten percent of children still in the critical early child development stage (0-9 years) are in child-headed households. Limpopo accounts for the highest number of children (27 000) residing in a child-only household with the Eastern Cape and KZN each reporting 16 000 children in this vulnerable situation, even if it is only for a temporary period of time (Meintjies and Hall, 2013: 89).

The eating behaviour of children (10-14 years), usually established at an early age, was measured in the SANHANES-1 revealing that before leaving for school, two-thirds of children consumed breakfast.

With regards to lunch boxes, the majority (51.10 percent) did not take one to school and nearly 30.00 percent indicated there was no food at home to pack, whilst 37.20 percent relied on the food provided at school. The study revealed that eating outside the home is a common occurrence for 48.00 percent of adults with 28.30 percent doing this on a weekly basis (HSRC, 2013b: 2, 3).

1.2.3 South African poverty and government assistance

The 2013 MDG Country Report (Stats SA, 2013a: 20, 25-26) emphasised that SA experiences poverty, unemployment and inequality, known as the triple challenge, with hunger being linked to these issues. High rates of child poverty are experienced in SA. Insufficient family income compromises the attainment of children's rights relating to food and nutrition as mentioned in the introduction to this chapter.

In 2011 in SA, the upper-poverty line (UPL) was reported as R604 per person per month with 58.20 percent (10.8M) children living below this line, a sizeable decrease since 2003 due to the increase in social support grants. In KZN, just over 2.8M children live below the poverty line (Hall, 2013b: 90). The high unemployment rate in SA compounds the problem, with the last quarter figure for 2013 at 24.10 percent (Stats SA, 2013b) which has increased to 25.50 percent in the second quarter of 2014 (Stats SA, 2014). For the eThekweni municipality, three years earlier (in the 2011 Census) an even higher unemployment rate of 30.20 percent was recorded (Stats SA, 2014). In 2011, over thirty-five percent of South African children were in a household where no adults were employed, affecting predominantly African children (40.00 percent), a stark contrast to the affected three percent of white children. In KZN, 42.50 percent (nearly 1.8M) of children lived in households devoid of an employed adult (Hall, 2013b: 91). The cost of living for the poor has decreased through government initiatives with various social grants provided to reduce poverty (Stats SA, 2013a: 21-23), as discussed further in Chapter 3.

1.3 SCHOOL EDUCATION

1.3.1 Government and private school education in South Africa

In SA, the cost of education varies per school with government schools being considerably less expensive than private educational institutions. Government schools are classified by the Minister of Education according to the Treasury's National Poverty Table into five quintiles. The state funding the school receives depends on the quintile. Quintile 1 comprises the poorest schools, while the least poor schools are in quintile 5. Nationally, each quintile contains 20.00 percent of all learners (Hall and Giese, 2009: 35, 37). The Minister of Basic Education, Ms Angie Motshekga, in the 2014/15 Basic Education Budget Vote Speech mentions that 86.00 percent of government schools are fee-exempt quintile 1, 2 and 3 schools (Department of Basic Education (DBE), 2014; Western Cape Education Department, 2013). In KZN, according to the National Poverty Table 2014, quintiles 1, 2 and 3 constitute 65.50 percent of the learners with 18.70 percent in quintile 4 and 15.80 percent in the least poor schools in quintile 5. It is the School Governing Body (SGB) that sets the school fees (Western Cape Education Department, 2013). Parents have a majority say in the functioning of the school through the SGB. The

minister also emphasised the importance and value of parental support and community involvement in education.

The SA national benchmark for the learner-educator ratio is 40:1, with data from a major international African primary school quality study (Southern and Eastern Consortium for Monitoring Educational Quality (SACMEQ) III Project) indicating that in KZN the average ratio is 35:1 with rural averages being higher than in urban schools (Moloi and Chetty, 2011: 4-5). Wood (2009: 23) advocates that early childhood education requires a high child-adult ratio, allowing for greater interaction to facilitate learning.

The Department of Basic Education advocates English as the medium of instruction and learning in all schools (DBE, 2014). Irrespective of the choice of school, the child's learning will be influenced by the pre-existing social factors of culture, social class, gender, language and ethnicity. Good quality early childhood education is of importance, with the educator requiring both professional knowledge to promote learning as well as curriculum knowledge to provide the appropriate education (MacNaughton, 2009, 47; Cullen, 2009: 182,185,188).

1.3.2 Grade R

In Germany, in the 1800s, the first Grade R, known as Kindergarten, was opened where children learnt through play and interaction to develop intellectually, emotionally and physically (Moyer, 2001: 161,163).

In SA, Grade R is in the foundation phase (Grade R-3) at school. Grade R learners are also referred to as preschool or pre-primary children as formal schooling in SA only commences in Grade One. School attendance, as stated in Act 84 the SA Schools Act, 1966, is only compulsory from Grade 1 and from age seven. Learners need not attend Grade R which is also known as Grade 0 or reception year. Entrance to Grade R is possible when a child is four years old and turning five before midyear (Department of Government Communication and Information System (GCIS), 2011: 160).

A wide range of ages (from four to seven years old) can be found in Grade R. This is due to parents delaying the start of this phase of education, known as 'redshirting', being of the opinion that the child is too immature for academic success (Gullo and Hughes, 2011: 325).

Grade R can be stressful for a child due to parental or caregiver attachment loss and will impact on the child's ability to learn in the classroom (Gurain, 2002: 77). A trusting relationship therefore needs to be established between the educator and the child as well as encouraging children to select their own groups or partners. Through this interaction with their peers a child's communication skills and language will develop (Wood, 2009: 20, 22; Jordan, 2009: 40).

It is a DBE target that by 2014 (original deadline was 2010) every child will attend Grade R before proceeding to Grade One, as stimulation of cognitive development is vital at this early age (GCIS, 2011:

154; Hall, 2013a: 103). The Minister of Basic Education informed the National Assembly in July 2014 that Grade R was in 16 909 out of a total of 18 475 government public primary schools with 779 370 learners enrolled (DBE, 2014). Grade R enrolment rates have improved substantially as in 2009 according to the SA Yearbook 2010/2011 only 620 223 learners were enrolled in the 13 900 schools offering Grade R programmes (GCIS, 2011: 150).

The majority of children (94.00) attend government schools and the remaining six percent are at private schools. Stats SA (2012) indicated that there were fewer five year olds (approximately 85.00 percent) than six year olds (approximately 95.00 percent) attending an educational institution, with a total of just over 2M children in this age group. Moreover there were a fairly equal number of males and females enrolled in pre-primary school. In KZN in 2011, it was established by Stats SA that there were 455 000 learners enrolled for Grade R, a considerable increase from the 206 000 attending in 2002. It has been established that non-attendance at school is mainly due to financial constraints and affects those children from disadvantaged socio-economic families (Hall, 2013a: 102-104).

1.3.3 Academic ability of children entering Grade R

Research has confirmed that children entering Grade R will have varying abilities in reading and mathematics as a result of age, ethnicity, economic standing and child care arrangements during the preceding Grade R year. In the United States (US) The Early Childhood Longitudinal Study of Class 2010-11 found older Grade Rs performed better on average than younger ones. For reading, the female learners obtained higher scores than the males. A Grade R learner performed better at mathematics if a parent had a post-school qualification. Where English was the primary home language, the children scored higher than the non-English speaking children (US Department of Education, 2012).

1.3.4 Gender differences that impact on academic performance

Every child is an individual with many influences affecting learning. In Grade R fewer girls than boys have emotional, behavioural and learning difficulties. There are generic gender learning differences that researchers have identified between boys and girls although there could be exceptions. This is partly due to the difference in the rate of development of the brain. The right hemisphere is where brain development (speech and spatial) commences with the development in the left hemisphere (reading and writing) starting earlier in girls. The male brain develops more slowly and boys and girls differ with regard to making use of a particular hemisphere in the brain. As boys use the right hemisphere more they tend to have superior spatial abilities and are dominant in logical reasoning. Girls use the left hemisphere more so they have greater verbal abilities, with pre-primary girls reading faster than boys. Generally girls do better academically than boys (Gurain, 2002: 24, 26-27, 29, 33, 50, 80).

Girls are considered to be better listeners than boys who tend to hear less of what is said. Boys need varied activities to stimulate the brain as they become bored very easily whilst girls have the ability to deal with boredom (Gurain, 2002: 46). Gender preference with regard to play activities to support learning must be taken into consideration (Wood, 2009: 22-23) as boys enjoy being active and moving around during the learning process. At an early age boys are unable to control impulses in the classroom

whilst girls are generally more passive and quieter in class. Boys require more space in a classroom as they like to spread out when working (Gurain, 2002: 53, 58).

1.4 NUTRITION EDUCATION

1.4.1 Nutrition education defined

McNulty (2013: 5-7, 9) identified a variety of definitions for NE ranging from knowledge acquisition to dietary behaviour modification. However, attaining nutrition knowledge is the essential first step before behavioural changes can occur. It is acknowledged that UN agencies such as WHO, FAO and UNICEF rarely use the term “nutrition education” for programmes of this nature (McNulty, 2013: 13).

Contento (2011: xv) in the preface of her book *Nutrition Education: Linking Research, Theory and Practice* provides this comprehensive definition of NE which is accepted by prominent nutrition organisations:

“Nutrition education is any combination of educational strategies, accompanied by environmental support, designed to facilitate voluntary adoption of food choices and other food-and nutrition-related behaviours conducive to health and well-being. Nutrition education is delivered through multiple venues and involves activities at the individual, community, and policy level”.

1.4.2 Nutrition education in South Africa

Nutrition and education are two of the priorities recognized by the National Planning Commission (NPC) for the National Development Plan (NDP) for 2030. The NDP advocates healthy dietary practices being taught and encouraged to assist an individual in achieving household food and nutrition security as the NPC acknowledges that childhood malnutrition as well as diseases of lifestyle are a major challenge in SA (National Planning Commission, 2011: 1,31,312-313,315).

In 1994 the SA government recognised the seriousness of malnutrition and the Department of Health (DoH) formulated an Integrated Nutrition Strategy (INS) which developed into the Integrated Nutrition Programme (INP) (Labadarios, Dhansay and Hendricks, 2008: 152). The INP comprises of eight interlinked focus areas (Behr, 2008: 42-43), one of them being NE to address malnutrition (Labadarios et al., 2005: 100).

In 2000, the DoH in a drive to address both under-and overnutrition created a paediatric expert working group to formulate scientific-based suitable Paediatric Food-Based Dietary Guidelines (PFBDGs). These were applicable to children between the ages of one to seven years as this age group have specific nutritional requirements to ensure healthy development. These ten guidelines were created within the SA context and were introduced after testing in 2003 by the DoH (Bourne, Marais and Love, 2007: 240-241,245). This national initiative provides an important nutrition education tool (NET).

Knowledge of the FBDGs would allow the children to become familiar with the importance of eating a variety of foods; having five small meals a day; making starchy foods the basis of the main meal; eating plenty of fruit and vegetables and drinking milk every day; having a daily adequate protein intake of either plant or animal source; having only small quantities of sweet foods and drinks; being encouraged to drink clean, safe water regularly, and play and be active daily (Bowley et al., 2007). The SA FBDGs are mentioned in more detail in Chapter 2.

NE is considered a necessity for all young children due to the increasing complexity of dietary choices in the promotion of a healthy lifestyle. Besides gaining adequate food and nutrition knowledge, NE needs to enable long term healthy behavioural changes. This requires the adoption of the correct attitude, critical thinking skills and motivation (Contento, 2011: 6, 9, 12, 15). Recommendations from the SANHANES-1 findings were for school curricula to implement healthy eating education and physical activity (HSRC, 2013b: 5). Moreover, researchers worldwide have identified the importance of NE for young children as it influences physical and cognitive development in the formative years (Murphy et al., 1995: 223; Wagner, Meusel and Kirch, 2005: 103; Dixey et al., 1999: 7; Steyn et al., 2009: 146). A well-developed nutrition curriculum is vital so that learners can become more knowledgeable and develop skills and values essential for informed decision making (Reddy et al., 2010: 15).

Appropriate NETs are required for nutrition activities to make NE learner-centered (Sherman and Muelhoff, 2007: 336). The importance of using NETs is evident in the resourceful HealthKick toolkit for educators in the Western Cape, for the delivery of the HealthKick intervention, to improve primary school children's nutrition and physical activity (Draper et al., 2010: 4).

1.4.2 School as the setting for nutrition education

Contento (2011: 17, 18) advises that NE can take place in different settings, with the school being one of them. Schools are considered to be the ideal place of learning to enable children to make correct food choices and develop favourable eating habits through nutrition education (Behr and Ntsie, 2008: 334; Reddy et al., 2010: 15).

NE included in the curriculum and in learning areas, like mathematics and language, has proved successful, according to Perez-Rodrigo and Aranceta (2001: 131-132). Integration in science, arts and social studies proved effective in the US "Eat Well and Keep Moving" intervention (Steyn et al., 2009: 149). In addition, through school gardening interventions, different aspects of NE can be incorporated (Hawkes, 2013: 48).

In 1995, WHO established the concept of Health Promoting Schools (HPS) and in 2005 developed the Nutrition-Friendly Schools Initiative (NFSI). To obtain the NFSI accreditation, a school would be required to have a curriculum that incorporated nutrition and health promotion as well as an environment that was supportive in this regard (Hawkes, 2013: 20).

Worldwide many NE interventions are conducted in schools, however it is recommended in the 2008 WHO “School policy Framework: Implementation of the Global Strategy on Diet, Physical Activity and Health” that NE is included in both the school curriculum and policies (Hawkes, 2013; 19).

School-based interventions vary in duration with those longer than six months tending to be more successful, as documented in a review of childhood obesity interventions between 2000 and 2009 (Sharma, 2011: 207S,212S). Interventions need to be tailored to be more effective to meet the needs of the participants who besides gaining nutrition knowledge need to be able to develop self-efficacy for healthier food choices (Perez-Rodrigo and Aranceta, 2001: 133).

The involvement of parents is viewed as important (Behr and Ntsie, 2008: 334) and there is a lack of conclusive evidence, according to Hawkes (2013: 48), regarding the extent to which NE learnt by school children is passed on to members at home and to those in the wider community. Nethe et al. (2012: 119) is of the opinion that NE should also be aimed at school staff, educators and parents. Developing these participants to have sufficient knowledge and promote a healthy lifestyle is important but often a difficult task (McNulty, 2013: 37; Draper et al., 2010: 4).

Unfortunately, not all children in developing countries, especially girls, go to school due to household duties they have to perform. Often the incentive to attend school, the snack or lunch provided, falls short in supplying adequate nutrients for the child (Kraemer et al., 2012: 137).

1.4.4 Nutrition educator training

For the implementation of NE to be effective, educator training and motivation is essential (Perez-Rodrigo and Aranceta, 2001: 132; Reddy et al, 2010: 15; McCaughtry et al., 2012: 78). As NE in school curricula is not a distinct subject, no specific time is devoted to this education and discrepancies in delivery relating to both time and content occur (McNulty, 2013: 17; McCaughtry et al., 2012: 71-72).

From a global review on school-based nutrition intervention by Steyn et al. (2009: 148-150) trained educators are used in many of these interventions in the US: Healthy Start; The Child and Adolescent Trial for Cardiovascular Health (CATCH); PATHWAYS; High-5 Project; The Teens Eating for Energy and Nutrition at School (TEENS); Eat Well and Keep Moving, and the Know your Body (adapted) School Health Promotion Programme in Crete. Unfortunately, most countries do not have educators initially trained in NE.

Inadequate or insufficient knowledge leads to a lack of confidence in the delivery and teaching of nutrition and less emphasis is then given to NE in the classroom. Subsequent professional development in the field of nutrition is required (McCaughtry et al., 2012: 74-75). In sub-Saharan Africa, in particular, there is a severe lack of professional capacity on a national level with regard to NE (McNulty, 2013: 39). In SA, the necessity for NE training has been reiterated and perceived as important by 82.20 percent of LO public school educators. These educators indicated that nutrition knowledge was obtained from textbooks (88.90 percent), seminars (77.80 percent) and television programmes (73.30 percent)

(Oldewage-Theron and Egal, 2012: 4, 6, 8). Similarly, teachers in a US urban study by McCaughtry et al. (2012: 75) obtained nutrition information from textbooks which were outdated, in addition to using the internet.

Educators need to provide relevant information to enable children to make healthier choices. Besides imparting knowledge and skills to influence behaviour, educators need to know and be sensitive to the psychological factors that influence an individual's choice of food (Contento, 2011: 45). It was established by Oldewage-Theron and Egal (2012: 7) that South African Life Orientation (LO) educators lack nutrition knowledge due to only a few educators (33.30 percent) receiving formal training in this area whilst studying. It is a concern that the findings of a nutrition knowledge study (Oldewage-Theron and Egal, 2012: 6, 8) of public school LO educators (n=24), from nine provinces in SA revealed that prior to a NEP only 23.30 percent of the educators had heard of the SA FBDGs (Vorster, 2001: S3). Moreover, none of the respondents could name any of the dietary guidelines. Although this was a small sample of LO educators, NE training is considered essential for those in positions of providing nutrition information and guidance to children and indirectly to parents or caregivers to assist in the formation of life-long optimal eating habits.

1.4.5 Commencing nutrition education in Grade R

Commencing NE in Grade R is imperative as children starting school lack nutrition general knowledge which affects the ability to select a nutritionally balanced diet. Studies have revealed that in children there is a definite relationship between dietary behaviour, nutrition attitude and nutrition knowledge (Choi et al., 2008: 308, 315). Education is therefore the crux for improved health and economic opportunities as the attainment of education leads to improved nutrition status and this can result in enhanced educational achievements (Darnton-Hill et al., 2006: S55) irrespective of food security improvements (McNulty, 2013: 37).

Sharma (2011: 208S) is of the opinion that all children should have NE, starting from preschool and continuing until Grade 12. The Academy of Nutrition and Dietetics (AND) advocate NE as an essential component of preschool programmes where the children should be given the opportunity to acquire knowledge on food, its sources and the link to nutrition (Murphy et al., 1995: 219). However, in many countries, like SA, preschool (four to six years) is not compulsory (Nethe et al., 2012: 120).

The understanding of what nutrition means to preschool children was reported by Murphy et al. (1995: 220). For the majority of this age group this term referred to eating food that is healthy or good for one. This is considered to be a developmentally suitable interpretation of nutrition that is a science of food relating to the absorption of nutrients required by the body for health and development (Dixey et al., 1999: 7).

The Matheson, Spranger and Saxe study (2002: 87,89) assessed how preschool children classified food and found the children tended to use concrete observable characteristics of colour (26%) and

shape (13%) more so than abstract food groups (11%) for classification. Classification according to nutrient content is an abstract concept that is developed in children. Shah et al. (2010: 433) are of the opinion that the nutrition education and beliefs of preschool children are most often handed down at home by a member of the older generation and is often incorrect. It is therefore imperative that developmentally appropriate, learner centred, effective NE is provided to preschool children (Cason, 2001). This should result in behavioural and attitudinal changes to food intake due to the knowledge gained (Shah et al., 2010: 435).

Young children are the ideal candidates for NE as healthy eating behaviours developed early on will extend into adolescence and adult life (Blom-Hoffman et al., 2004: 46; Hu et al., 2009: 258). Younger children are more enthusiastic about learning; nevertheless sustained NE throughout a child's school career is advocated by Shah et al. (2010: 434). An ideal situation posited by Wagner et al. (2005: 109) is for NE to be considered as one of the core competencies instilled at school together with reading, writing and arithmetic in a grade-specific curriculum (Heneman et al., 2008: 3).

1.4.6 Nutrition in the South African school curriculum

De Villiers et al. (2012) reported that in 1997 Outcomes Based Education (OBE) was introduced in schools, with LO as a new learning area with four learning outcomes of which Health Promotion was one. OBE was followed by the revised National Curriculum Statement (NCS) which included minimal NE in the foundation phase. This is evident in Table 1.4 outlining the Health promotion assessment standards in this phase (DBE, 2002: 16-17).

Table 1.4: The FBDG related assessment standards for the Health Promotion learning outcome in the NCS Foundation phase LO learning area (Adapted from revised NCS, LO, Grades R-9 (DBE, 2002: 16-17)).

LEARNING AREA: LIFE ORIENTATION (LO)	
FOUNDATION PHASE : Grade R to 3	
LEARNING PROGRAMME: LIFE SKILLS	
LEARNING OUTCOME 1: HEALTH PROMOTION - ASSESSMENT STANDARDS	
The learner will be able to make informed decisions regarding personal, community and environmental health. The learner -	
Grade R	Explains the importance of drinking only clean water and eating fresh food. Describes steps that can be taken to ensure personal hygiene.
Grade 1	Identifies nutritious choices from a range of commonly available foods and drinks. Explains steps to ensure personal hygiene and links these steps to environmental health
Grade 2	Suggests and investigates actions to make the home and school environment healthier
Grade 3	Compares healthy and poor dietary habits and describes the effects of such habits on personal health.

Recently (2011 and 2012) the NCS was phased out and replaced with a new Curriculum and Assessment Policy Statement (CAPS). In the foundation phase, Life Skills is one of the three learning areas to which six hours of instruction are allocated per week over 40 academic weeks. NE is part of the Life Skills Personal and Social Well-being study area which is allocated one hour of teaching time

per week. This CAPS curriculum places a greater emphasis on nutrition and it is related to the SA FBDGs (Vorster, 2001: S3) as evident in the extracts from the Grade R course outline for Personal and Social Well-being as presented in Table 1.5 (DBE, 2011: 6, 15-21). The two remaining learning areas in the Life Skills learning programme are Physical Education and Creative Arts (De Villiers et al., 2012).

Table 1.5: Outline of the Grade R CAPS course material for the Personal and Social well-being study area in the Life Skills learning programme in Grade R (Adapted from CAPS, Grade R-3 Life Skills (DBE, 2011: 15-21)).

FOUNDATION PHASE - GRADE R	
LEARNING PROGRAMME: LIFE SKILLS	
STUDY AREA: PERSONAL AND SOCIAL WELL BEING	
TOPICS	OUTLINE OF COURSE MATERIAL
My body	<ul style="list-style-type: none"> • What my body needs to keep healthy
Healthy living	<ul style="list-style-type: none"> • Good basic hygiene practices • Washing regularly • Cleaning teeth, hair, nails • Washing fruit before eating • Good toilet habits • Sleep • Exercise
Taste and smell	<ul style="list-style-type: none"> • Tastes and smells I like • Tastes that are new to me
Fruit	<ul style="list-style-type: none"> • Different types of fruit • Tastes and textures of fruit • Where fruit comes from • Colours and shapes of fruit
Vegetables	<ul style="list-style-type: none"> • Different types of vegetables • Tastes and textures of vegetables • Where vegetables come from • Colours and shapes of vegetables
Dairy farming	<ul style="list-style-type: none"> • Dairy products and the animals they come from • How we get butter
Spring / summer/ autumn/ winter	<ul style="list-style-type: none"> • How people are affected - e.g. what we eat,
Sport	<ul style="list-style-type: none"> • Why playing sport is good for me

1.4.7 Parental and community involvement in nutrition education

Contento (2011: 44) disclosed that global NE reviews reveal that for NE to be effective suitable educational methods must be utilised. The NEP approach needs to take into account the local context including culture and socioeconomic sensitivity (McNulty, 2013: 37; Mbhenyane et al., 2008: 227). Children are influenced by people in their social environment therefore NE needs to be imparted to the community as well and not only to children (Shah et al., 2010: 434).

Community partnerships can augment NE at school and enable dietary changes to occur (Perez-Rodrigo and Aranceta, 2001: 134; Steyn et al, 2009: 146). For success, it is essential to bridge the gap between school and the parents or caregivers as traditional beliefs may be different from the educational approach (Kelly, 2007: 88). This is also acknowledged by the HSRC (2013b: 5) where parental and community participation in education is stated as a recommendation from the SANHANES-1 (HSRC, 2013a: 3). The participation rate of parents in the child's education is however often poor which hinders

the effectiveness of NE especially for young children (Perez-Rodrigo and Aranceta, 2001: 134; Steyn et al., 2009: 151). NE is vital for parents as 62.90 percent of SA adults obtained a medium score for general nutritional knowledge and a high score was achieved by only one in five adults (22.60 percent). A similar percentage believed they were following a healthy diet although one in four ate insufficient fruit and vegetables (25.60 percent), 18.30 percent consumed too many fatty foods and 19.70 percent scored high on sugar intake (HSRC, 2013a: 3).

1.4.8 Interrelated nutrition interventions

A multidisciplinary approach to NE globally is required for the prevention of behaviours associated with obesity in preschool children. The European Union (EU) funded ToyBox project was a preschool investigation for the development of a multi-component programme to foster healthy eating behaviours to reduce obesity. Therefore, various stakeholders were identified for the interventions: school advisory committees; nutrition services; health services; catering services including vending machine owners; sport services; farmers; playground companies and those in broadcasting (Nethe et al., 2012: 118-119, 122). For the implementation of healthy food choices at SA schools, the HSRC (2013b: 5) SANHANES-1 recommends that food vendors are strictly controlled in regards to the types and quantity of food served.

The inclusion of a number of inter-related interventions including NE within the school environment have been found to be beneficial according to Perez-Rodrigo and Aranceta (2001: 133). This is supported by the analysis of 45 ToyBox project interventions which identified high quality programmes in Spain (PERSEO - Pilot study for Health, Physical Exercise and against Obesity), Germany (TigerKids, PEB - Plattform Einarhrung und Bewegung) and Belgium-Flanders (Tutti Frutti, Thursday Veggieday at school, Wild van Water). These were assessed according to the following criteria: decreasing sedentary behaviour; increasing physical activity, healthy food and water intake; decreasing the consumption of high energy drinks; greater involvement of parents and the improvement of teacher's health (Nethe et al., 2012: 124-125).

In Chapter 3, NE will be discussed in more detail.

1.5 MOTIVATION FOR THE STUDY

The MDGs, to which all member states of the UN are in agreement, preserves the basic human rights of access to food, education and health care with sufficient nutrition being a critical aspect in achieving five of the eight goals. In a 2006 The World Bank report, nutrition was repositioned to being fundamental to development (Pridmore and Carr Hill, 2009: 7, 18).

The AND, the School Nutrition Association (SNA) and the Society for Nutrition Education (SNE) in a joint position paper concur that NE should be provided in schools to enable children to learn and adopt

lifelong healthful eating behaviours. Unfortunately, few children are afforded the opportunity to receive the minimum yearly recommended 50 hours of NE (Briggs, Fleischhacker, and Mueller, 2010: 363) which needs to be communicated in a supportive nurturing learning environment (DBE, 2011: 12). Perez-Rodrigo and Aranceta, (2001: 136) make mention of nutrition specific initiatives in European schools that have been stimulated by the WHO Health Promotion Initiative including the creation of the European Network of HPS.

In SA, the Constitution states that all children should have access to sufficient food and that children have the right to basic nutrition (Phometsi, Kruger and van Riet, 2006: 529). Blom-Hoffman and Du Paul (2003: 264) emphasise that the relationship between the health status of a child and diet is well known so early interventions are important with the school setting considered the optimal cost-effective place for this to occur during the school day.

Besides the implementation of NE from pre-school age, a whole-school multi-component approach was advocated by Kafatos and Codrington (2001: 14) with family involvement encouraged to improve the dietary lifestyle of children. The aforementioned organisations (AND, SNA and SNE), advocate a multi-component approach requiring a healthful school environment and family involvement to facilitate a change in behaviour (Briggs, Fleischhacker, and Mueller, 2010: 360). Kelly (2007: 89) supports the UNICEF concept that every school should become a community school, a multipurpose institution where the community needs relating to education, health and welfare, and food production can be addressed in a holistic manner. These approaches could result in decreasing the incidence of obesity and overweight in childhood (Sharma, 2011: 208S; Lakshman et al., 2010).

A concern voiced by Sherman and Muelhoff (2007: 335) was that little time is dedicated to NE in school curricula worldwide as it is integrated into existing subjects. In addition, appropriate NETs are required for nutrition activities to make NE learner-centred. A baseline study, conducted in 2009, in Grade R at 20 Durban suburban schools confirmed the necessity for NE for this age group and appropriate NETs. The schools differed in the amount of time spent on NE in Grade R.

Different learning styles are required as some children are visual learners, others prefer to learn through listening and discussion as they are aural learners and some are tactile learners benefiting from the hands-on experiences (DBE, 2011: 12). Children gaining nutrition knowledge through active involvement will be empowered to make behavioural, life skills and attitude changes relating to good food choices and eating habits (FAO, 2005), hence the importance of NE in school.

The NEP incorporated the SA FBDGs (Vorster, 2001: S3). This was to improve the learner's nutritional status and quality of life to help prevent the occurrence of nutrition-related disease as advocated by Hendricks, Goeiman & Dhansay, 2007: 252). Similarly, the SA FBDGs (Vorster, 2001: S3) were used as the foundation for the goals for the "HealthKick" programme in the Western Cape (Draper et al.,

2010: 3). FBDGs also formed the basis of the NE curriculum in the EU-supported EURODIET project (1998-2000) (Kafatos and Codrington, 2001: 14).

Children between four and seven years old are able to comprehend the link between food choices and health (Singleton, Achtenberg & Shannon, 1992: 67). Therefore, the SA PFBDGs need to be the basis of NE in preschools to enable children to have the correct nutritional intake for optimal development (Bowley et al., 2007). Contento (2011: 37, 39, 45, 46) posits that there are many determinants of behaviour, modifiable and non-modifiable, that influence what people eat. Improving nutrition knowledge alone will not be as effective as behaviour-focused NE. To enable changes to dietary behaviour a NEP needs to address the sensory-affective factors, person-related determinants (perceptions, attitudes, values and skills), and social environmental determinants (physical, cultural and economic). The influence of the home environment on eating habits is also acknowledged by Draper et al., (2010: 5). The nutrition educator must improve not only the nutritional status and health of the child but also the broader community and thereby contribute to the future development of a healthy nation (FAO, 2005).

A Grade R based NE intervention study was conducted in Hefei, eastern China with the one year post-test results revealing a significant decrease in unhealthy eating behaviours due to the learner's involvement in the NEP (Hu, 2009: 259). Sharma (2011: 208S) emphasises that interventions in this age group are warranted as dietary patterns are forming and a change to a healthier behaviour is possible as they are still impressionable.

This study is the first research project of its kind in a suburban area in Durban and would therefore provide valuable information regarding the impact of NE as a result of the Grade Rs completing a NEP based on the SA FBDGs (Vorster, 2001: S3). A similar study to address malnutrition was conducted in Boipatong and the Vaal using the identical NETs which resulted in an improvement in the nutritional knowledge of the children. The present study would therefore be of value to the DoH in their drive to decrease malnutrition through NE. In addition, the DBE can benefit from the results of this descriptive study to motivate, plan and implement formal NE in pre-primary schools in SA which can have a positive effect on the well-being of the family and benefit the community.

1.6 AIMS AND OBJECTIVES

1.6.1 Study Aims

The purpose of this study is to determine the impact of a Grade R NEP on Grade R children in order to get the DBE to include the NEP in the pre-primary school education curriculum.

1.6.2 Objectives

The specific objectives of this research study are to:

1. Determine the need for a NEP for Grade R children in suburban areas of Durban (baseline study).

2. Identify suitable NETs to address the outcomes identified in the baseline study.
3. Determine the existing nutrition knowledge of Grade R children in a suburban government and private school, by developing and using a nutrition knowledge questionnaire (NKQ).
4. Develop a NEP for Grade R based on the SA FBDGs (Vorster, 2001: S3) and the nutrient-based food groups.
5. Implement the Grade R NEP in a government school, private school and control school.
6. Determine the impact of the NEP in a government school and a private school by repeating the same NKQ.
7. Compare the differences and similarities of nutrition knowledge gained by learners in a government school and a private school.
8. Compare the differences and similarities of nutrition knowledge gained by the boys and the girls participating in the study.
9. Compare the differences and similarities between the pre-and post-test knowledge of the Grade R children in the control and experimental schools

1.7 PHASES OF THE STUDY

There were three phases to this study as illustrated in Figure 1.3:

Phase 1: In this phase the pilot study was conducted. The outcome of this resulted in the selection of suitable NETs for use in the NEP.

Phase 2: A Grade R NEP was designed to incorporate the selected NETs. Thereafter, a NKQ was developed and suitable field workers were sourced and trained to administer the NKQ which was then refined.

Phase 3: The researcher monitored the entire phase of pre-and post-testing and the intervention. The pre-test was administered to the two intervention schools and the control school one week prior to the NEP intervention. The eight week intervention was implemented by the trained foundation phase educator in both the government and the private school. The nutrition knowledge of the Grade R children was reassessed one week after the intervention in all 3 schools.

PHASES OF THE STUDY

Development of proposal and literature review

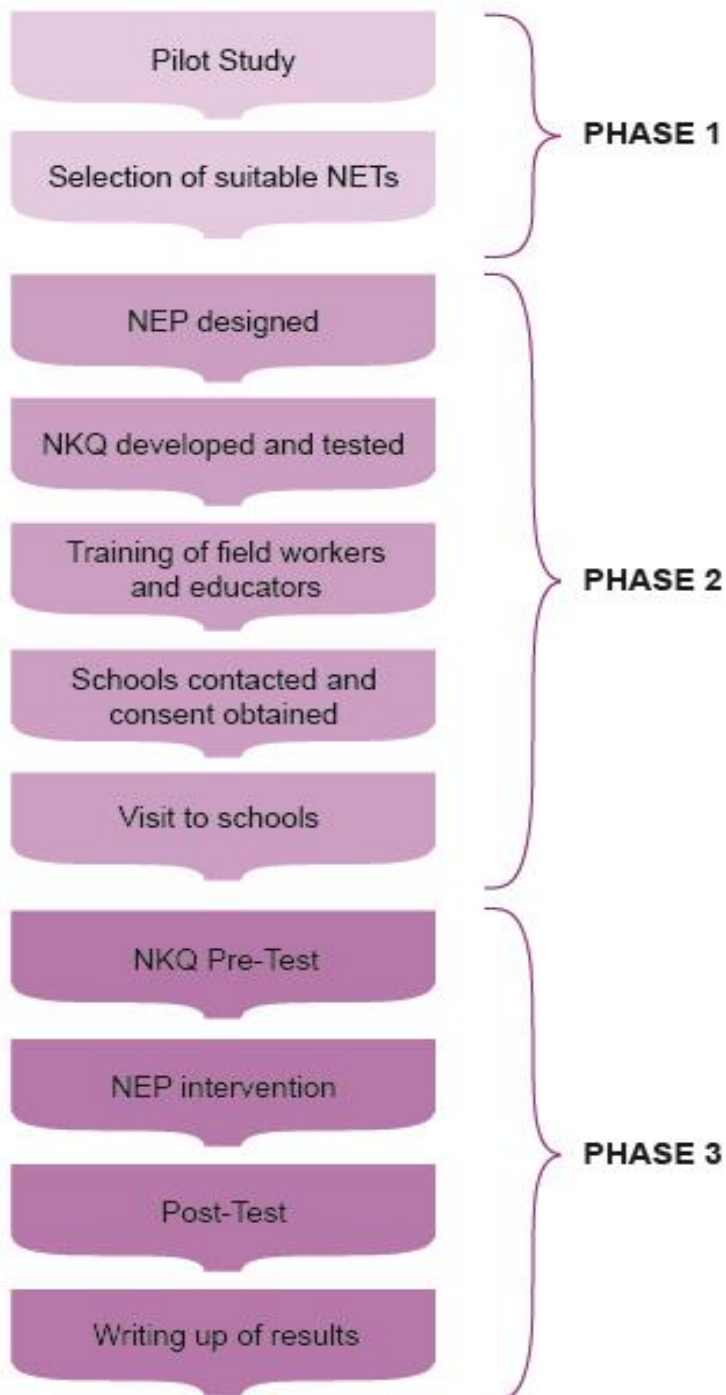


Figure 1.3: Phases of the study

1.8 OUTLINE OF THE STUDY

Depicted in Figure 1.4, is the outline of the steps followed for the execution of this study.

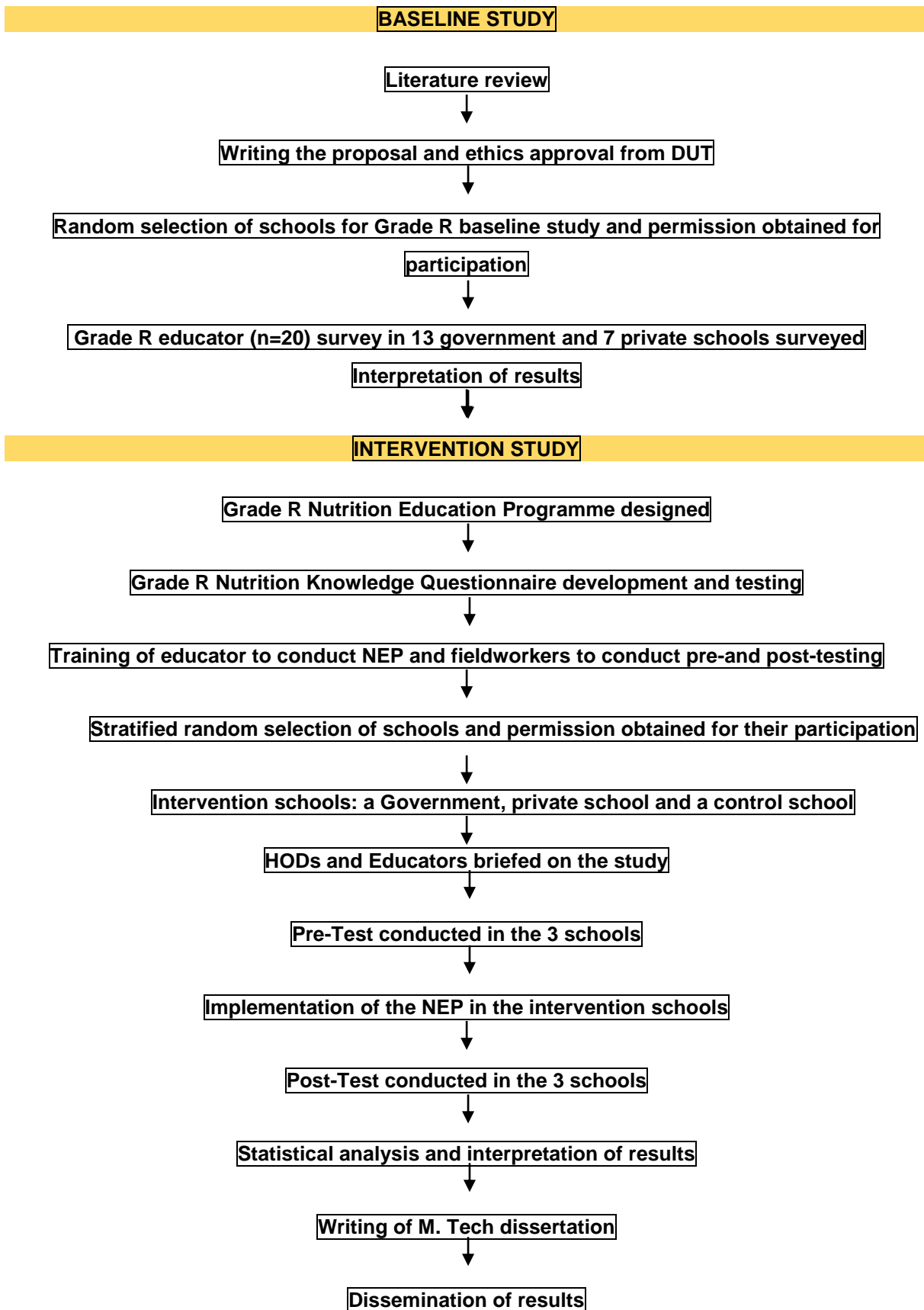


Figure 1.4: Outline of the study

1.9 OUTLINE OF THE DISSERTATION CHAPTERS

The dissertation consists of six chapters. In chapter 1, the background and the motivation for this study is highlighted whilst chapter 2 focuses on literature relevant to malnutrition and this research. This leads to chapter 3, a literature review on NE to address malnutrition in children. The baseline study is discussed in Chapter 4 followed by the methodology used for the execution of the NEP to collect data as detailed in Chapter 5. The results are presented and discussed in Chapter 6 and the dissertation is concluded with Chapter 7 where conclusions and recommendations are provided.

1.10 CONCLUSION

Globally, it has been identified that many risk factors of disease are nutrition-related (Darnton-Hill et al., 2006: S55). Darnton-Hill et al. (2006: S63-S64) emphasizes that achieving the MDGs by 2015 would afford a solution to the nutrition health issues of preschool children. In addition, the improvement of nutrition and education as well as gender equality will hasten economic development with each of these factors positively impacting on the other.

With the specific objectives and the motivation for this study outlined here, the subsequent two chapters cover a review of the literature on malnutrition and NE with a focus on the Grade R age group. In addition, NE programmes have been highlighted in both industrialized and developing countries that have had a positive impact on children, in particular preschool children.

This study provides a means of gaining insight into the effectiveness of a NEP which utilized a variety of NETs to improve the nutrition knowledge of Grade R learners in suburban schools in Durban, KZN. The following chapter focuses on NE as a means to reduce malnutrition in children.

CHAPTER 2: LITERATURE REVIEW: NUTRITION EDUCATION

2.1 INTRODUCTION

In this chapter, the different international and South African approaches to teaching NE to children have been researched. This chapter will provide insight into the importance of effective nutrition education (NE), the theoretical frameworks or models used for NE, the development of a nutrition education programme (NEP), the advances and impact of NE as well as the tools used to increase nutrition knowledge.

Good nutrition and education are both basic human rights enshrined in the Constitution of South Africa (SA). Furthermore, the South African government is one of the co-signatories to the implementation of the Millennium Development Goals (MDGs) where Goals 1 and 2 relate to the achievement of these rights (Wenhold, Kruger and Muehloff, 2008: 442).

2.2 PURPOSE OF NUTRITION EDUCATION

Education, as explained by Contento (2011: 14), is a process which provides both knowledge and skills to enable personal development and change. In the United States (US) the Society of Nutrition Education (SNE) and the Academy of Nutrition and Dietetics (AND), both leading NE organisations, have very similar views on NE and these are in keeping with the definition of NE provided by Contento (2011: 16) as cited in Chapter 1.

NE has been highlighted, by the United Nations Standing Committee on Nutrition (UNSCN) in the 2010 World Nutrition Situation report, as a critical element for improving nutrition and food security worldwide and not only in developing countries. However, to sustain these improvements, NE needs to be focused at the national level cascading down to the community level (McNulty, 2013: 3-4). Contento (2011: 15) emphasises NE as important for all those in the supportive environment for the attainment of food and nutrition goals.

The Food and Agriculture Organisation (FAO) (2011: 4) emphasised the importance of NE in the forthcoming 15 to 20 years, in particular, with regard to the choice of a healthy diet for all consumers. Food choice has become increasingly more complex therefore nutritional literacy is required to stem the confusion when trying to select healthful foods (Contento, 2011: 6-7). Attainment of a nutritionally balanced diet is a key aim of the FAO as it will benefit the well-being of society and contribute to economic enrichment (FAO, 2011: 4).

NE is required to correct misconceptions relating to nutritional practices passed from one generation to another as well as a general lack of nutrition knowledge which negatively impacts on a person's nutritional status (Vorster, 2001: S6).

Nutrition educators promote the well-being of consumers by bringing attention to food and health issues yet respecting a person's rights when suggesting the implementation of any changes. Nevertheless, the NE focus should be on improving the food and nutrition practices of the target audience (Contento, 2011: 15). This will be a positive step in the reduction of malnutrition and nutrition-related diseases (Mbhenyane et al., 2008: 227) and has a direct bearing on the future of children (Wenhold, Kruger and Muehlhoff, 2008: 442).

With NE incorporated into the school curriculum, ideally as an independent subject, the trained educator would be able to reinforce food and nutrition knowledge, skills, attitudes and values within a school context. In SA, the purpose of enhancing NE at school through the curriculum is acknowledged as important and is one of the primary objectives of the National School Nutrition Programme (NSNP), reported by Wenhold, Kruger and Muehlhoff (2008: 460-461).

2.3 THEORETICAL FRAMEWORKS/MODELS FOR NUTRITION EDUCATION

The terms: theoretical frameworks, models and theory are similar in meaning and used interchangeably by researchers. A number of different models (Adams, Zask, and Dietrich, 2009) and theories have been used for NE (Manios et al., 2002; Warren et al., 2003; Fitzgibbon et al., 2002). Contento (2011: 48, 54, 56, 59) confirmed three goals of NE: enhance motivation to enable the necessary action to occur; facilitate the ability to act; and provide supportive environments for action.

As outlined in the conceptual framework in Figure 2.1, a NEP should during the motivational phase focus on increasing awareness and motivation and provide support for change to occur. Whilst in the action phase of the NEP the person's ability to act needs to be facilitated to enable the change to be maintained over an extended period of time (Contento, 2011: 55-56).

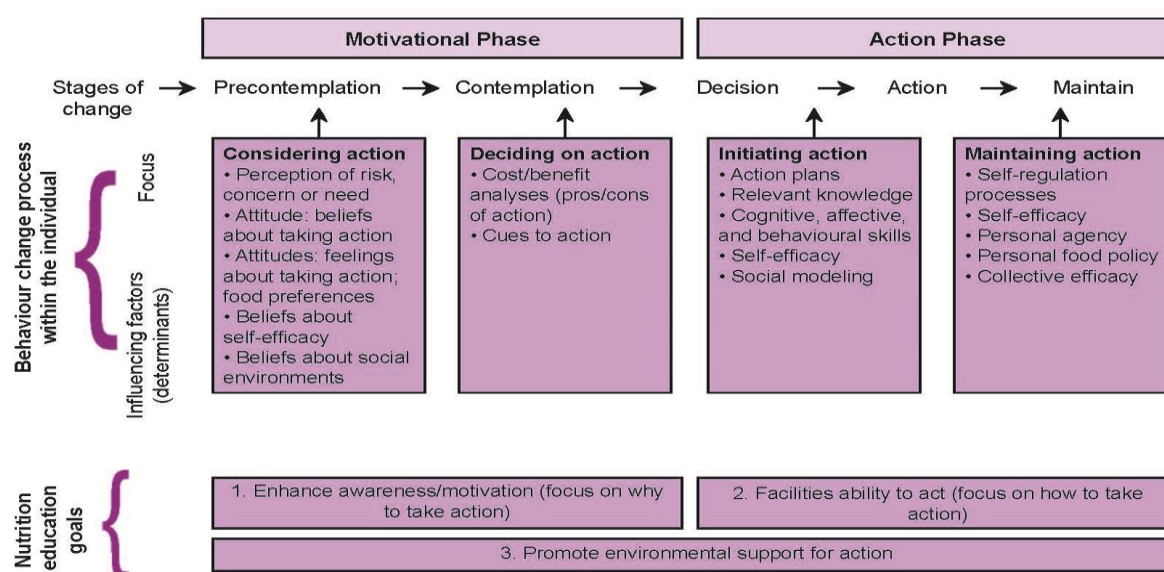


Figure 2.1: Conceptual framework for nutrition education (Contento 2011: 56)

One can select an appropriate theory or combination of theories for the creation of a specific intervention model to suit the educational goals of the intervention and the particular audience. NEP-integrated models combine different theories to address mediators in the motivation and action phases. Psychosocial theories are important where the desired outcome is to increase awareness and thereby improve motivation (Contento, 2011: 200-203).

2.3.1 The Knowledge-Attitude Behaviour Model

In a review, conducted by Roseman, Riddell and Haynes (2011), of US school-based NIs it was noted that both knowledge and behaviour improvement were the focus of the majority (85%) of these interventions. Contento (2011: 49, 56) acknowledges that the knowledge-attitude-behaviour (KAB) model is a common NE approach. The attainment of scientific-based knowledge is the primary motivator for the attitude change and consequently this can lead to a behavioural shift. Blom-Hoffman et al. (2004) designed a multi-component NE programme for pre-primary school children to allow for achievement of knowledge in the classroom, reinforcement at home by the parents, and a lunchtime component where the behaviour change could take place. Contento (2011: 56) expounds on the two different kinds of knowledge which enable a person to take action. Why-to knowledge is essential for motivation for action, for example, selection of food due to the health benefit. Furthermore, how-to knowledge will provide information and skills to enable action once a person is motivated, for example identifying food sources of different nutrients.

2.3.2 Multiple Intelligence Theory

Cason (2001: 161) indicates that the principles of the Multiple Intelligence theory developed by Gardner (1983) can be applied in various educational settings for NE. Armstrong (2009: 56) emphasises that the Multiple Intelligence concept forms the basis of all educational models, however these will vary when different intelligences are emphasised in a model. The focus of this theory is on the development of the whole child, acknowledging individual differences, where learning and discovery of reality takes place through the eight intelligences: naturalist, intrapersonal, interpersonal, musical, body-kinaesthetic, spatial, logical-mathematical, and linguistic. For each of the Multiple Intelligences, a variety of teaching strategies will enhance student learning (Cason, 2001: 161). In Table 2.1, Multiple Intelligence related teaching activities suitable for the active involvement of pre-primary school children for NE are suggested by Armstrong (2009: 61-63, 75-79, 83-87, 91-93),

Table 2.1: A sample of different teaching activities for each of the eight multiple intelligences suitable for pre-primary school nutrition education (Armstrong 2009: 61-63, 75-79, 83-87, 91-93)

The 8 MULTIPLE INTELLIGENCES	SUITABLE TEACHING ACTIVITIES
Naturalist (Nature smart)	Gardening and growing of plants
Intrapersonal (Self smart)	Time out for reflection, self-worth activities and free choice time
Interpersonal (People smart)	Simulation, small group activities, board games, puppets
Musical (Music smart)	Group singing, raps or chants, background music playing

Body-kinaesthetic (Body smart)	Any activity with hands, cooking, gardening, tactile experiences
Spatial (Picture smart)	Drawing pictures, colouring in, visual puzzles
Logical-mathematical (Logic smart)	Numeracy, categorization or grouping of items, food identification, healthy choices, computer use
Linguistic (Word smart)	stories, reading, and writing e.g. journal writing

An eight-hour US NEP for pre-primary children conducted by Cason (2001: 161) was based on the theory of multiple intelligences with age appropriate activities. The objective of the study was to enable a preschool child to develop skills to select and prepare nutritious foods, to identify, name and taste different fruit and vegetables and acquire behaviours that would result in a healthy lifestyle. Parental input provided the pre-and post-information on the child's food intake, their likes and dislikes. It proved to be an effective programme; however the results could not be generalised (Cason, 2001: 162-3).

2.3.3 The Cognitive Development Theory

Young et al., (2004: 254) used the constructivist theory in an American preschool NE intervention by using prior knowledge of familiar foods to form the foundation on which new knowledge was built, in this case introducing children to new foods.

Aspects of Jean Piaget's cognitive development theory have been applied to various nutrition interventions (NIs). In Piaget's model children between the ages of four to seven years are in the pre-operational stage of cognitive development before progressing into the concrete operational stage (7-11 years). There is, however, an overlap between elements of the different stages. The impact of a NI can be affected by the cognitive development of a child. In Wageningen, the Netherlands, a NE study revealed that there was a correlation between the child's cognition and thought process influencing food selection and food perceptions (Zeinstra et al., 2007). Zeinstra et al. (2007) provides observations, presented in Table 2.2, of the cognitive characteristics of children in the two stages of cognitive development, applicable to food and nutrition.

Table 2.2: Overview of the general and nutrition related cognitive characteristics of the pre-operational and concrete operational stages of development (Zeinstra et al., 2007)

STAGES OF COGNITIVE DEVELOPMENT	
PRE-OPERATIONAL STAGE (2-7 YEARS)	CONCRETE OPERATIONAL STAGE (7-11 YEARS)
Limited ability to process information	Cued processors (prompted)
Egocentric	Can view from another's perspective
Can focus on only one characteristic	Multiple aspects are taken into account
Concrete thinking	Logical relationships recognised
Decision based on the most important sensory attributes	Decisions more thoughtful and varied
Unable to differentiate between food and snacks	Distinction made between food and snacks
Foods not altered during digestion	Foods are changed somehow during digestion
Healthy food can be identified but no explanation can be given	Know that food will make one healthy and grow but no knowledge of how this occurs

No idea of food contamination	Elementary idea of food contamination
Brand preferences based on sensory perception and emotional attributes	Brand preferences based on reasoning e.g. healthiness

According to Piaget, a preschool child is egocentric and will focus attention on the most significant information, ignoring other aspects of importance. Self-discovery and allowing mistakes to be made by a child are vital in the process of learning and development. The learning experience needs to be at an appropriate cognitive level for a child for ease of assimilation allowing for some recognition but providing new aspects of knowledge (Rickard et al., 1995: 1123-1124).

2.3.4 The Social Cognitive Theory

Research conducted by Perry (1999: 7, 25) alludes to the behavioural approach of the Social Cognitive Theory (SCT) by Bandura as being the principal theoretical model on which numerous successful programmes for health promotion have been designed. Here external factors in the environment are the motivating force in behavioural change (Rickard et al., 1995: 1122; Contento, Randell and Basch, 2002: 16). Anderson, Winett and Wojcik (2007: 305) indicate that the SCT model describes the determinants of human behaviour as a unique interaction between social-environment, behavioural and personal factors as illustrated in Figure 2.2.

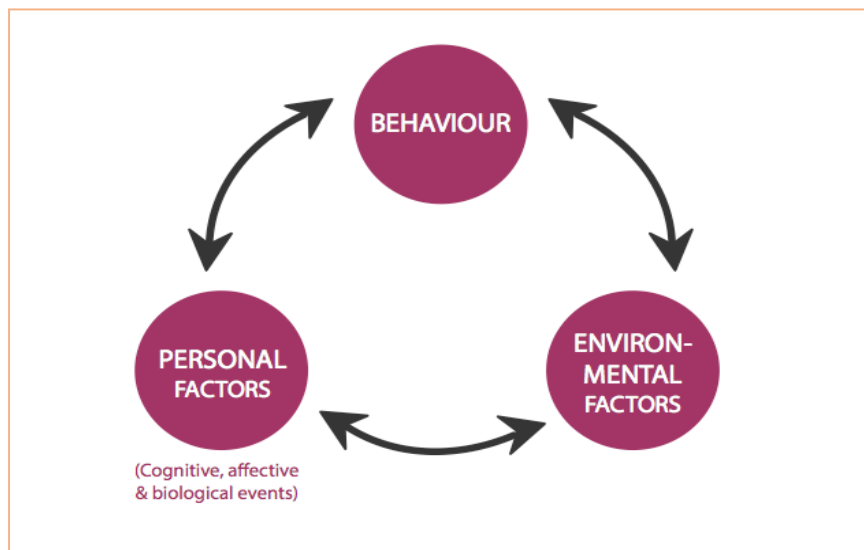


Figure 2.2: The Social Cognitive Theory (Pajares 2002)

Behaviour is influenced by personal beliefs and the probable positive and negative outcomes of certain actions. Personal efficacy is important for the adoption of healthful behaviours. To engage in these behaviours knowledge and skills in food and nutrition related areas is required. An individual operates within the constraints of the environment which needs to be supportive as it impacts on behaviour. Therefore role models in the environment for the observational learning of food behaviour and skills are important for children (Contento, 2011: 97-99).

A US study by Young et al. (2004: 255) used the SCT as a basis for the preschool nutrition activities which supported the development of motor, language and listening skills, including sensory evaluation and the trying of new foods, for one of the components of this intervention.

2.3.5 The Play Approach

Matheson, Spranger and Saxe (2002: 85-86, 91) indicate that developmental psychologists, specifically in the Bronfenbrenner theory, suggest that learning takes place through experience and play. Therefore, food and nutrition knowledge is gained by preschool children through experiences at home with food.

In Canada, observing preschool children at play in a well-equipped toy kitchen for a structured activity was used by Matheson, Spranger and Saxe (2002: 86-88, 90) to understand the children's food behaviours. These researchers indicated that it was evident that memory and mimicking home experiences were used to dramatise food preparation of meals, the serving of food and cleaning up. Communication skills in this age group are limited so no detailed explanations were provided by the children during play only simple statements which echoed parental verbal prompts to children. It is apparent that the home environment, especially parental influences, is important in shaping the food behaviours of children.

The play approach through experimentation, exploration and discovery has been advocated by Rickard et al. (1995: 1121-1122) as a method suitable for enhancing nutrition knowledge to develop healthy eating habits. Furthermore, these researchers emphasised the characteristics of this theory of dynamic systems (individual, learning environment and task), illustrated in Figure 2.3 (Rickard et al., 1995: 1123), which promotes learning and the adoption of appropriate nutrition habits:

- Play is an opportunity for learning irrespective of the outcome.
- Play evokes joy and self-satisfaction whilst learning (intrinsic motivation).
- Play is fun.
- Play is an activity when children choose what, where, when and how to do it.
- Play results in active mental, physical and/or emotional involvement.
- Play results in free choice exploration and taking responsibility for choices made.
- Play provides a shielding environment for learning with no risk of failure.

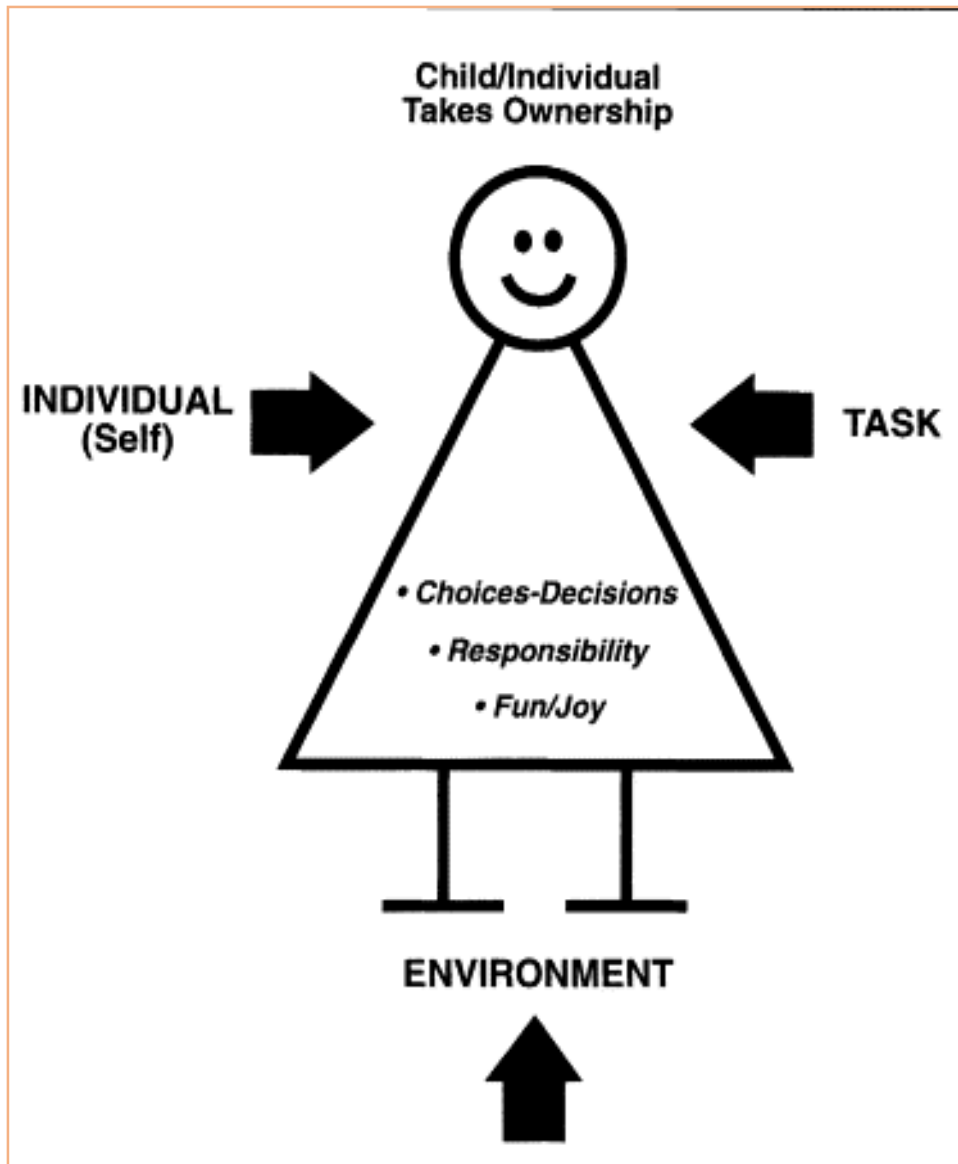


Figure 2.3: The play approach to learning (Rickard et al., 1995: 1123)

2.3.6 The General Systems Theory

The General Systems Theory is multidisciplinary in nature, used by Watts et al. (2012: 475) to achieve the NE objectives of a pre-primary to 5th Grade US (New York State) teacher-led educational process. A school environment is complex and the different components, internal and external to the school, are interdependent as depicted in Figure 2.4 (Watts et al., 2012: 475). Many factors contribute to the NE provided by a specific teacher, in a particular school situated in a certain community. In addition, the government educational policies and the funding provided have a direct impact on the school characteristics, teacher behaviour and the NE provided by the teacher.

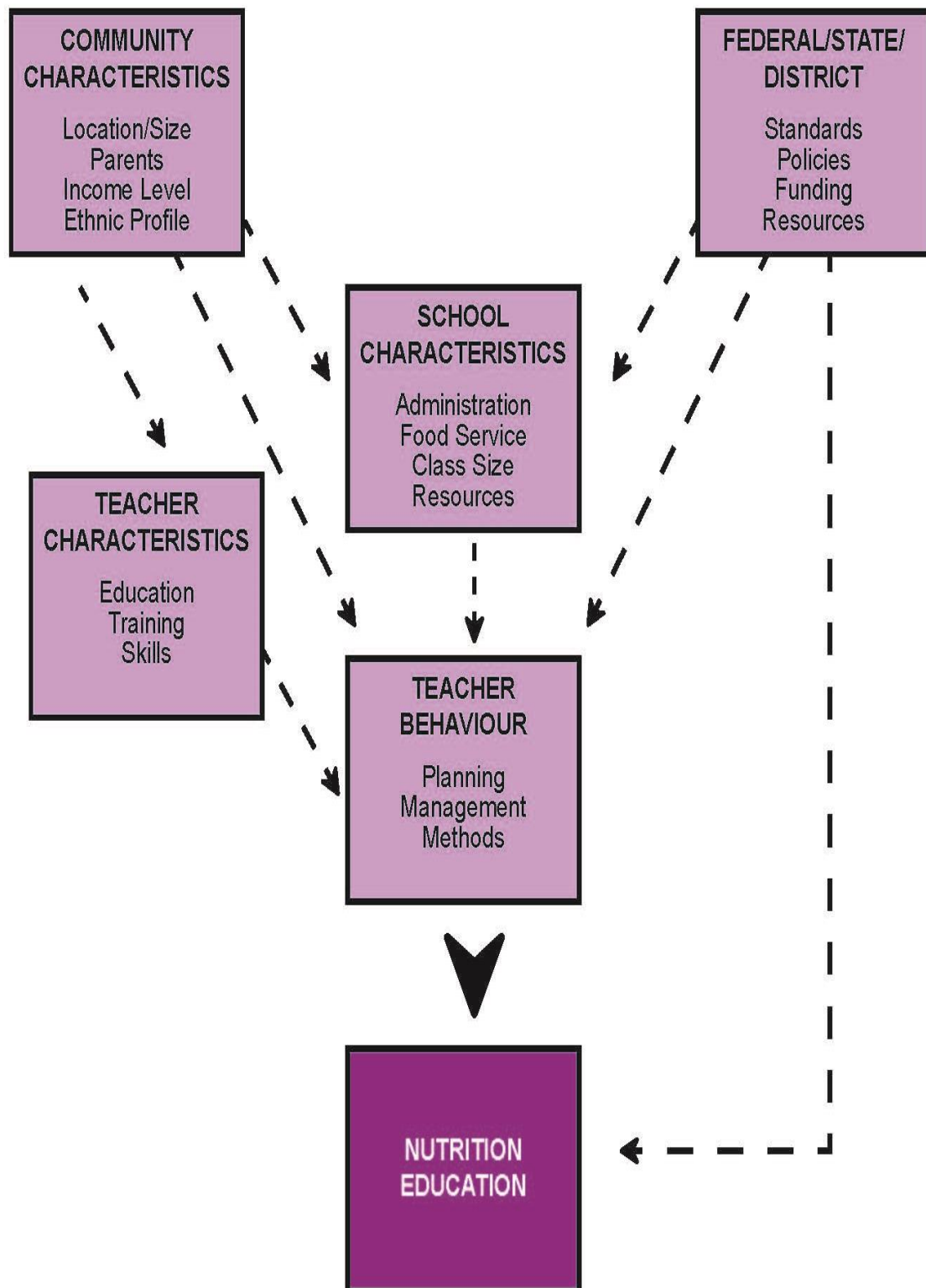


Figure 2.4: School environment and the teacher-led nutrition education instructional process description using the General Systems Theory (Watts et al., 2012: 475)

2.3.7 The Logic Model

The Logic model has been used for the development of a number of NEPs (Hyndman, Hershfield and Thesenvitz, 2001: 15). Contento (2011: 59-60, 300) expounds the three components of a Logic Model of Theory-based NE, as illustrated in Figure 2.5 (Contento 2011: 60):

- Inputs: These are resources identified for the NEP including personnel, space, time, money, materials and partners for the intervention.
- Outputs: This component comprises of intervention activities/ programmes (e.g. classes, work with families, community partners, the media and policy makers) that will enhance motivation leading to action through environmental support (interpersonal, institutional and food environment support). Outputs can be short-term to determine whether learning and motivation takes place, medium-term where behaviours change due to action, and long-term outputs showing improved health.
- Outcomes: The activity indicators measure the efficiency of the planned intervention activities against the desired outcomes of the NEP, for example, to decrease the risk of disease, or decrease food security, or improve health through changed food behaviours and practices (Hyndman, Hershfield and Thesenvitz, 2001: 16).

The US Food Trust Kindergarten Initiative (KI) used the Logic Model. The intervention strategy spanned three areas: education, community development and policy change. Collaboration of all three aspects was important to ensure the success of the NI. For each of these areas, populations of interest were identified (learners, educators, government and school officials, parents and community organisations). With the aforementioned factors in mind, the activities related to each programme, population and strategy were inserted into the Logic Model. Buy-in and support from all stakeholders was vital (The Food Trust, 2007: 21; Hyndman, Hershfield and Thesenvitz, 2001: 10, 14).

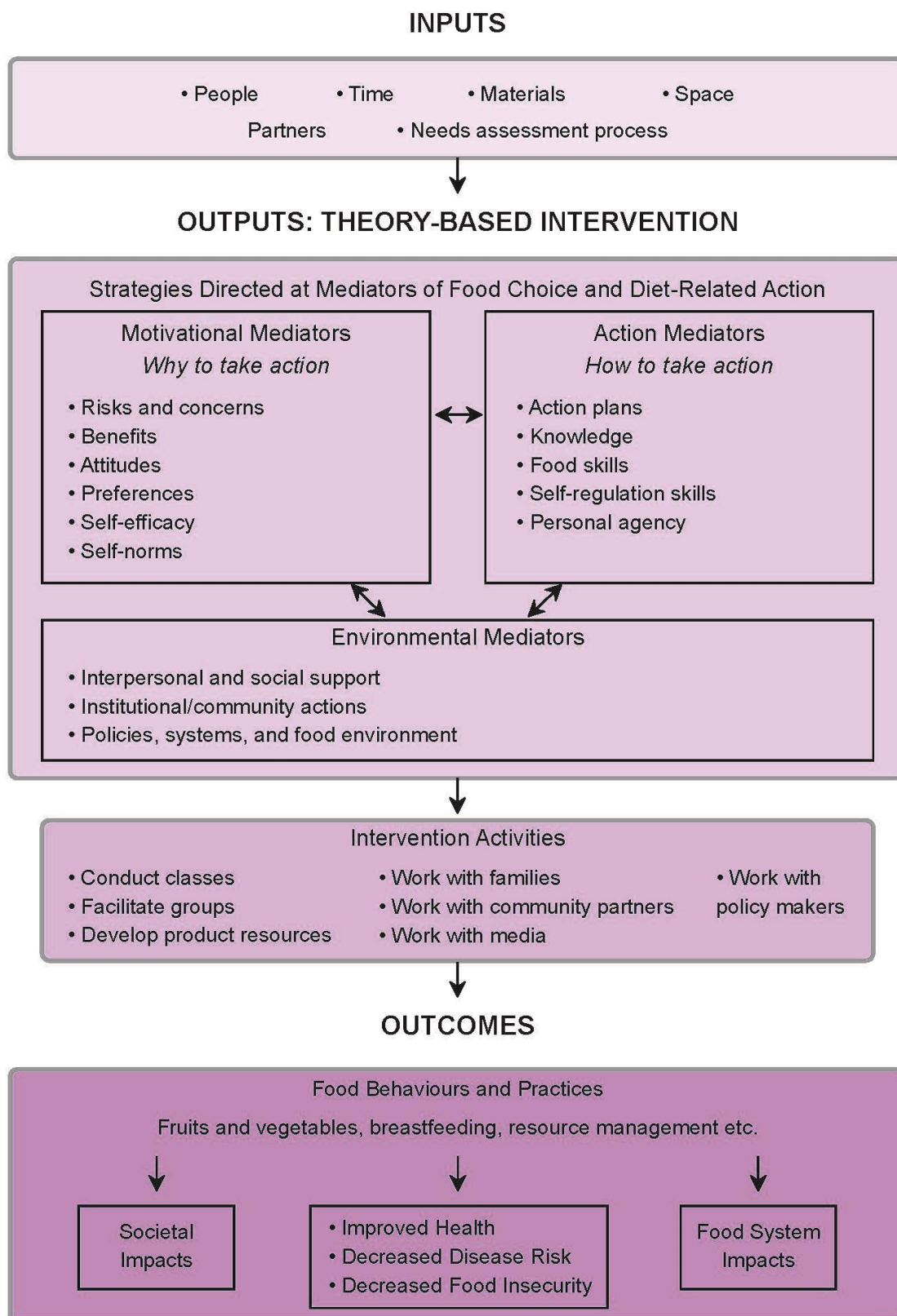


Figure 2.5: Logic Model of theory-based nutrition education (Contento 2011: 60)

2.3.8 The Stepwise Procedure for a Behaviour-focused and Theory-based NE programme

The Stepwise procedure is an implementation framework or practice in the form of a Logic Model, comprising six steps (Figure 2.6, Contento, 2011: 148), used for theory-based NE programmes (Contento, 2011: 148). At each step, the theory and research is integrated with practice.

In Step 1 of this procedure, the main health issue, which needs changing, will be identified together with a few behavioural targets for an intended audience.

For Step 2, using theory and evidence, the personal psychosocial mediators for behaviour change need to be determined. These include culture-specific beliefs regarding health and food, attitudes and values, food preferences, social group pressure and the stage of motivational readiness. In addition, other relevant audience characteristics such as the educational and cognitive development level of children and preferred learning styles are identified (Contento, 2011: 146,149,176-177,183).

For the third step, Contento (2011: 201,203,218) indicates that an appropriate theory is selected and a relevant intervention model is created with the establishment of the different components (classroom, family and environmental) to be used in the programme.

NE programme objectives are required to be stated in Step 4 for the achievement of targeted actions or behaviour.

In Step 5, the educational plan is designed in a sequential manner incorporating practical activities to address change. NE alone will not bring about change it has to be achieved through collaboration with other groups within or external to the school environment.

Lastly for Step 6, the programme process and outcome evaluation which serves many purposes requires planning and designing (Contento, 2011: 148,240,245,302).

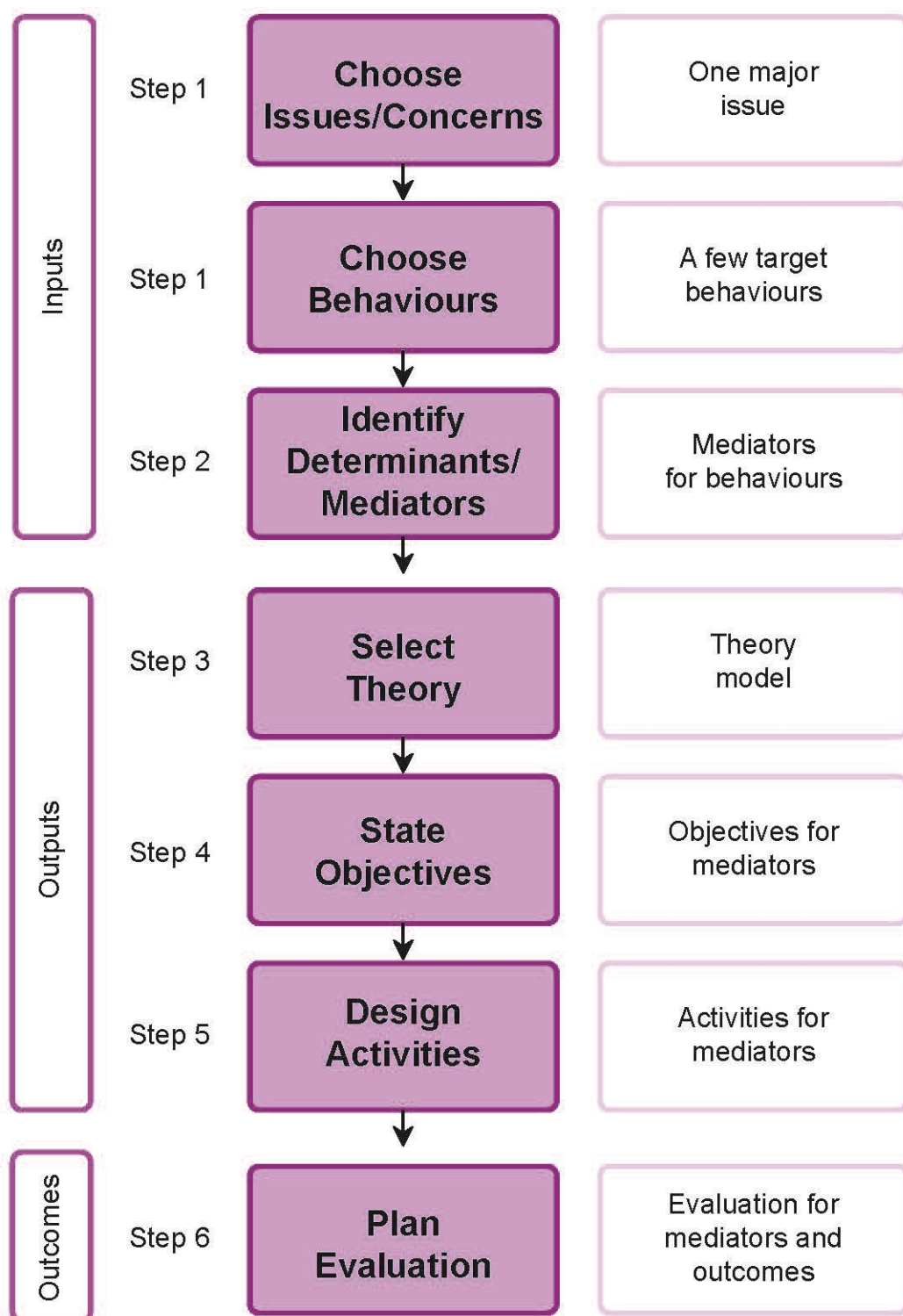


Figure 2.6: Flowchart of steps in designing theory-based nutrition education (Contento 2011: 148)

2.4 ADVANCES IN NUTRITION EDUCATION

Traditionally, NE was focused on improving knowledge only. However, the educational approach for food and nutrition has changed and a “tri-partite” curriculum for teaching NE in schools was developed by the FAO in 2005. This curriculum recognises that the child, besides learning in the classroom, also learns from the school environment as well as from family and community. At school, NE should be embedded across different curricular, be a part of extra-curricular activities and involve families and communities. The school environment should be a healthy one to promote good nutrition and health with school gardens an important aspect of food and NE (Wenhold, Kruger and Muelhoff, 2008: 460-461,464).

A child-centred interactive approach to NE at school is advocated by Contento (2011: 273) with the FAO providing a food and nutrition curriculum outline for the school setting which needs adapting to suit the age group and local context (Wenhold, Kruger and Muelhoff, 2008: 461). As food choice and dietary behaviour has become more complex, critical thinking skills are also required (Contento, 2011: 273).

The social marketing strategy is a successful approach to NE acknowledged by Behr and Ntsie, (2008: 325,327). This strategy uses the marketing techniques of business to influence the decision to change nutritional behaviour of a large target audience. It is a “bottom-up” approach with the nutrition issue identified by the researchers, with all aspects of the proposed programme and its delivery critically analyzed by the primary and secondary target participants. The effect of a NE social marketing campaign is questionable due to the inability to gather data on the behavioural change although increasing awareness has proved successful. Broad behaviour messages rather than one specific nutrition message could impact on the effectiveness of a programme. However, when the target group has impact on the development of the campaign there is an increased likelihood that the behaviour change objectives will be achieved (Young et al., 2004: 250,256,257).

The variety of channels used for the communication of NE has increased with new technologies in use. Suitability depends largely on the target audience. Mass media channels (newspapers, radio, television and the internet) each have different advantages and disadvantages with the web becoming an increasing popular source of NE. Educational computer games are fairly new technologies that have been used in a small number of health promotion interventions for school going children (Contento, 2011: 388).

Lacking in SA was a uniform visual representation of the SA Guidelines for Healthy Eating. This food guide was viewed as an essential NE tool for SA, therefore the Department of Health (DoH) National Nutrition Directorate, with FAO support developed the SA Food Guide in a parallel process to the Food-Based Dietary guideline (FBDG) revision (Vorster, Badham and Venter, 2013: S7).

The Food Guide was launched during the 2012 National Nutrition Week (NNW). The diagrammatic representation in Figure 2.7 (DoH, Directorate Nutrition, 2012: 4) is of different food groups including

traditional foods that when eaten in the correct proportions will constitute a healthy diet for the whole population. Sugary and sweetened foods and drinks have been excluded from this food guide making it unique. The varying sizes of the circles provide an indication of the volumetric percentage of food which should be consumed daily from a specific food group in relation to another food group (DoH, Directorate Nutrition, 2012: 4).

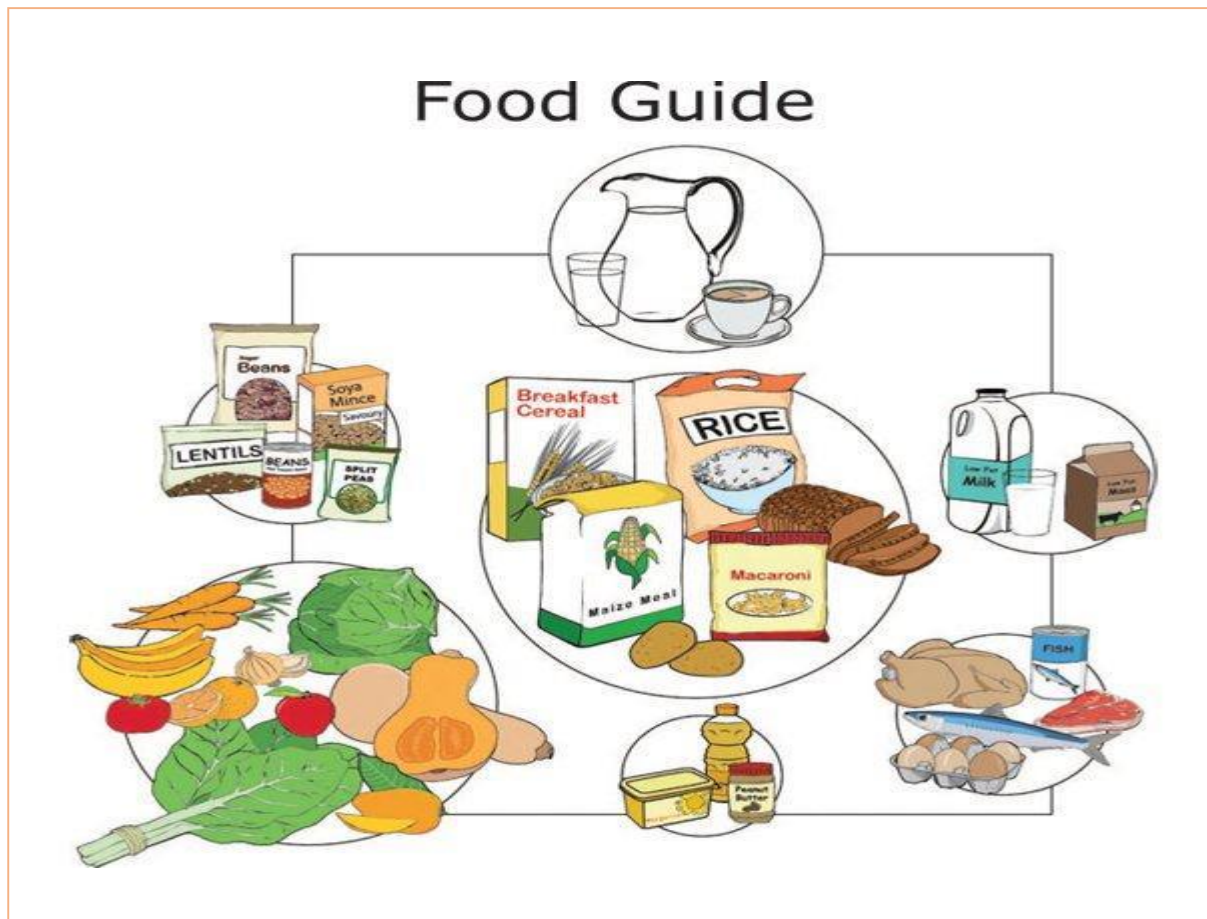


Figure 2.7: The South African Food Guide (DoH, Directorate Nutrition, 2012: 4)

Globally, prolific NE research has been conducted due to the increasing interest by governments and the public regarding nutritional health and the combating of chronic diseases of lifestyle (CDL). This growing body of knowledge provides evidence which once evaluated could generate “best practice” (Contento, 2011: 21, 44, 47).

2.5 COMPONENTS OF AN EFFECTIVE NUTRITION EDUCATION PROGRAMME

Contento, Randell and Basch, (2002: 12, 13) posit that there are many factors identified through research that contribute to the effectiveness of a NEP as outlined below.

The initial commitment of government and community leaders and funders is vital at the outset of a NEP. Moreover, community involvement during the entire programme inclusive of its evaluation concretizes ownership and ensures sustainability (Behr and Ntsie, 2008: 324,329). In addition, ongoing

commitment of the various stakeholders is imperative to the success of a programme (Wagner, Meusel and Kirch, 2005: 103).

A NEP to be implemented on a large scale needs to be sustainable as in the case of the Australian “Munch and Move” New South Wales (NSW) state-wide programme designed to prevent overweight and obesity with the focus on the professional development of preschool and day care centre staff (Hardy et. al., 2010).

For a NEP to be effective there must be input from nutrition professionals. In addition, the programme must follow the dietary guidelines of the country (Hu et al., 2009: 254) and be relevant to the participants who must be actively involved (Behr and Ntsie, 2008: 324). Blom-Hoffman et al. (2004: 59) indicates that school psychologists can play an important role in the development, implementation and effectiveness of a health promotion programme where behaviour change is desired, as in the case of the NEP “Every Day, Lots of Ways” (EDLW) implemented by Blom-Hoffman and Du Paul (2003: 264) in Pennsylvania, US.

A NEP will be more effective if household food security, socioeconomic, cultural and ethnic perspectives of the target population are considered when planning the intervention (Dixey et al., 1999: 7; Young et al., 2004: 251).

Nutrition interventions in the formative years are strongly believed by a number of researchers to be the most appropriate (Shah et al., 2010: 434; Hu et al., 2009: 254; Sherr et al., 2011). It is at this stage in a child’s life that they form food preferences, attitudes and behaviours with some developing a fear of trying new foods, known as neophobia (Young et al., 2004: 251). It is acknowledged by Kaiser et al. (2012: 2028) in a US study that parental role modelling has a positive effect on the fruit and vegetable intake of school children.

Schools have been identified as the ideal setting for cost-effective NEPs (Parcel, Keider and Basen-Engguist, 2000: 88; Heneman et al., 2008). Children spend a large percentage of their day at school and are considered to be a large captive audience (Parcel, Keider and Basen-Engguist, 2000: 88) where knowledge and attitudes can be changed at an individual level (De Bourdeaudhuij et al., 2011: 206). Younger children are more enthusiastic about learning; however sustained NE throughout a child’s school career is advocated by Shah et al. (2010: 435). Using a variety of media in the NEP is more effectual than the choice of only a single media (Behr and Ntsie, 2008: 324; Contento, 2011: 44).

Within a school, an environment conducive to healthy eating should be provided and if food is supplied healthy options are required (Dixey et al., 1999: 83). It is recommended by De Bourdeaudhuij and co-researchers (2011: 206) that school policies would need to be amended to enable changes in the school environment to facilitate the promotion of healthy behaviours.

A review on school-based obesity reduction programmes in children between six and twelve years old in seven Western European countries was conducted by De Bourdeaudhuij et al. (2011: 205, 209). The findings revealed that when NE and school environmental interventions are combined they are more effective than when implemented alone. In this review, those studies using only classroom lessons for the intervention were found to successfully increase knowledge; however the impact on dietary modification and an increase of physical activity was only partially met.

There are many factors besides knowledge that influence dietary practices yet NE is most often knowledge-based. An effective NEP therefore needs to identify and modify the determinants of dietary behaviour (Contento, 2011: 45). Parcel, Keider and Basen-Engquist (2000: 89) mention that the success of a NEP in a school setting could be affected by a lack of school resources, the academic demands on the teacher and public opinion. Barriers to healthy eating noted in the home setting were the lack of time, energy and money with the perception by the elderly that nutritious food is more expensive. A child's food preference will often sway a parent in their food purchasing behaviour which could negate the NE received. Limited exposure to various foods restricts the preschool child's development in accepting new foods on which to build future healthful habits (Young et al., 2004: 251-253). It is therefore important that the home environment is complemented with an education programme at school especially where there is no parental pressure for children to learn to like new foods (Kaiser et al., 2012: 2028).

Blom-Hoffman et al., (2004: 46) emphasised that schools are situated in a neighbourhood and therefore connected to those in the community. The largest Asian school NE and behavioural intervention took place in India during 2006-2008: '*Medical education for children/adolescents for realistic prevention of obesity and diabetes and for healthy ageing*' (MARG). It involved children ($n=40196$), teachers ($n=1500$) and parents ($n=25\,000$) and affirmed that the 8-11 year-old age group showed notably higher knowledge and behaviour improvement results than the older age groups (Shah et al., 2010: 428,433).

Capacity building of knowledge and skills of those implementing the programme will impact on the success of the programme (Behr and Ntsie, 2008: 324; De Bourdeaudhuij et al., 2011: 206). Training of all educators in NE allows for multiple teacher role models for the children. As key role players they support the child and provide feedback in the advancement of a healthy eating lifestyle which ultimately impacts on academic achievement (Parcel, Keider and Basen-Engquist, 2000: 89; Hu et al., 2009: 254).

Besides teachers, parents require knowledge of correct nutritional practices to reinforce what is being learnt by the children in the NEP for the development of healthy dietary habits (Hu et al., 2009: 254; Wagner, Meusel and Kirch, 2005: 109). Committed parental involvement in the US "*Colour Me Healthy*" (CMH) programme was lacking. An inability to engage with parents was also evident in other studies cited by Witt and Dunn (2012: 112). The parents' acceptance of NE together with their intense involvement will enhance the effectiveness of an intervention (Wagner, Meusel and Kirch, 2005: 109;

Hu et al., 2009: 254). Parents also need to encourage young children to decrease their consumption of junk foods (Young et al., 2004: 253).

The time period of the intervention and the number of hours allocated varies between programmes and can impact on the effectiveness of the programme. Most NEP are relatively short in duration, an observation made by Contento, Randell and Basch, (2002: 17). The results of a study by Connell, Turner and Mason (1985) mentioned by Contento (2011: 54) in her book "Nutrition Education: Linking Research, Theory and Practice" suggests that for dietary behaviour and attitudinal change to occur, between 35 to 50 hours of NE is required with the latter duration reiterated by Dixey et al., (1999: 17). In contrast, an increase in nutrition knowledge in school can, according to Contento (2011: 54), be achieved in approximately eight hours. Contact sessions may occur daily, weekly or even monthly (Witt and Dunn, 2012: 108).

For the MARG education intervention (India), forty-five minutes to an hour was allocated weekly over a six month period (Shah et al., 2010: 429). The US KI devoted 65 hours to fulfil the programme objectives of increasing a child's intake of nutritious food and awareness of locally grown produce (The Food Trust, 2007: 21). Fifteen hours were devoted to the German NEP for preschool children by Wagner, Meusel and Kirch (2005: 104) with the majority of the time spent on project work following a theory lesson. Varying time periods were observed for American NEPs with the CMH fruit and vegetable nutrition and physical activity programme held over six weeks (Witt and Dunn, 2012: 107), and over 12 weeks a preschool intervention by Young et al. (2004: 254). Others are longer, up to a year, as in the case of the KI (The Food Trust, 2007: 6). The Canadian preschool study by Matheson, Spranger and Saxe (2002: 85) which examined children's food perceptions and their food experiences took place over two years. Wagner, Meusel and Kirch (2005: 103) emphasised that a long term programme with repetition fosters positive behavioural change which can form the basis of future action.

The implementation of the intervention must be fulfilled as designed with appropriate evaluation measures. When a dietary behavioural change occurs as a result of NE, this adds greatly to the effectiveness of an intervention programme where knowledge is usually the prime outcome. To judge the efficacy of an intervention, a valid and reliable measure of evaluation is required that suits the age, culture and level of literacy of the participants (Contento, Randell and Basch, 2002: 14-15).

2.6 PLANNING AND DEVELOPMENT OF A NUTRITION EDUCATION PROGRAMME

A NEP needs to be developed to answer the research questions pertaining to a study. This process of development is achieved in four phases: conceptualisation, formulation, implementation and evaluation and will be discussed in more detail in this section.

2.6.1 Phase 1: Conceptualisation

The conceptualisation phase is the vital first step in devising a NEP. This will include defining the relevant problems and determining the causes of the identified issues resulting in the establishment of an educational framework suited to the programme (Behr and Ntsie, 2008: 327).

➤ **Defining the nutritional problems**

As indicated in Figure 2.8 (FAO, 1997) the first aspect of designing a NEP for a specific audience is to identify the nutrition problem through research (FAO, 1997) so that the issues can be addressed through the NEP (Contento, 2011: 149). Different methods can be used to gather this data from the target population (Behr and Ntsie, 2008: 327). The needs analysis must be inclusive of all stakeholders in the NEP (Contento, 2011: 151).

The nutritional problems in high-and low-income countries are mentioned in Chapter 3. Researchers have highlighted various nutritional concerns relating to children: insufficient fruit and vegetable intake (Keyte et al., 2012: 155); eating of junk foods; poor knowledge regarding fibre and food composition; a variety of foods lacking in the diet; high consumption of soft drinks; sugar intake requires moderation; excess consumption of fat including saturated fat; unable to select foods that are low in fat or cholesterol; and missing breakfast (Murphy et al., 1995: 219; Dixey et al., 1999: 79; Witt and Dunn, 2012: 107).

If there are dietary guidelines for a population they are not always known or easily understood especially by pre-primary children, as established in a US study by Murphy et al. (1995: 219). Unhealthy dietary behaviours resulting in overweight and obesity are a recurring health problem cited by researchers worldwide. Numerous NEPs have been formulated and reviewed to address these nutritional problems that have life threatening ramifications (Blom-Hoffman et al., 2004: 46; Hu et al., 2009: 253; Wagner, Meusel and Kirch, 2005: 102; Witt and Dunn, 2012: 107; Hardy et al., 2010; Dixey et al., 1999: 8; Nethe et al., 2012: 118).

➤ **Determining the causes of the nutritional problem**

On identification of the nutritional problem, it is necessary to determine and understand the cause to formulate the actions required for the intervention (Behr and Ntsie, 2008: 327,328). Through surveys and data on dietary behaviours and food practices of the intended audience, an understanding of the causes of the nutritional problem is provided (Contento, 2011: 155). Nethe et al. (2012: 127) suggests that the quality of current health promotion activities needs to be assessed to identify any aspect that is lacking to allow for inclusion in an intervention.

Developed countries have formulated specific dietary guidelines for the inhabitants to promote nutritional health and prevent disease; however, these are not always adhered to (Dixey et al., 1999: 14). Knowledge of the audience's food purchasing practices, food frequency intake, specific food habits, food safety practices, meal patterns and quality of consumed food is therefore important for prioritising

the practices that contribute to the nutritional issue (Contento, 2011: 155,157). It is an acknowledged fact, shared by Dixey et al., (1999: 13), that the nutritional significance of food is not the most influential factor when people select food to eat. Many factors including cost, availability, cultural and personal factors influence the choice of food and they differ, depending on the target audience. The affluent lifestyle in China with the replacement of the traditional diet with a more varied diet and fast food indulgence of the only child in the family, is the cause of inadequate nutrition and obesity in both children and adults (Hu et al., 2009: 253-254). In stark contrast, vulnerable groups due to a variety of reasons have limited access to food, impacting on their health and nutrition status (Dixey et al., 1999: 13).

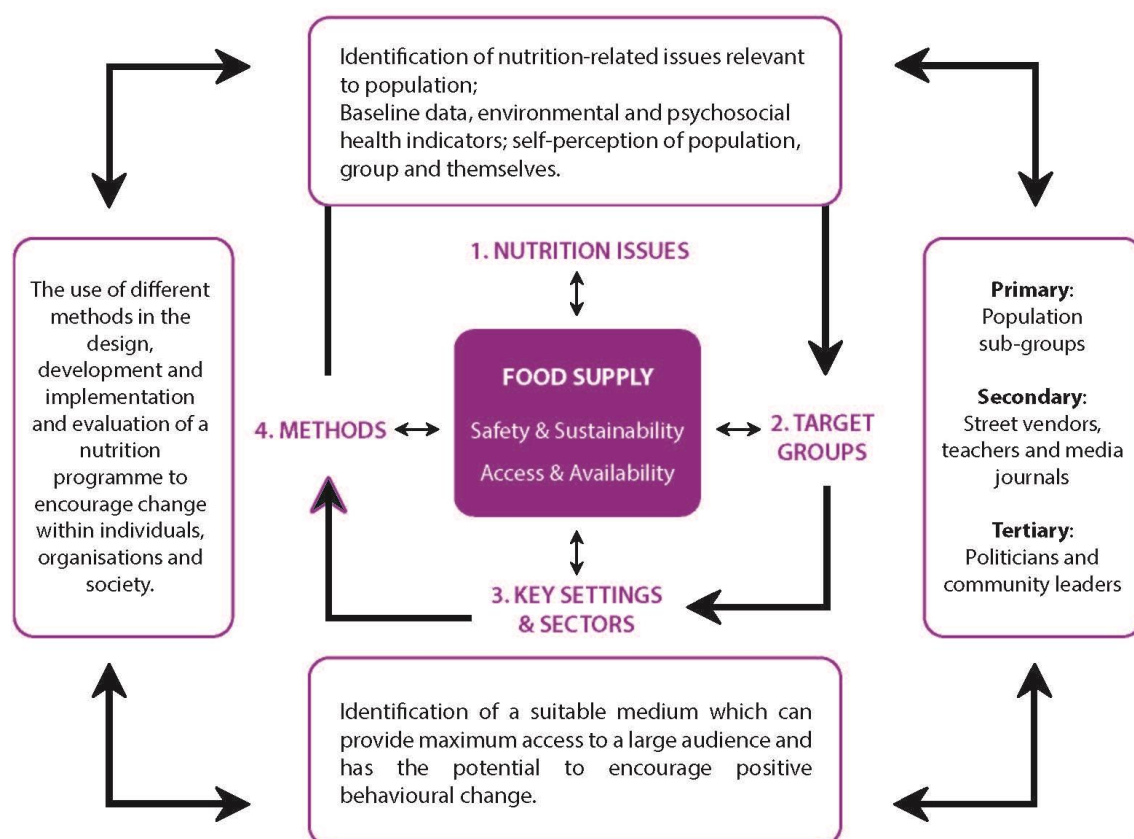


Figure 2.8: Framework for planning nutrition promotion and education programmes for the public (FAO 1997)

A child is subjected to different levels of influence in the social environment affecting their nutrition behaviour, as represented in Figure 2.9 (Perry 1999: 27). Siblings, parents and friends, represented in the inner circle, exert the greatest influence upon the child's nutrition intake (Perry, 1999: 26-27). It is acknowledged that from birth, parents have a strong influence on a child's food consumption and unhealthy eating habits may result (Hu et al., 2009: 254). Perry (1999: 29) posits that an intervention might need to be targeted to certain role-players in this social environment to effect a healthy lifestyle change in the child. Hardy et al. (2010) disclosed that the majority of preschools in the Australian NSW "Munch and Move" study had food and beverage rules for parents to follow relating to lunchbox content. It was also apparent that some of the preschools had difficulty in identifying which foods were appropriate or not for lunch at school.

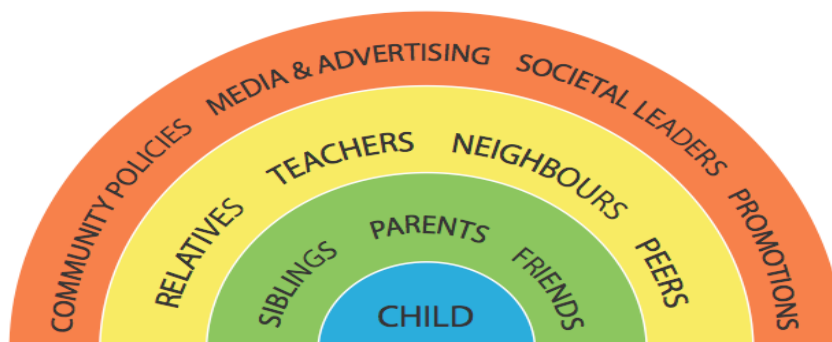


Figure 2.9: The social environment of young children (Perry, 1999: 27)

Increasing urbanisation with depopulation occurring in rural areas and westernization of the population has led to a change in diet resulting in unhealthy eating patterns with an increased tendency to eat foods high in saturated fatty acids (SFA) and refined carbohydrates (CHOs) rather than traditional meals (Misera and Khurana, 2008). In industrialised nations there is a tendency to consume more processed foods including fast foods. In addition, there is an imbalance in the quantity of animal and plant foods eaten by children. Snacking between meals and skipping breakfast, an essential start to the day, is becoming more prevalent amongst children and adolescents (Dixey et al., 1999: 11-12). The increase in overweight and obese children in developed countries can be attributed to a poor-quality diet (Florence, Asbridge and Veugelers, 2008: 214). Decreased physical activity also contributes to high obesity levels mentioned by Misera and Khurana (2008) and Dixey et al., (1999: 12). The promotion of physical activity, therefore, in addition to healthy eating formed the basis of the Australian “Munch and Move” programme (Hardy et al., 2010).

Inadequate fruit and vegetable intake has been highlighted in many studies around the world as a cause of concern for nutritional health (Keyte et al., 2012: 155; Dixey et al., 1999: 12; Blom-Hoffman et al., 2004: 48; Witt and Dunn, 2012: 107). Recent studies have been conducted in Hampshire in the United Kingdom (UK) by Keyte et al., (2012: 156) and in the US by Witt and Dunn, (2012: 107) to increase the consumption of fruit and vegetables by preschool children.

A lack of NE will impact on informed decision making regarding a healthy dietary lifestyle and will therefore be a contributing factor to the causes of nutritional problems (Contento, 2011: 13). In SA, the inclusion of NE in pre-primary school has been very limited yet it should be an essential part of the curriculum for early childhood development to prevent nutritional problems (Murphy et al., 1995: 223).

The causes of the nutrition issue need to be clarified, to enable the setting of the short and long term objectives for the NEP (Hyndman, Hershfield and Thesenvitz, 2001:15). The focus of a NEP will need to be limited to one or more of the prioritised behaviours that need changing (Contento, 2011: 157).

➤ **Establishing the educational framework**

Hyndman, Hershfield and Thesenvitz. (2001: 15) suggest that before embarking on the creation of an educational framework existing models, theories and frameworks relating to health promotion should be consulted.

Inclusion of more than one target group is advocated by Nethe et al., (2012: 120) to provide the diversity required in a quality intervention programme. During the conceptualisation phase the setting of the three target groups (primary, secondary and tertiary) (Figure 3.8, FAO 1977), needs to be determined (Behr and Ntsie, 2008: 328).

Before selecting a theory/model, Contento (2011: 177, 200) recommends considering the stage of motivation readiness for the target audience. These stages vary from pre-contemplation, contemplation, deciding or taking action. Research evidence of the target behaviour of the intended group provides useful information when developing a model.

Anderson, Winett and Wojcik (2007: 311) believe that a NEP designed for a particular demographic group, a specific gender or socioeconomic status (SES) will be more successful than an intervention where these are disregarded. When developing a NEP in a particular educational setting, it must be acceptable for children from a variety of cultural and socio-economic backgrounds (Hardy et. al., 2010).

Nutrition interventions during the formative years of childhood are believed to be the most appropriate as behavioural habits are formed through learning and experiences at school and within the family. These direct surroundings in which young children find themselves impact on the modelling of their behavioural patterns including nutritional ones. Four-year-olds were the primary target population for the Australian “Munch and Move” programme as food choices and eating habits are known to be shaped during these early years (Hardy et al., 2010). School educators, as part of the secondary target group, are often influential in health promotion activities and can reinforce positive nutritional behaviours as children are inherently motivated (Wagner, Meusel and Kirch, 2005: 103; Shah et al., 2010: 434). Nethe et al. (2012: 127) therefore advocate the inclusion of promoting healthy behaviour of educators as an objective in NEP interventions. In addition, support for a NE intervention should be sought from the tertiary target group of local government and community leaders and in the case of NE in schools; the programme should be linked to the curriculum.

There will be significant differences in school environments within and between countries which necessitates local culturally adapted school interventions (De Bourdeaudhuij et al., 2011: 213). Likewise, cultural relevance is emphasised by Perez-Rodrigo and Aranceta (2003: S83) as one of the important aspects contributing to the success of NE in schools.

Dixey et al. (1999: 15-19) indicates that there are three aspects to a school curriculum framework relating to NE: the formal, the hidden and the parallel curriculum. The hidden curriculum refers to those

non-formal aspects of school which includes the physical and social environments. The parallel curriculum encompasses the out-of-school activities relating to family, community and mass media. A formal curriculum, as the teaching framework for a NI, needs to exhibit a balance between the content of the curriculum and the process of learning. Incorporation of key nutrition concepts into other subjects has been emphasised by Rickard et al., (1995: 1124) as a method to capitalize on the learning and its relationship to different aspects affecting a healthy lifestyle. Broad themes running across several areas of learning can link together related knowledge in the educational framework (Rickard et al., 1995: 1125; Murphy et al., 1995: 223).

A multi-component approach to a school health intervention is advocated by Parcel, Keider and Basen-Engguist, (2000: 95,114) as having a greater prospect of success than only one component. This is reiterated by De Bourdeaudhuij et al. (2011: 209) in the review of school-based obesity programmes in Western Europe. The systemic whole-school approach for health promotion would include the child's own concept of health and the related behaviour and that of the staff; the nutrition and physical education (PE); the healthy physical school environment including playground activity and PE lessons; the nutrition services for the promotion of healthy foods in school; the policies relating to food pricing; the health services for early intervention of obesity including the health of all school staff, and the involvement of staff, parents and community members (Parcel, Keider and Basen-Engguist, 2000: 95,96,107; De Bourdeaudhuij et al., 2011: 209,214; Nethe et al., 2012: 120). A three-pronged approach was used for a pre-primary school study in the US by Blom-Hoffman et al. (2004: 48) to improve fruit and vegetable knowledge (classroom-based component), to change behaviour by eating "5-A-Day" (lunchtime-based component) and involve parents (home component) by providing them with the lesson content plus behavioural ideas for change. In addition, the parents contributed recipes for a school cookbook on fruit and vegetables which they received at year end.

2.6.2 Phase 2: Formulation

The outcomes conceived in phase one form the basis of the second phase of the planning process. From feedback and consultation with stakeholders a suitable action plan with appropriate programme goal/s needs to be developed (Hyndman, Hershfield and Thesenvitz, 2001: 9). This plan also includes the strategy for message communication and media selection (Behr and Ntsie, 2008: 328) bearing in mind the different priority group/s identified for the intervention (Hardy et al., 2010). Wagner, Meusel and Kirch, (2005: 103) emphasise that the design, content and methods of a NEP for children must be authentically child orientated also allowing for action to be included in a child's daily routine. A child must see the connection between what is learnt and the application of this knowledge for self-directed action. Contento (2011: 273,226) therefore emphasises the necessity to stimulate higher-order thinking (analysis, synthesis and evaluation) when developing a NEP even for young children. These higher levels of cognitive thinking together with the lower levels of knowledge recall, comprehension and application need to be considered.

➤ Setting objectives

The objectives for each NEP are unique as they relate to the specific NI to address a nutritional problem. General educational objectives and environmental support objectives provide direction for the development of the educational and environmental components of a school-based NEP (Contento, 2011: 231). Rickard et al. (1955: 1124) comment that when setting objectives one must bear in mind learning is a multifaceted process which requires a partnership between schools, families and children. Having ascertained the different components in an intervention the next step is to set the objectives aligned to the overriding goal of the nutrition programme. The objectives must be SMART:

- Specific
- Measurable
- Appropriate
- Reasonable
- Timed

to be achieved within a certain period. (Hyndman, Hershfield and Thesenvitz, 2001: 10).

Specific objectives for each component are required for the development of each activity and the cognitive levels of thinking (knowledge, comprehension, application, analysis, synthesis, and evaluation) required, achieving the desired programme outcome/s (Contento, 2011: 222-226,231).

In addition, a desirable outcome in a NEP is for the participant to recognize the need to change dietary habits. Affective domain objectives therefore need to be set at the appropriate level for the participants of any theory-based NEP. These levels of affective engagement vary, from the lowest level where the participant receives the message by paying attention, then to active participation, followed by commitment to the behaviour. At the next level, the participant will behave according to a set of own principles, and lastly internalise values for behaviour consistent to a world-view (Contento, 2011: 226,228,274).

When objectives are formulated so are the indicators to measure the success of the intervention. Dependent on the goal, objectives will either be achieved in the short (2-3 months to 2 years) or long term (2-5 years). The collection and analysis of short and long term data verify whether specific targets have been achieved (Hyndman, Hershfield and Thesenvitz, 2001: 11, 13).

Researchers have formulated objectives for NEPs based on the dietary guideline recommendations of a particular country with Murphy et al. (1995: 218) using the dietary guidelines of America; and Oldewage-Theron and Egal (2009: 284) the SA FBDGs (Vorster, 2001: S3).

In Australia, preventing obesity in early childhood has been recognised as a priority with the “Munch and Move” preschool programme implemented to correct lifestyle habits in this age group. The objectives were to promote healthy eating habits and food choices as well as increase physical activity (Hardy et al., 2010).

The nutrition objectives for the US “Healthy Bodies Wilshire Program”, a nutrition and fitness programme using the play approach for obese pre-primary children and their families, was three fold:

- Find pleasure in consuming different foods from various food groups
- Experiment with novel foods and different preparation methods
- Change food choices to increase pleasure and improve health and well-being (Rickard et al., 1995: 1125).

Dixey et al. (1995: 67-76) suggested that for pre-primary children in health-promoting schools in Europe, the main themes and related objectives of a formal classroom curriculum should include the following:

- Sensory perception, food preferences and responsible decision making when offered choices of food
- Eating habits, food and emotional development
- Nutrition and positive health
- Food classification
- Food production, manufacturing and distribution
- Recognition of the different food departments in a shop
- Hygiene and simple food preparation, including setting the table

➤ **Designing messages**

Pre-testing of nutrition messages with the target population should occur to obtain feedback to enable the development of appropriate messages and materials (Young et al., 2004: 253). Contento (2011: 208) affirms that NE messages should follow the guidelines suggested by the International Organisation of Consumer Unions which emphasise accuracy, objectivity and completeness of information in addition to non-discrimination and non-commercialism.

NE messages will vary greatly dependent on the audience and approach used for the programme. Age-appropriate messages are therefore essential (Shah et al., 2010: 429) and reinforcement messages for parents need to be designed (Young et al., 2004: 254). The US “Five a Day for Better Health” message campaign was used in the Blom-Hoffman study (2004: 46) to encourage preschool children to consume a minimum of five portions of fruit and vegetables every day. The key healthy eating messages for the “Munch and Move” pre-primary programme (Australia) were:

- Select water as a beverage
- Eat less snacks and choose healthier snack options
- Eat greater quantities of fruit and vegetables (Hardy et al., 2010).

The health communication messages created to alter behaviour in the social marketing approach to NE are based on the “4Ps” of a marketing mix namely, product, price, place and promotion. Product refers to the knowledge gained and the behaviour that should be adopted. Price intimates the exchange that must occur for the health benefit from the communication. The accessibility of the service to the target

audience is represented by Place in the mix. Lastly, Promotion is the persuasion used to convince the participant that there is value in changing the behaviour (Behr and Ntsie, 2008: 325).

➤ **Choosing the media and multi-media combinations**

For the delivery of nutrition messages a suitable means of communication must be identified with multiple strategies considered as children assimilate knowledge in a variety of ways (Behr and Ntsie, 2008: 326). Contento (2011: 243) emphasised that people are generally only capable of remembering ten percent of what is read, twenty percent of what is heard, thirty percent of what is seen, fifty percent of what is heard and seen, seventy percent of what is said and written, and ninety percent of what is said and done. Different types of learning therefore need to be considered which would impact on the choice of media. Diverse methods of learning suggested by Rickard et al., (1995: 1124) include hands-on experiences, active experimentation, and creative activities. The use of actual food, food models or photographs, demonstrations, video-clips and web-based programmes are examples of effective media for NE which can increase motivation and learning (Contento, 2011: 243,273).

Hardy et al. (2010) reports that communication regarding food rules and policies with NSW preschool parents occurred through different communication methods including personal letters, newsletters, face to face communication and notices posted on boards. A study completed by Wagner, Meusel and Kirch, (2005: 104) in Germany, included parents who received information and had discussions regarding the programme at a parents evening.

Individuals need reminders to motivate them to take action which can be achieved through a variety of means for example: fridge magnets; posters; brochures; bookmarks, and pencils with messages, (Contento, 2011: 252,253,273).

In India observations by Shah et al. (2010: 434) showed that most often nutrition information available through the different media is in English which could restrict access to information depending on the home language. A family's SES would also impact on the availability of these resources (Shah, et al., 2010: 434).

The 24-week US "Early Sprouts" preschool social ecological programme included the establishment of vegetable gardens in the play area. Children learnt how to plant, look after and harvest six vegetables besides being involved in the weekly cooking activity which incorporated a target vegetable (Kalich and Arnold, 2008: SA53). In a classroom situation when a child is actively involved in food preparation and eats what has been prepared, behavioural changes tend to occur (Contento, 2011: 251).

Part of the KI (US) was to provide the preschoolers, three times a week, with a variety of healthy snacks using mainly local produce to enable them to develop a liking for them (The Food Trust, 2007: 16). Research has substantiated that taste is a strong determinant of food choice (Contento, 2011: 251). The snacks included pumpkin muffins, spinach salad, and local peaches and squash pudding to name

a few. The parents also took part in food tastings and cookery demonstrations and were afforded the opportunity of going on field trips to increase their knowledge of the local foods (The Food Trust, 2007: 16, 21).

The US CMH curriculum provided interactive opportunities for preschool children to learn about nutritious foods and physical activity. This was achieved through the use of colour relating to fruit and vegetables, a music CD, and discovery of the senses when they had to identify the mystery fruit and vegetables in brown paper packets followed by a tasting session. Besides the lessons, prescribed imaginary trips were included in the curriculum for the physical activity aspect which included various role-playing scenarios (Witt and Dunn, 2012: 109).

A social marketing approach would use a combination of advertising, entertainment and promotional activity to reach the target population with the behaviour change messages (Behr and Ntsie, 2008: 326). Contento (2011: 252) suggests that billboard messages can be used for this approach.

2.6.3 Phase 3: Implementation

For implementation, suitable materials will be utilised and the training of those implementing the programme, prior to the execution of the NEP, is essential (Behr and Ntsie, 2008: 328).

➤ The materials

The appropriateness of the learning materials of a NEP contributes to the success of the intervention. For the play approach the NE materials must allow for active engagement in discovery by children with age-appropriate problem-solving activities to achieve healthy eating habits (Rickard et al., 1955: 1125, 1126). Appealing to a preschooler's sense of having fun is reiterated by Young et al. (2004: 254) and Shah et al. (2010: 435) so that maintaining a healthy lifestyle is seen in this light. Materials for parents need to be provided in the appropriate language and at the appropriate level for the nutrition information required (Young et al., 2004: 256).

All the necessary training materials for the NEP must be provided for the teacher's use to contribute to the effectiveness of the programme. These NE materials must provide the facts for improving the child's knowledge, the skills for food preparation, the opportunities to explore the sensory perception of food and the psychosocial influences associated with eating habits. The inclusion of materials to encourage creative expression by children and the use of small group activities to promote group participation and improve communication skills including listening, are both emphasised by Dixey et al., (1999: 21-22, 27).

Various resources were provided for the Australian "Munch and Move" programme, namely a teacher's resource manual filled with a variety of games and food-based learning experiences, for example cooking and food tasting, and vegetable gardens at school. Materials used for primary school children in different European countries surveyed by Dixey et al. (1999: 54-55) included games, food, pictures, textbooks, books, booklets, videos, worksheets, materials obtained from health and nutrition authorities,

computer programmes and puzzles. Material to take home for reinforcement of learning in the form of a booklet can be beneficial to the child and the parent (Shah et al., 2010: 429).

On completion of a school-based intervention, the materials and NETs can be provided for future use in the classroom, as in the case of the US “Every Day Lots of Ways” study by Blom-Hoffman et al. (2004: 49).

➤ **Training the change agents**

Different change agents, for example teacher, parent, paraprofessional and nutritionist, can be used in a NI. For a lunch-time-based multi-component intervention conducted by Blom-Hoffman et al. (2004: 47), paraprofessional staff members from the school were used as behavioural change agents.

Those conducting a NI require training as in the study by Wagner, Meusel and Kirch, (2005: 104), where nutrition experts attended a three-day training programme to be certified as child nutrition experts by the German Nutrition Association. For the “Munch and Move” intervention, a one-day workshop provided the necessary professional development for preschool staff (Hardy et. al., 2010). Teacher training is required for comprehensive knowledge and teaching practices necessary for the achievement of the objectives of a programme (Parcel, Keider and Basen-Engguist, 2000: 116; The Food Trust, 2007: 5). The approach used by the teacher to facilitate learning will vary depending on the choice of learning paradigm. Moreover, a child-centred approach is vital for a successful intervention whilst the teacher acts as the facilitator in the learning process (Rickard et al., 1995: 1122, 1124). Blom-Hoffman and Du Paul (2003: 269) confirmed that nutrition knowledge does not necessarily result in a food behavioural change. Educators therefore need to be trained to promote nutritious food habits using motivation as a strategy. A teacher also needs to be aware of the complexities of overweight and obese children and be trained in teaching children to accept diverse body shapes and sizes (Murphy et al., 1995: 223). Teacher training was an important aspect of the US KI as teachers acted as role models in the consumption of nutritious foods (The Food Trust, 2007: 21). All the educators in a school can play a role in imparting nutrition knowledge and through sustained effort can facilitate a behaviour change towards healthy eating (Shah et al., 2010: 434). Murphy et al., (1995: 222) emphasised that US pre-primary educators acknowledged the health benefits for children following dietary guidelines. However, this research identified that the educators had limited knowledge relating to recommended serving sizes.

Parents or caregivers require NE and training to sensitise them to healthy practices and food choices as they usually dictate what is to be consumed and how it is prepared (Shah et al., 2010: 429; Hu et al., 2009: 255; Kaiser et al., 2012: 2033; The Food Trust, 2007: 21). Strengthening the social support given by the family in building a person’s nutrition efficacy is an important aspect of a NI. Self-regulatory nutrition behaviour is the key, cited by Anderson, Winett and Wojcik (2007: 311), to a healthier nutrition lifestyle. Outcome expectations of the behaviour change need to be positive and any negative ones dispelled (Wagner, Meusel and Kirch, 2005: 103). The KI (US) has an education programme specifically designed for parents/caregivers to ensure that they will value a healthier eating pattern and

enable the provision of such to occur more easily (The Food Trust, 2007: 21). Moreover, research in the US by Anderson, Winett and Wojcik (2007: 306) affirmed that social support from the family is imperative in improving nutrition status over a period of time and in different situations.

➤ **Execution of the intervention**

Contento, Randell and Basch (2002: 16) emphasise the importance of a NEP being delivered as it was designed. The integrity of the different components of a NEP implementation needs to be promoted and held at an acceptable level to ensure that the desired knowledge and effective behavioural changes occur (Blom-Hoffman et al., 2004: 48). During the implementation of the CMH (US) the educators were not permitted to comment on the snack being consumed by the preschool children nor encourage them to eat it (Witt and Dunn, 2012: 108). To verify if the integrity level is acceptable, integrity checks need to be conducted by the researchers with feedback and support provided to those involved in the execution of the programme (Blom-Hoffman et al., 2004: 51, 57).

2.6.4 Phase 4: Evaluation

The ideal is for evaluation and monitoring procedures to occur from the outset and remain continuous throughout the programme resulting in a comprehensive evaluation (Behr and Ntsie, 2008: 328). Different types of validated methods of assessment should be used to measure each phase of a programme to provide reliable statistics (The Food Trust, 2007: 6). If a NEP comprises more than one component, as in the US pre-primary EDLW programme, then the different components need to be evaluated (Blom-Hoffman et al., 2004: 50).

Wentzel-Viljoen (2008: 872,877,881-887) designed a theory-based nutrition evaluation framework to determine the success of a NEP. An evaluation agenda needs to be designed in accordance with the programme purpose which requires clear objectives, identifies the appropriate measuring instruments for each phase and the intended use of all the collected results. Evaluation takes place in all stages of the programme: initiation; planning or design; implementation also known as process, and on programme completion.

A diagnostic evaluation relating to the areas of school, classroom, family and community needs to be completed prior to the planning of a NEP (Dixey et al., 1999: 24). It is recommended by Nethe et al., (2012: 126,127) that existing government policies and regulations on health promotion in schools should be evaluated prior to the planning to allow for building on these strategies and to be aware of implementation barriers.

During planning, the suitability of a programme is a quality criterion that requires consideration by educators for the programme usability in the school setting during school hours (Nethe et al., 2012: 120). Evaluation during planning may occur as in a preschool “Try new foods” campaign conducted by Young et al., (2004: 254,256) in Colorado, US. Here a food frequency questionnaire was completed by the parents to determine which foods were considered novel, in other words, had been consumed less

than four times by the child. As a result of the evaluation, the Birch's food preference panel was modified and used pre-and post the campaign to evaluate preschoolers' partiality to both new and well-known foods (Young et al., 2004: 256).

The actual process requires monitoring through observations as well as interviews with involved stakeholders. This evaluation will assess if implementation is occurring as planned and will discover any inadvertent consequences and unforeseen outcomes. Programme implementation improvements can be undertaken at this stage as a result of the information gathered during this stage of the evaluation process, known as formative assessment (Wentzel-Viljoen, 2008: 881). For the CMH fruit and vegetable consumption programme in the US, conducted by Witt and Dunn (2012: 108-110), in addition to a food frequency questionnaire, parents were asked to complete a health survey, a food diary for three days and a survey to assess the consumption changes of fruit and vegetables at home. This study used process evaluation to gauge the delivery of the lessons, the children's attendance as well as their completion of the take-home tasks.

Outcome evaluation assesses the efficacy of the education programme on the target population in comparison to the intended outcomes through the collection of data using either experimental or quasi-experimental design evaluation tools (Wentzel-Viljoen, 2008: 882). From baseline, the follow-up periods of an intervention will vary dependent on the programme. It can be categorised as short-term when less than three months, medium-term between three and twelve months and long-term when the follow-up period is beyond twelve months (De Bourdeaudhuij et al., 2011: 209) with evidence of improvements over a longer period of time emphasised by Dixey et al., (1999: 25-26). In the pre-primary-based NEP study in China by Hu et al., (2009: 255) parents completed voluntary questionnaires at baseline, mid-term and post the intervention. The data gathered provided insight into the children's lifestyle behaviours, nutrition knowledge of the parents, their attitudes and dietary behaviours.

A research review conducted by Contento, Randell and Basch (2002: 3-4) on evaluation measures used in preschool NE classroom interventions established that knowledge, attitudes, food preferences and behaviours were measured. For preschool children, pre-and post-knowledge tests can be administered either individually or in small groups. The questions are read aloud due to the literacy levels of the children, pictures are used in questionnaires, and a number of studies used picture faces to illustrate a range of feelings. In certain of the studies reviewed, children completed questionnaires to evaluate attitudes towards eating vegetables, and other nutritious foods. Actual food items were tasted in another study to enable children to categorise their food preferences. A taste test tool was developed by Kaiser et al., (2012: 2033) (US) for educators to evaluate their student's food tastings. The data allowed for categorisation of the food into high or low previous exposure as well as high or low response. This provides valuable information for future pairings in food tastings to promote greater acceptance of those foods found to be categorised as low in previous exposure and low in response. In addition, parents can be informed of the appealing healthy items. In Britain the National Healthy Schools

Programme on fruit and vegetable intake in seven to nine year olds was assessed using a 24 hour recall questionnaire (Keyte et al., 2012: 156).

Contento, Randell and Basch (2002: 8) established that observation and parental reports were the main methods used to evaluate children's food behaviour. Visual examination of plate waste was used in the US by Blom-Hoffman et al. (2004: 50-51) to determine behavioural change in the lunch-time component. This is considered a reliable method of collecting data but necessitated the training of two research assistants to perform the estimations accurately using a modified Cromstock Scale. The review of school-based interventions in Europe by De Bourdeaudhuij et al. (2011: 206) showed that anthropometrics were used as an assessment tool in the majority of these studies. Body weight and height measurements are nutritional status markers, which can be used prior, and post an intervention to determine if the nutritional status has changed as a result of the intervention (Hu et al., 2009: 255,259; The Food Trust, 2007: 6).

From a summative evaluation through analysis and interpretation of data by a statistical expert, recommendations can be made and used for the future to improve the effectiveness of a nutrition programme (Dixey et al., 1999: 25; Wentzel-Viljoen, 2008: 882,892). Through the use of focus group discussions with the different stakeholders, qualitative data can be gathered which will complement the quantitative findings as in the case of the "Early Sprouts" NEP (US) (Kalich and Arnold, 2008: SA53). Studies related to the NE training of certain stakeholders: educators, foodservice personnel and paraprofessionals, have been reviewed by Contento, Randell and Basch, (2002: 7). Understanding the views, nutrition-related knowledge, attitudes and behaviour of these different stakeholders is most beneficial for a programme (Blom-Hoffman et al., 2004: 52; Wagner, Meusel and Kirch, 2005: 104). To assess the degree of commitment by an educator to a NEP is important as it impacts on the student outcomes (Contento, Randell and Basch, 2002: 10).

Stakeholder feedback is essential and can occur in different formats (Wentzel-Viljoen, 2008: 892). Different questionnaires to determine satisfaction of the study conducted by Blom-Hoffman et al. (2004: 52) were administered to educators and learners, with results from both groups supporting the acceptability of the nutrition programme. Similarly, Blom-Hoffman et al., (2004: 55, 58) advocate evaluating the effect of a NEP on the family component as well as ascertaining the parents' knowledge and attitudes toward nutrition. The US KI parents completed a before-and-after survey regarding the child's eating habits and physical activity levels. The parents' reactions and evaluation of the initiative were gathered at the end of a year. Annually, feedback was provided by educators on the training received and the programme in general (The Food Trust, 2007: 7).

Efficiency is one of the quality criteria that must be assessed to determine the relationship between the intervention results and the means used to achieve those outcomes (Nethe et al., 2012: 120). Validity or accuracy, as well as reliability for the measurement of errors, are important aspects of any NE evaluation instruments (Contento, Randell and Basch, 2002: 14).

2.7 TOOLS FOR NUTRITION EDUCATION

A variety of tools for NEP in schools are utilised by researchers and elaborated on in this section.

A resource guide for a NEP needs to outline the competencies to be achieved and the activities to support the learning (Sherr et al., 2011). Active learning places the child at the centre of the learning with a variety of tools used to achieve this (Dixey et al., 1999: 21).

Participants in focus group interviews in a Californian study in the US by Sherr et al. (2011) informed researchers of the requirements for a preschool competency-based resource guide. These included the following: a guide for the teacher; nutrition-related educational activities, cultural sensitivity, suitable recipes, daily food preparation, materials for parents, parental activities, dietary restrictions, food allergies, ideas for field trips, gardening materials and additional nutrition-related resources. “Connecting the Dots... Healthy Foods, Healthy Choices, Healthy Kids” (CTD) was the resultant resource document developed by these researchers. Coloured dots were used in this resource as a code to connect each material to the relevant competency (Sherr et al., 2011).

A “toolkit” of resources is provided for the US CMH intervention with emphasis on different colours of fruit and vegetables. This kit includes a guide for the teacher, newsletters for parents, sets of picture cards, posters for the classroom and a music CD (Witt and Dunn, 2012: 109).

Educational activities used by Young et al. (2004: 255,256) in Colorado, US included a memory card game, a food sampling party, a variation of the “Simon Says” game, in addition to an activity for sensory evaluation. Reading stories based on the NE theme are beneficial (Young et al., 2004: 256). De Bourdeaudhuij et al. (2011: 209-210) in a review of school-based interventions in Europe, noted that the KALEDO board game, named after the researcher who developed this game for youngsters, affected an increase in the intake of vegetables but had no effect on BMI. Mentioned in this European review were two different studies where slightly older children benefitted from using a personalized computer programme in a multi-component intervention. ‘Top Grub’ was a novel card game developed for a UK primary school intervention. This game and its different variations was used to assist in the teaching of the “healthy eating” curriculum (Lakshman et al., 2010).

A variety of creative activities can be used in NE as in MARG in India; these included cartoons; cards; posters and masks (Shah et al., 2010: 429). Dixey et al., (1999: 22) provides additional creative ideas, the use of pictures in collages; creative writing; food preparation and its presentation.

Material to take home for reinforcement of learning can be beneficial to the child and the parent and may result in greater success of the intervention (Sherman and Muehlhoff, 2007: 339) and could be in the form of a booklet (Shah et al., 2010: 429). Through the workbook the child would be able to transfer knowledge to the parents or caregivers encouraging cooperative learning (Contento, 2011: 243). Hu

et al. (2009: 255) reports on a Chinese intervention that used an illustrated nutrition book for children, nutritional pamphlets for parents distributed at the start of the NEP, and pictures relating to nutrition for the preschool classrooms.

For the Australian “Munch and Move” programme, vegetable gardens at school were used as a NET and the teacher’s resource manual had a variety of games and food-based learning experiences (food tasting and cooking) (Hardy et al., 2010). In a Californian pre-school children’s programme besides cooking and gardening activities, field trips were included (Scherr et al., 2011) in the programme. Additional resources in the “Munch and Move” programme were an information page for the notice board, a programme poster and the game of snakes and ladders which was based on the key messages of this programme (Hardy et al., 2010).

Nutritious food is a good tool to develop nutritious behaviour although it does take between eight and fifteen repeated exposures to the new food item to establish familiarity before the child is willing to include the item in his/her diet (Hu et al., 2009: 254; Young et al., 2004: 254). Kaiser et al. (2012: 2033) believe food tastings should be accompanied with NE which should also be linked to other school subjects. In the US in Colorado, three times a week, during a 12 week intervention, conducted by Young et al. (2004: 256), the children were given the chance to try new foods. Any food that could cause choking was not included.

Consideration of the food cost and its availability to the target population must influence the choice of food selected for a NEP (Young et al., 2004: 254). In the CMH programme (US) to develop healthy consumption habits, a healthy fruit snack (pineapple, cantaloupe melon, grapes and strawberry) was provided two days a week, and a vegetable snack (carrots, baby tomatoes, broccoli and celery with salad dressing and crackers), was given on two alternate days to each preschool child to consume in the classroom during snack time (Witt and Dunn, 2012: 108). A suggestion is made by Kaiser et al. (2012: 2033) for parents to see their children readily trying new foods in a videotaped food tasting session.

In a US intervention by Blom-Hoffman et al. (2004: 49, 55, 58), motivational “5-A-Day” fruit and vegetable stickers were given to children who had consumed the fruit and vegetables during lunch break. It was noted by these researchers that the students enjoyed earning the stickers and this reinforcement had a positive effect on the fruit and vegetable intake.

Currently, the SA school curriculum does not place great emphasis on NE. The Life Orientation public school educators who require nutrition knowledge to teach this component in the Life Skills programme concluded that a NE manual was required as a NET (Oldewage-Theron and Egal, 2012: 5). NE topics to be included in the manual were those currently in the school syllabi as reported by Oldewage-Theron and Egal, (2012: 4-7). The topics were: healthy food choices, nutrient composition of food, lifestyle diseases, and causative factors of malnutrition, indicators of malnutrition, and the function of nutrition in health. In addition, other topics of importance missing from the syllabi were identified for inclusion:

the planning of meals, food safety, nutritional needs of children, and hygiene. The Department of Basic Education (DBE) together with the FAO commissioned researchers Oldewage-Theron and Egal (The Centre of Sustainable Livelihoods, Vaal University of Technology), to develop manuals for nutrition for the LO Curriculum for primary schools in SA. Different manuals for the educator, the parent or caregiver and the national school nutrition programme (NSNP) volunteers were created and implementation started in 2011 (Oldewage-Theron, 2011).

FBDGs are used in various countries as a nutrition tool to enable informed decision making by consumers. These guidelines are used as the basis of some school NEPs as in Belgium by Vereecken et al. (2012) and in an Australian study by Zarnowiecki et al. (2011: 1284). The SA FBDGs (Vorster, 2001: S3), stated in Chapter 2 (Table 2.1), is used as an educational tool to promote a healthier lifestyle for school children as it guides the nutrition aspect of the Life Skills programme commencing from Grade R. Oldewage-Theron and Egal (2012: 2) report that the FBDGS is not well known amongst LO educators resulting in a lack of nutrition knowledge and healthy nutritional practices.

2.8 IMPACT OF NUTRITION EDUCATION

Many school studies have observed the significant impact on the improvement of nutrition knowledge of children (Wagner, Meusel and Kirch, 2005: 108; Heneman et al., 2008: 3). Through knowledge empowerment, NE can play an important role in the reduction of nutrition-related diseases and improve the nutritional status of SA children and adults who experience both under- and overnutrition (Mbhenyane et al., 2008: 227). For many children, school may be the only place where they gain nutrition knowledge and guidance regarding healthy eating (Oldewage-Theron and Egal, 2012: 7). Obtaining NE in school, where children spend most of the day, will help them to develop an improved attitude towards healthy eating and result in the shifting of nutritional behaviours. However, this requires the acquisition of knowledge by the parents and their familiarity with the recommended dietary behaviours (Hu et al., 2009: 259).

Nutrition-knowledgeable educators are of significant benefit to communities who receive NE from children who are considered change agents, transferring knowledge learnt at school to the community in which they reside (Wenhold, Kruger and Muelhoff, 2008: 464). A NEP designed for school educators should have a positive impact on the nutrition knowledge of the educator and enable the person to become a good role model for children. Stimulating the educator's interest in the field of nutrition and creating a desire to change their attitude towards following a healthier eating pattern forms the basis of a good role model (Oldewage-Theron and Egal, 2012: 7).

In SA, a NEP baseline study of public LO educators by Oldewage-Theron and Egal (2012: 5-6) ascertained that there was a significant ($p=0.047$) improvement in overall knowledge post the intervention. In particular, the educators were significantly more knowledgeable in classifying vitamins ($p=0.015$) and fat ($p=0.001$) and defining malnutrition ($p=0.002$). The understanding of "enjoying a

variety of foods” and a “balanced, mixed meal” improved as post-intervention there was a 21.00 and 58.00 percent respective increase in the number of correct answers (Oldewage-Theron, 2012: 2).

In Australia a study by Zarnowiecki and her co-authors (2011: 1286, 1288-1289) ascertained a positive relationship between the nutrition knowledge of parents and the recognition by five to six-year-olds of healthy and unhealthy foods. Parents from a lower SES possessed less nutrition knowledge than parents from a higher SES. The authors of this study concluded that there is a direct correlation between the educational level of a parent and the nutrition knowledge of a child. It is an acknowledged fact that it is easier to increase knowledge than to modify attitudes relating to food choices; however, both are important.

Research has established that attitudes and behavioural changes related to a NI are difficult to modify especially over a fairly short period of time. Educators in a study in Germany judged improvements in attitudes and behaviour by observing the lunchbox content of pre-school children (Wagner, Meusel and Kirch, 2005: 108), whilst in a Californian programme staff completed a survey to ascertain the effectiveness of attitudinal and behavioural modifications of pre-primary children (Heneman et al., 2008). Parental surveys in this study by Heneman et al., (2008) on children’s eating behaviour and healthy activities, highlighted a significant improvement as a result of the “Child’s Health through Farming, Food, and Fitness” Program (CHF3). However, a Chinese study completed by Hu et al. (2009: 257-258) revealed that pre-primary children displayed some significant nutritional behavioural changes as in eating breakfast, reducing unhealthy snacks and watching less TV whilst eating but they continued to prefer salty foods and consume sweets before meals and going to bed. Some aspects of parental attitudes changed in this study but the eating habits of the parents did not change significantly nor was there a noteworthy improvement in their concern towards the nutritional needs of the children.

The “Munch and Move” study (Australia) and others surveyed by Hardy et al., (2010) established that parents required greater knowledge regarding nutritional foods and portion sizes which would impact on a child’s eating habits and the lunchbox content.

The US CMH programme findings revealed that the impact of this programme resulted in a greater increase in the consumption of fruit (31.00 percent) than vegetables (24.00 percent) between baseline and an assessment one week post the intervention. An assessment three months after the completion of the programme alludes to the maintenance of the behaviour change (Witt and Dunn, 2012: 112).

A multi-faceted NE intervention is considered an effective means in improving a child’s health and behaviour. The CHF3 programme comprised different components to promote health through the school canteen including the establishment of a salad bar, the gardening project incorporating NE, and recycling food waste for compost (Heneman et al., 2008).

Heneman et al. (2008) states that studies which support environmental-based learning are effective, therefore the school environment, from pre-primary onwards, is an ideal setting (Hu et al., 2009: 258). Similarly, due to the success of the KI in Philadelphia, US, the Healthy Farms/ Healthy School Act was introduced in 2005 in this state. Its implementation allowed for state funding for a pre-primary child to receive nutrition and agricultural education as part of the curriculum (The Food Trust, 2007: 20).

A NE study can contribute significantly to the body of knowledge particularly if it is the first study of its kind, as in the case of preschool studies in the US, the “5-A-Day” programme (Blom-Hoffman et al., 2004: 56) and one in China conducted by Hu et al., (2009: 258-259). In SA, the first public primary school LO educators study by Oldewage-Theron and Egal (2012: 2) determined the impact of a NEP on the nutrition knowledge of these educators.

2.9 CONCLUSION

The literature makes a convincing case that NE is important for children in the achievement of long term good health and is a positive step in the reduction of malnutrition and nutrition-related diseases.

At school there is the opportunity to enhance nutritional learning, influence dietary behaviours and promote healthy lifestyle choices linked to families and the community. It is therefore imperative that NE commences in Grade R, an important period in a child’s development where the establishment of healthy dietary patterns can commence.

The following chapter reports on malnutrition as a background to this study.

CHAPTER 3: LITERATURE REVIEW: MALNUTRITION

3.1 INTRODUCTION

The intention of this chapter is to provide an overview of the literature on the importance of child nutrition to prevent under-and overnutrition which is a global challenge and prevalent in South Africa (SA). Various strategies to address malnutrition in SA and globally will be reviewed and the progress of SA meeting the 2015 Millennium Development Goals (MDGs) will be reported.

The World Declaration on nutrition adopted by delegates from 159 countries from the joint Food and Agricultural Organization (FAO) and World Health Organization (WHO) International Conference on Nutrition (ICN) in Rome (1992) states that “Hunger and malnutrition are unacceptable in a world that has both the knowledge and the resources to end this human catastrophe. We recognize that access to nutritionally adequate and safe food is a right of each individual. We recognize that globally there is enough food for all....” (FAO, 1997).

Food security exists when a person has continual access to safe and nutritious foods to meet their dietary requirements for optimal health. The FAO (2012) estimated that in 2010, 925 M people went hungry, with more women than men experiencing food insecurity. Populations worldwide are also at risk of nutrition insecurity as the food consumed is sufficient but nutritionally inadequate. People are often unaware of “hidden hunger” as a result of a diet deficient in vitamins and minerals. This negatively impacts on health, survival, cognition and hence earning capacity. Hidden hunger is a global condition in both developed and developing countries especially amongst women and children. However, it is more prevalent in the 2.5 Billion (B) poor people surviving on less than \$2.50 per day (Kraemer et al., 2012: 40-41,153) with 36 percent of the South African populace living below this poverty line. Half of those living on the African continent live below \$1.25 per day (The World Bank, 2011). Rosenbloom, Kaluski and Berry (2008: 275) commented that good nutrition is central to a country’s wellbeing in terms of health, economic growth and development. Nutrition education (NE) is a powerful tool in fighting malnutrition and positive results can be achieved when parents, educators, curriculum developers and government are all involved (FAO, 2005).

3.2 WHAT IS MALNUTRITION?

Malnutrition is classified as under-or overnutrition (Khuzwayo, 2008: 166) as the outcome of a combination of different causative factors (Swart and Dhansay, 2008: 387), found in both developing and developed countries (FAO, 2005). However, in recent years malnutrition has been classified as severe acute (longer than three months) or moderate acute (less than three months). The malnutrition is either non-illness related due to a decrease in nutrient intake or illness related due to nutrient imbalance (A.S.P.E.N., 2013).

3.2.1 Overnutrition

Overnutrition in children is a worldwide concern, resulting in overweight and obesity, due to excess fat accumulated in the body (Khuzwayo, 2008: 167). The WHO (2012) declared overnutrition as the fifth leading cause of global deaths as a result of diabetes, heart disease, hypertension and metabolic disorders. Obesity is a serious health problem and its occurrence continues to increase (Hammond, 2008: 385).

Body Mass Index-for-age (BMIFA) is an index of weight-for-height-for-age for children from nine years of age (WHO, 2009). It measures nutritional status: underweight, overweight and obesity (Khuzwayo, 2008: 175). The 2007 WHO growth reference for five to 19 year olds classifies overweight as Body Mass Index (BMI) +1 Standard Deviation (SD), which is equivalent to BMI 25 kg/m² at 19 years. Obesity results in a high BMI for age, with >+2 SD equivalent to BMI 30 kg/m² at 19 years (WHO, 2009).

Joint (UNICEF-WHO-The World Bank) child malnutrition estimates indicate that globally in 2012 the percentage of overweight children under five years old was 6.70 percent (43.7M), similar to Africa at 6.40 percent (10.9M) and both significantly lower than the 18.30 percent (1.2M) overweight under five-year-old children found in Southern Africa. Since 1990 the overweight prevalence has increased steadily. The number of overweight children is considerably greater in low income countries (35M) in comparison to high income countries (8M) with 12M (7.00 percent) under-fives affected in Africa in 2011. Africa has experienced the most rapid increases in childhood obesity and overweight. In comparison in Asia, the occurrence of overweight was lower (5.00 percent); however the number of overweight children was greater (17M) (UNICEF-WHO-The World Bank, 2012).

Rossouw, Grant and Viljoen (2012) suggest that the findings of the Health of the Nation Study (HNS) in SA indicate that some African cultures view overweight in girls as an indicator of prosperity. Furthermore, research of African women has indicated that if overweight, the perception is that one is not afflicted with the Human Immunodeficiency Virus (HIV) and/or Acquired Immunodeficiency Syndrome (AIDS) (Rossouw, Grant and Viljoen, 2012). Children in the low and middle income developing countries face a double burden of disease due to inadequate diets and excessive intake of foods high in fat, sugar, salt and energy with minimal physical activity. An obese or overweight child has a greater chance of developing an early onset of diabetes and cardiovascular diseases, and will most likely remain an obese adult (WHO, 2012). Obese children experience difficulty with physical activities (FAO, 2005), breathing, have psychological problems (WHO, 2012; Rossouw, Grant and Viljoen, 2012) and little interest in education (FAO, 2005). Rossouw, Grant and Viljoen (2012) indicated it is estimated that by 2020 obesity-related disorders could result in seven out of every ten deaths.

The analysis of the anthropometric data in the 2005 SA National Food Consumption Survey: Fortification baseline-1 (NFCS:FB-1) indicates overweight in one to nine-year old children in SA at 10.00 percent, with an obesity rate of four percent. In comparison to the 1999 SA National Food Consumption Survey (NFCS), the obesity rate had increased by one percent and the overweight prevalence in this age group had decreased by two percent (Rossouw, Grant and Viljoen, 2012; Labadarios, Dhansay

and Hendricks, 2008: 150). Urban areas exhibit higher rates of overweight and obesity than rural areas as reported in the 1999 NFCS (Rossouw, Grant and Viljoen, 2012). This observation is confirmed by Ardington and Case (2009) in the analysis of the National Income Dynamics Study (NIDS) which reported a greater obesity risk for higher income households which are associated with urban areas. Gender has been shown to have an impact on the BMI of SA children with girls of all races having a higher percentage of body fat than boys (Goedecke, Jennings and Lambert, 2006: 66). This is also evident in the findings of the HNS (2001-2004) conducted amongst SA school children of different race groups (six to 13 years old) to quantify the incidences of obesity and overweight. Both of these conditions were found to be relatively high amongst boys with 10.80 percent being overweight and three percent obese. However, for girls the percentages were higher for overweight (13.00 percent) and obesity (4.90 percent) (Armstrong et al., 2006: 439, 443). In the HNS in the six year-old age group, girls showed a greater incidence of overweight than boys (11.90 and 8.00 respectively); however, in respect to obesity, this was the reverse, where six percent of boys compared to four percent of girls were obese (Armstrong et al., 2006: 441-442). Indian children are seldom obese, with white learners in the 2008 NIDS study found to be significantly more obese than the other race groups (Ardington and Case, 2009).

The prevalence of overweight in children increases yearly and by 2015 it is estimated that in southern Africa this figure will be 20.80 percent, in Africa 6.70 percent, and globally 7.10 percent (UNICEF-WHO-The World Bank, 2012).

3.2.2 Undernutrition

Undernutrition is due to an insufficient dietary intake and/or repetitive infectious diseases. It can be found either in mild or severe forms: stunting (low Height-for-Age (H/A)) is the most serious, followed by underweight (low Weight-for-Age (W/A)). The most severe form is wasting (low Weight-for-Height (W/H)). Undernutrition includes severe Protein-Energy Malnutrition (PEM), resulting in marasmus and kwashiorkor (Khuzwayo, 2008: 167).

Khuzwayo (2008: 168) mentions that hunger over an extended period, is related to undernutrition as a result of food and nutrition insecurity. The hunger data collected in the General Household Survey (GHS) 2002-2010 is weak due to the emotive and subjective nature of this issue, according to Hall (2011c). Nevertheless, in 2010, nearly 3.3M (17.50 percent) of SA children, between 0-17 years, were reported to be living in households experiencing hunger, the majority (18.80 percent) being African, with almost 17.00 percent of six to 11 year olds experiencing hunger. In KZN, hunger was reported for 24.60 percent of children, which is considered high and exceeds the national average (Hall, 2011).

Undernutrition affects the survival of an individual with detrimental implications on a child's education as they would have limited learning capacity. Poor attention, fatigue and restlessness would be displayed in the classroom. Children are frequently absent from school due to a lowered resistance to infections and illnesses (FAO, 2005). The occurrence of tuberculosis (TB) being linked to malnutrition is well documented according to Naude, Labuschagne and Labadarios (2008: 771). Undernutrition

consequently impacts negatively on productivity and earning capability in later life (FAO, 2005). This perpetuates the poor socio-economic status of many people in Africa (Zere and McIntyre, 2003). A child's intellectual development during the pre-school years can be permanently affected if the malnutrition has been in existence for an extended period of time (Zere and McIntyre, 2003).

3.2.2.1 Stunting, wasting and underweight

Stunting due to chronic undernutrition is low H/A with the cut-off point z-score $<-2SD$. Stunting measures the manifestation of long term dietary inadequacy which often commences in utero (Berry, Hall and Hendricks, 2011a). In the Sight and Life 2009 Annual report, stunting is indicated as a serious problem in low-income countries affecting at least 195M children globally (Kraemer et al., 2012: 45). Between 1990 and 2010, the stunting prevalence of pre-school children declined from 39.70 to 26.70 percent (171M). If this trend continues, by 2020 it is predicted that world-wide 21.80 percent of children (142M) under five will be stunted and by 2025 the prevalence should further decrease to 19.3 percent (128M). However, for Africa between 1990 and 2010, the decrease in the prevalence of this disorder was minimal (40 and 38 percent respectively) with a projected 37.00 percent (64M) occurrence in 2020 with middle, east and west Africa having the highest incident rates (de Onis, Blössner and Borghi, 2011). Stunting is SA's most common nutritional disorder among one to nine-year olds resulting in increased risk of death for children under five (Berry, Hall and Hendricks, 2011a). The stunting incident rate for SA is considered high but has decreased since 1999 (de Onis, Blössner and Borghi, 2011). Furthermore, White learners (five percent) were stunted significantly less than other race groups with the highest prevalence in Black learners (13.80 percent), reflecting deprivation (Reddy et al., 2010: 37, 42). The NFCS found that children living in SA urban formal areas in 2005 were less prone to stunting (16.00 percent) than those living in urban informal places (19.00 percent) (Berry, Hall and Hendricks, 2011a; Labaradois, Dhansay and Hendricks, 2008: 135-136).

Berry, Hall and Hendricks (2011a) commented that severely stunted children (z-score $<-3 SD$) are a serious problem in SA. Nevertheless, the 2005 NFCS found that the national incidence of severe stunting had decreased to five percent and in KZN to three percent (Labaradois, Dhansay and Hendricks, 2008: 134). Rossouw, Grant and Viljoen (2012) mentioned that numerous studies have linked stunting to the risk of overweight developing at a later period.

Wasting, confirmed by Berry, Hall and Hendricks (2011b) is an acute form of current malnutrition in children under five. This condition is usually accompanied by multi-micronutrient deficiencies (McLaren and Kraemer, 2012: 149). Wasting can be moderate (cut-off point z-score $<-2 SD$) affecting eight percent (52M) of global children under five, with an 11.00 percent decrease since 1990 when approximately 58M were wasted. The majority (70.00 percent) of these children live in south-central Asia (UNICEF-WHO-The WorldBank, 2012). For severe wasting, the cut-off point is z-score $<-3SD$ (Khuzwayo, 2008: 175). In 2005, one in 20 SA children (4.50 percent) between the ages of one to nine and four to six years was wasted (Berry, Hall and Hendricks, 2011b). In 2005, the KZN percentage for wasting was the lowest of all the provinces at one percent. This was a decrease from the four percent

indicated in 1999 (Berry, Hall and Hendricks, 2011b; Labadarios, Dhansay and Hendricks, 2008: 135-136).

Underweight statistics measures low W/A with the cut-off point z-score $<-2SD$ with severe underweight below $-3SD$ (Swart and Dhansay, 2008: 390). It does not, however, reveal whether the malnutrition is longstanding or short lived (Khuzwayo, 2008: 175; Zere and McIntyre, 2003). In 2011, worldwide 101M (16.00 percent) children under five were found to be underweight based on the WHO standards. Although there has been a decrease since 1990 (159M) millions in this age group are still at risk (UNICEF-WHO-The World Bank, 2012).

3.2.2.2 Protein Energy Malnutrition

Severe macronutrient undernutrition, known as Protein Energy Malnutrition (PEM), is a consequence associated with food paucity and unemployment (Bradshaw, Bourne and Nannan, 2003). Kruger, Hendricks and Puoane, (2008: 674) state that marasmus and kwashiorkor are two forms of PEM with W/A cut off point percentages used to determine the different deficiencies. Nutritional marasmus occurs due to a decrease in food intake over an extended period of time resulting in extreme wasting with loss of muscle mass, whilst kwashiorkor is a result of an insufficient intake of dietary protein together with severe protein loss and oedema is evident. Marasmic kwashiorkor has the same symptoms as kwashiorkor with oedema occurring but of a more severe nature (Gibson, 2005: 405).

The findings of the 2000 SA National Burden of Disease Study (NBDS) established that PEM was ranked fifth in SA as a cause of death and affected four percent of boys and girls under five years of age. The incidence of PEM reduces as a child over five increases in age. Naude, Labuschagne and Labadarios (2008: 759) commented that research conducted by Fields-Gardner and Ferguson (2004) established that a lack of dietary protein lowers the immune status of an individual resulting in deficiencies of folic acid, iron (Fe) and sometimes Vit. B12 (Stopler, 2008: 828).

3.2.3 Micronutrient deficiencies in children

Micronutrients, more commonly termed vitamins and minerals, are essential dietary components required in small amounts. Micronutrients are vital for the development of the brain both prior and post conception, for maintaining growth, health and prevention of disease. Micronutrient deficiency occurs in both developing and developed nations (Kraemer et al., 2012: 36-37, 58).

The NFCS (1999), revealed that the intake of various micronutrients: Vit. A, B6 and C, niacin, riboflavin, calcium (Ca), Fe, foliate and zinc (Zn) was less than fifty percent of the recommended intake in children between the ages of one to nine (Labadarios, Dhansay and Hendricks, 2008: 152). Black et al. (2008) mention that as a result of undernutrition the following are experienced: Vit. A deficiency (VAD), Iron Deficiency Anaemia (IDA) and Iodine Deficiency Disease (IDD).

3.2.3.1 Vitamin A Deficiency

McLaren and Kraemer (2012: iv) state that Vit. A deficiency disorders (VADDs) affect all age groups throughout the world. An estimated 190M pre-school children were mentioned in the Sight and Life Annual report of 2009 as being Vit. A deficient (Kraemer et al., 2012: 45). VAD occurs most often in developing countries with an adverse effect on the rates of morbidity, the presence of an infectious disease, and mortality (Ahmed and Darnton-Hill, 2004: 198-199).

For a child aged one to nine, a serum retinol level less than 20µg/dL indicates inadequate or marginal Vit. A status whilst a level less than 10ug/dL classifies a child as severely Vit. A deficient. When comparing the marginal Vit. A status of SA children, aged one to six years, in the 1994 SAVACG with the 2005 NFCS:FB-1, there was a marked increase between 1994 (33 percent) and 2005 (64 percent) (Berry, Hall and Hendricks, 2011d). This rate is considered high, as two out of three SA children had an inadequate Vit. A status whilst one in seven (14 percent) children in SA was deficient in Vit. A. In 2005, KwaZulu-Natal (KZN) had the highest prevalence of VAD (89 percent), a serious health issue for children in this age group with almost half of this age group (45 percent) suffering from severe VAD (Labadarios, Dhansay and Hendricks, 2008: 138-142, 267; Berry, Hall and Hendricks, 2011d).

Kruger, Hendricks and Puoane (2008: 673) elucidate the symptoms of a VAD as:

- ❖ Growth faltering
- ❖ Infection, due to impaired immune functions
- ❖ Impaired night vision
- ❖ Night blindness leads to Xerophthalmia, which means dry eye, the term covering VAD of the eye.
- ❖ Corneal xerosis results from the spreading of the xerosis from the conjunctiva to the cornea culminating in keratomalacia, deformation of the cornea.
- ❖ Vit. A related corneal scars results in visual impairment and blindness in severely malnourished children (Ahmed and Darnton-Hill, 2004: 196,197),
- ❖ Keratinization of the skin resulting in lesions due to the dryness (Bender, 2009: 133),

McLaren and Kraemer (2012: 109) confirm that a child's growth is affected by VAD with evidence from a country-wide Indonesian survey (1978-79) by Sommer. Here it was observed that children with corneal xerophthalmic were consistently stunted and there was a correlation between the degree of the deficiency and the growth retardation (Ahmed and Darnton-Hill, 2004: 198).

According to Gallagher (2008: 72-73) an estimated 250M children are at risk of blindness as a result of VAD. The 2009 Sight and Life Annual Report indicates that 5.8M malnourished preschool children coming mostly from South Asia were diagnosed with clinical eye disease caused by the deficiency of this micronutrient (Kraemer et al, 2012: 45).

It is reported by McLaren and Kraemer (2012: 14) that the control of VADD would reduce the under-five mortality rate considerably. Different interventions can prevent and control VAD as expounded by Ahmed and Darnton-Hill (2004: 204). These are the food-based approaches of dietary diversification and fortification of staple products. Worldwide, margarine is fortified with Vit. A. Other Vit. A-fortified items include: wheat; rice and other grain products; tea; dairy foods; edible oils; formula foods and sugar (McLaren and Kraemer, 2012: 168,176-177).

Vit. A supplementation is used as a strategy to curb VAD deficiency and is considered essential although it does not address the fundamental causes of VAD (Whitney and Rolfes, 2013: 343). McLaren and Kraemer (2012: 92) conducted mortality Vit. A prevention trials in Indonesia, Nepal, India, Sudan and Ghana in the 1980s and 90s and reported a decrease in the mortality rate with supplementation. According to these authors (2012: 95) a 1990 Cape Town hospital trial by Hussey and Klein also showed that when Vit. A supplementation was included in the treatment of children with severe measles; the mortality rate was significantly reduced. Public health interventions are also mentioned by Ahmed and Darnton-Hill (2004: 208) as important in modifying the Vit. A intake. The interventions include the control of infectious diseases, promotion of breast feeding and fortifying complementary foods for weaning. An integrated approach to multiple micronutrient deficiencies is advised.

Secondary VADD may occur when the body is unable to metabolise Vit. A. Various types of secondary VAD have been reported for example Celiac disease, chronic pancreatitis, cirrhosis of the liver and cystic fibrosis (McLaren and Kraemer, 2012: 155, 156).

3.2.3.2 Iron Deficiency Anaemia

Gallagher (2008:118) states that Iron (Fe) has many important functions in the body. Studies have revealed that Fe requires Copper and Zn, and these deficiencies increase infections leading to anaemia as the Fe status is affected (Olivares, Hertrampf and Uauy, 2007: 21). The nutritional deficiency can result in Iron Deficiency Anaemia (IDA), an extremely common childhood deficiency especially in children younger than two years old (Lucas and Feucht, 2008: 238). Children with anaemia will experience fatigue and breathlessness after normal physical activity, learning difficulties and have a greater risk of illness (FAO, 2005). Consequently, a low pass rate will be experienced at school with the possibility of later low earning potential and therefore remaining in the grips of poverty later in life (Badham, Zimmermann and Kraemer, 2007). According to Labadarios, Dhansay and Hendricks (2008: 144, 262), between 1994 and 2005, the number of Fe-depleted and IDA children (one to six years) in SA doubled with one out of five children being affected, which is a concern. However, Fe deficiency does not necessarily lead to anaemia (de Pee et al., 2007: 33). SA data from 2005 for one to nine-year olds indicates that six percent were Fe deficient with nearly eight percent developing IDA. By international standards, the latter figure is considered low. In KZN, the incidence rate was lower than the national rate for both Fe deficiency and IDA (Berry, Hall and Hendricks, 2011c).

During pregnancy, IDA is reported by UNICEF (2009) to cause approximately 111 000 deaths per annum. For effective anaemia control, a country requires a unique integrated approach by incorporating diversity of food intake, food fortification, and micronutrient supplementation, control of malaria and worm infestations as well as education (Kraemer et al., 2012: 127).

3.2.3.3 Iodine Deficiency Disease

Iodine is an ultra trace mineral. Worldwide there are about 2B people at risk due to living in iodine deficient areas. An Iodine Deficiency Disease (IDD) can range from mild to severe, with varying degrees of impaired cognition including brain damage. Besides other growth abnormalities related to iodine deficiency, goitre develops due to hypothyroidism. For the past two decades, the International Council for Control of Iodine Deficiency Disorders (ICCIDD) has been working with United Nations Children's Fund (UNICEF) and WHO to globally eradicate iodine deficiency through the consumption of iodized salt (Kraemer et al., 2012: 39). The richest natural source of iodine is seafood (Gallagher, 2008: 128). The urinary iodine (UI) concentration values of children in the 2005 NFCS reveal that there has been an almost complete elimination of IDD. These results established that nationally five out of ten children were reported to have excessive UI concentrations. In KZN, those deficient in iodine were in the minority (Labadarios, Dhansay and Hendricks, 2008: 139-140, 260).

Iodine and Fe deficiency are closely associated with the impaired intellectual ability of some 19M children born annually, according to the Sight and Life 2009 Annual report (Kraemer et al., 2012: 45).

3.2.3.4 Zinc deficiency

Samuel et al. (2010) commented that inadequate Zn intake in children is prevalent nationally due to dietary inadequacy of meat and fish, both rich in Zn. Poverty results in the high consumption of plant-based diets which are low in Zn. Inadequate Zn intake of school children was established in the NFCS-FB-1 (Labadarios, Dhansay and Hendricks, 2008: 146) and by Samuel et al. (2010) in an informal settlement study in a peri-urban area in SA.

An inadequate intake is defined when the serum Zn concentration is below the estimated average requirement (EAR) which will differ depending on age and gender, and fasting or non-fasting blood sample (Kruger, Hendricks and Puoane, 2008: 672; Samuel et al., 2010). A Zn deficiency will affect optimal growth; neuropsychological functions (Wenhold, Kruger and Muelhoff, 2008: 448); healing of wounds, appetite (Lucas and Feucht, 2008: 227); mental lethargy; skin changes (Gibson, 2005: 713); hair loss (alopecia); hypogeusia (taste perception) and hypogonadism in boys (Gallagher, 2008: 123). With Zn supplementation an increase in height and lean body mass will occur in children who are undernourished (Wenhold, Kruger and Muelhoff, 2008: 453). In addition, Zn fortification of maize meal, wheat flour and milk powder can address the deficiency (Kruger, Hendricks and Puoane, 2008: 684).

3.3 CAUSES OF MALNUTRITION

The basic, underlying and immediate causes of malnutrition, as illustrated in the UNICEF conceptual framework in Chapter one (Figure 1.3), are discussed here. In the World Health Report of 2010, there was agreement that the inequalities in education, housing and employment all impact on health and nutritional deficiencies in children and have severe future economic consequences. The nutritional deficiencies could be as a result of an inferior quality diet, low bioavailability, a lack of food due to seasonal availability, low income, cultural beliefs, limited knowledge and caring practices, and increased needs due to infections (Kraemer et al., 2012: 44,124).

In SA, Maunder et al., (2008: 27) posits that there is sufficient food for the entire populace however the government has a major challenge in respect to malnutrition, hunger and food insecurity. Cooperation is required between non-governmental organizations, the private sector, communities and individuals to reduce or eliminate malnutrition (FAO, 1997).

3.3.1 Basic causes

3.3.1.1 The economic situation

The economic context is recognised as one of the basic causes of malnutrition and the World Development Report 2006 affirms the relationship between economic wellbeing and improved health care and education. However, two vital determinants of economic status are good health and education (The World Bank, 2005). Having a profound impact currently on the nutrition status of children is the 'triple f' crisis. This refers to the food, fuel and financial price crisis being experienced worldwide (Cobham, Molina and Garde, 2012: 16). The SA Yearbook 2011/2012 makes mention of a year on year (July 2010-July 2011) inflationary increase in relation to the cost of food (7.50 percent) over the range of different categories: meat (11.30 percent); fuel (185 cents/litre); electricity (18.90 percent) as well as increases in housing and education. Since 2010, the SA Consumer Price Index (CPI) has accelerated from 4.30 percent to 5.80 percent in 2012. The economic growth rate in SA has slowed down since 2010, affected by the global economic situation worsening the adult (over 18 years) unemployment rate in SA. As at June 2011, this figure was reported as 25.70 percent in the SA Yearbook (2011/2012) whereas in 2008, 23.00 percent of the population were identified as unemployed by the GHS (2002-2008) (GCIS, 2012: 121-122). If international support is not forthcoming, local governments will not be able to implement successful nutrition programmes to address the problems due to insufficient funds and personnel (Black et al., 2008).

3.3.1.2 Poverty

Poverty is one of the basic causes of undernutrition and the aim of the first MDG was to rid the world of extreme poverty and hunger by 2015. An alarming statistic reported by the UN is that every 3.6 seconds a death occurs due to starvation and it is usually a child under five. The target is to halve both the

proportion of people who go hungry and those who survive on less than one dollar a day. UNICEF has realized that in sub-Saharan Africa these targets will not be met by 2015 as hunger is on the increase in this region (UNICEF, 2009).

Zere and McIntyre (2003) report that to measure the socio-economic status (SES) of a household the expenditure on basic necessities is used for nutrition studies. This has been found to be an accurate reflection of the income of the household and correlates with the health status of children under five years old. Studies have revealed that children from the lowest socio-economic households suffer greatly from malnutrition with stunting and underweight being statistically significant. Wasting does not appear to be affected by a change in this status. UNICEF (2009) declares that poverty has a severe impact not only on a child's physical and mental state but also their emotional and spiritual wellbeing. This inhibits a child developing to their full potential and results in the continuous cycle of poverty and hunger.

Severe poverty is evident in rural areas but it is also prevalent in some metropolitan and inner city areas. The two provinces that have the highest rates of poverty according to Zere and McIntyre (2003) are the Eastern Cape (EC) and the Northern Province. Poor African and Coloured children display the highest rates of stunting and underweight. The Western Cape and Gauteng have relatively low rates of stunting but have the highest concentration of children in the lowest socio-economic strata.

Studies have shown that old age pensions in SA contribute positively to childhood nutrition. There are numerous UNICEF activities to fight poverty to enable children to survive: immunization; micronutrient supplementation or fortification: promotion and protection of breastfeeding, and education (UNICEF, 2009). The activities are related to the various MDGs with Goals one, four and five being interlinked and Goals two and three focused on primary school education (Maunder et al., 2008: 9).

3.3.1.3 Education and ignorance

A lack of primary school education has been identified by the United Nation (UN) as one of the most serious problems of the world and one of the basic causes of malnutrition. The second MDG relates to achieving universal primary education by 2015. MDG 3 promotes gender equality in education, allowing all children to achieve full educational potential and help reduce poverty through education (UNICEF, 2009). Figures revealed by UNICEF (2012) show that in 2008, about 67M children globally of primary school age did not attend school for various reasons. This was mostly girls (53.00 percent) as they were expected to remain at home to fulfil cleaning and caring responsibilities or miss school if there was insufficient money. However, the gender parity index (GPI) reveals that in primary schools in SA the gender equality is very close (UNICEF, 2005).

The FAO and WHO have promoted the development of Food-Based Dietary Guidelines (FBDGs) to educate a target population in respect of the specific dietary intake for a healthy lifestyle. There are numerous countries in North and South America, Europe and Asia that have FBDGs. In sub-Saharan Africa, Namibia, Nigeria, Malawi and SA are mentioned by Hawkes, (2013: 6-8) as the only countries

with FBDGs. For this information tool to be implemented, governments need to actively promote FBDGs to the public and to those in the education sector, particularly school educators.

NE is one of the eight focus areas in the SA Integrated Nutrition Programme (INP) to address malnutrition (Labadarios et al., 2005: 100). Behr (2008: 51) indicates that the aim is to improve nutrition knowledge, behaviour and perceptions of the population. If there is a lack of knowledge and skills in the acquiring, preparing, storing and consuming of food for a nutritionally adequate diet, malnutrition will result (FAO, 2005).

When adults or parents are absent in the home, ignorance on the part of the children can result in a malnourished household (FAO, 2005). The 2003 South African Demographic and Health Survey (SADHS) statistics show that four percent of children (10-14 years) and nearly two percent between five and nine years old have suffered the loss of both parents (DoH, 2003). Malnutrition in a household can occur when there is an adequate income but a lack of nutrition knowledge. The different nutritional needs of various family members need to be understood and fulfilled by an educated person. Women are usually the ones educated in nutritional matters while men remain ignorant although they have the greatest influence on food purchases as they control the budget (FAO, 2005).

Kraemer et al. (2012: 138) emphasizes the importance of the “girl effect” in the developing world to break the cyclic nature of poverty. Educated girls are an economic and health benefit to themselves and their families which ripples out into society.

3.3.2 Underlying causes

The UNICEF conceptual framework identifies three underlying inadequacies namely: food security, maternal and child care, health services and environment (Matji, 2008: 840-841).

3.3.2.1 Insufficient household food security

The FAO (2005) defines Household Food Security (HFS) as “access by all people at all times to the food needed for an active and healthy life”. It is a human right for an individual to have nutritionally adequate food but worldwide this does not happen, according to the FAO, and this is one of the underlying causes of malnutrition. Research has found a strong association between food insecurity and poverty affecting accessibility to food (Khuzwayo, 2008: 172). Insufficient HFS can also be a result of low food production and poor agricultural practices including limited crop diversity. Climatic conditions and natural events such as floods, drought and hurricanes impact on agricultural production and hence dietary intake (FAO, 2005). Khuzwayo (2008: 168) explains that being food insecure does not indicate that a household is experiencing hunger. However, prolonged hunger is usually the outcome of extreme food insecurity.

Khuzwayo (2008: 164-165,173) affirmed that members within a household will have varying dietary requirements which need to be met to achieve HFS. When considering adequacy of a diet, a variety of culturally acceptable foods in terms of quantity and quality need to be consumed. Food prices and inflation affect food consumption and diversity. Insufficient HFS therefore has a direct influence on a person's nutritional status due to a lack of income to acquire nutritionally adequate and safe foods (FAO, 2005).

3.3.2.2 Poor maternal health and infant feeding

Inadequate care and feeding practices are considered one of the underlying causes of malnutrition in children. When a pregnant mother has a low pre-pregnancy weight, is malnourished during pregnancy and does not gain sufficient weight, has an infection or is anaemic, the foetus will be undernourished. This is one of the causes of low birth weight (LBW) where the baby weighs less than 2.5kg at birth (FAO, 1997). In 2003 in developing countries especially in Africa, according to UNICEF (2009), 17.00 percent of infants had a LBW. The infant mortality rate (IMR), both neonatal (age 0 to 28 days) and post-neonatal (age 29 days to one year) is influenced by foetal under-nutrition (FAO, 1997). The rapid mortality surveillance system (RMS) provides a fairly accurate estimate of the SA IMR and the under-five mortality rate (U5MR). A decline in both of these rates has occurred during the period 2009-2011. The IMR was 40 per 1 000 live births in 2009 and decreased to 30 in 2011 whilst the under-five mortality rate was 56 per 1 000 births (2009) reducing to 42 in 2011 (Hall, Nannan and Sambu, 2013).

The nutritional status of a woman is also depleted with multiple births and constant breast feeding together with the added physical burden of agricultural work (FAO, 1997). The SA government has recognised breast feeding as important to ensure food security (Khuzwayo, 2008: 172). The promotion, protection and support of breastfeeding are one of the INP focus areas with the creation of the Baby Friendly Hospital Initiative (BFHI) (Faber and Maunder, 2008: 269). This concept was developed by WHO and UNICEF to allow optimal growth and increased survival rates (Behr, 2008: 49). Swart and Dhansay (2008: 413) emphasise the importance of breastfeeding as it provides all nutrients and immunity required during the first six months of life with exclusive breastfeeding providing a better chance of survival. These authors report that UNICEF (2007) acknowledges that the early introduction of complementary food or fluids increases the risks of infection and malnutrition. Swart and Dhansay (2008: 413) report on a 1993 SA study by Steyn, Badenhorst, Nel and Ladzani, where inadequate feeding practices were found to occur more often in rural than in urban areas.

The fourth MDG is to improve maternal health, and the target is to reduce the maternal mortality ratio by three quarters by 2015 (UNICEF, 2009). If a mother's pre-pregnancy nutritional status is below par, evidence suggests that this has an impact on the outcome of the pregnancy. Improved nutrition for young women, even teenage girls, is therefore required as an intervention (FAO, 1997). During pregnancy, IDA is reported by Kraemer et al. (2012: 37) to cause approximately 115 000 per annum deaths as well as 600 000 stillbirths and deaths in the first week of life.

3.3.2.3 Insufficient health services and unhealthy environment

The third underlying cause of malnutrition in children is inadequate health services and an unhealthy environment. Faber and Maunder (2008: 275,277) indicate that access to health and nutrition services in SA is vital, especially in poor areas where the greatest need exists. Many factors could affect an individual's access to these facilities thus contributing to health disparities. The authors mention that the number of South Africans belonging to a medical aid scheme is low and medical aid coverage varies according to SES. UNICEF (2009) reveals that in developing countries about 270M children are without healthcare services. If children, especially malnourished ones, are not immunized they will contract diseases spread through poor sanitation. Health care services will therefore also help to achieve the fourth MDG to improve the rate of survival of a child.

Worldwide living in overcrowded conditions in dwellings with only mud floors is experienced by 614M children. Poor hygiene and sanitation will exacerbate the problem of infection and malnutrition and impact on a child's learning potential (FAO, 2005). It has been reported by UNICEF (2009) that intestinal worms infect around 400M school children yearly, affecting cognitive functioning. A child died every 15 seconds as a result of cholera and infant diarrhoea due to unsafe drinking water, appalling sanitation and poor hygiene. Goal 7 of the MDGs concerns environmental sustainability with the target to halve the number of people without safe drinking water by 2015. Many children resort to using surface water or walk long distances to obtain treated water.

UNICEF (2009) has various initiatives to help countries achieve environmental sustainability by implementing water and sanitation programmes, and improving health and hygiene practices through education at schools and in the community. In SA, the Health Promoting School (HPS) concept was introduced for the benefit of school children and the community. Based on the WHO initiative a HPS aims to provide a healthy environment, health education and health services besides other health related programmes (Wenhold, Kruger and Muelhoff, 2008: 459).

3.3.3 Immediate causes

The UNICEF conceptual framework, (see Figure 1.3) presents the determinants of child nutrition, links inadequate dietary intake and disease as immediate causes of malnutrition.

3.3.3.1 Inadequate Dietary Intake

Inadequate dietary intake can result in either under- or overnutrition which are influenced by socioeconomic and political factors (Kraemer et al., 2012: 45). For adequate dietary intake, food security at the household level is required (Khuzwayo, 2008: 164). Inadequate dietary intake affects millions during times of war and civil uprisings when there is often a lack of nutritious food aid for civilians. Food aid could also be denied for gender, age, political or religious affiliation reasons. Women and children often get the least amount of food in the family due to a lower status, a practice prevalent in certain societies (FAO, 1997).

Labadarios, Dhansay and Hendricks (2008: 137) disclosed that there is an association between poor dietary intake, poor HFS and the presence of stunting and underweight. Micronutrient malnutrition or “hidden hunger” as it is also known, is mentioned by Khuzwayo (2008: 167) as another outcome of deficient dietary intake.

In many countries there are flawed government strategies in place or there is a lack of commitment by government to solve inadequate dietary intake by implementing programmes to eliminate this problem, particularly for women and children (FAO, 1997).

Breast feeding promotion is an intervention mentioned by Black et al. (2008) to provide adequate nutrient intake for infants. Optimal complementary feeding is encouraged as weaning foods of poor nutritional value will result in malnutrition due to the mother's lack of knowledge (FAO, 2005).

With the rapid increase in the rate of urbanization (5% in sub-Saharan Africa) there is a change in dietary habits and consumption patterns with a shift from traditional staple foods towards convenience products. The western diet and the increased use of street food traders can result in inadequate dietary intake (FAO, 1997).

Affluence and a child's lifestyle can contribute to overnutrition (**Kipping, Jago and Lawlor, 2008**). Children are often able to make their own food choices which coupled with larger food portions contribute to obesity. It is a common occurrence that children eat fast foods and frequently eat in restaurants (Lucas and Feucht, 2008: 236). The high consumption of carbohydrates (CHOs), dietary fat and sweetened drinks are habits which could result in childhood obesity (**Kipping, Jago and Lawlor, 2008**).

Temple et al. (2006: 256) reported that a number of SA children bring unhealthy food to school from home. In addition, the choice of food provided in many primary school tuck-shops or bought from local vendors is limited and often the food purchased does not promote healthy eating as children favour “junk food”, the deep-fried “fat cakes”, chips and cool drinks. This applies to children from both government and private schools where similar buying behaviour was observed in the purchasing of food from school. In addition, numerous children both in urban and rural areas do not have breakfast before going to school which contributes to an inadequate dietary intake (Temple et al., 2006: 253, 255-256).

3.3.3.2 Illness/ Disease

Malnutrition is tied up closely with endemic diseases which present a vicious circle of malnutrition – infection. As poor nutrition aggravates infection this in turn aggravates malnutrition. Disease, for example, diarrhoea, respiratory diseases, measles, malaria, HIV and AIDS and intestinal parasites impacts on the nutritional state of a person (FAO, 2005) and can lead to death (FAO, 1997). Naude,

Labuschagne and Labadarios (2008: 771) cite that there is a strong link between malnutrition and TB (Bradshaw, Bourne and Nannan, 2003). It has been established that micronutrient deficiencies quicken the progress of HIV and AIDS increasing the mortality rate which in 2000 was the leading cause (40.00 percent) of deaths in children under five (Naude, Labuschagne and Labadarios, 2008: 772; Matji, 2008: 840). The 2000 NBDS established that 20.00 percent of children under five years old died due to poverty related diseases: 7.00 percent from PEM, 5.00 percent from pneumonia and 8.00 percent as a result of diarrhoea. However, children under one year experienced higher percentages of death from diarrhoea (11.00 percent) and respiratory infections (6.00 percent) with the PEM mortality rate lower at 3.00 percent (Bradshaw, Bourne and Nannan, 2003).

A malnourished person suffering from an infectious disease would not have sufficient nutrient reserves to cope with the increased nutrient requirements, especially protein (FAO, 2005). If a child suffers a chronic illness, obtaining optimum nutrition for growth is difficult (Lucas & Feucht, 2008: 230- 231). The UNICEF (2009) stated that by 2010, in sub-Saharan Africa, more than 18M children would be orphaned due to AIDS, and as a result will become susceptible to disease and malnutrition.

3.3.3.3 Eating behaviour of children

A child's eating behaviour is influenced by many factors. Liking and disliking foods is a biologically determined behavioural predisposition which can be changed with repeated exposure (Contento, 2011: 27, 29). Gender differences exist as females prefer sweet tasting foods and males salty foods (Gurain, 2002: 30) which will influence the choice of food and impact on the nutritional status of the child as these foods are preferred over healthier options (Contento, 2011: 29). Through the acquisition of parental perceptions, attitudes, beliefs and knowledge of food, a child's eating behaviour is influenced (Contento, 2011: 30). This can be detrimental to the child's nutritional well-being if there is a lack of nutrition knowledge in the family. The habit of eating together as a family is diminishing, resulting in a child often eating alone. Choi et al. (2008: 308-309) report that eating alone has a negative impact on the establishment of correct eating habits and skipping of meals often occurs. Poor dietary habits are difficult to change and usually continue into adulthood affecting the mental and physical status of the person. Many environmental factors impact on a child's eating habits which include culture, food availability, SES, advertising and the media (Contento, 2011: 39).

3.4 FACTORS CONTRIBUTING TO MALNUTRITION

3.4.1 Urbanisation

Labadarios, Dhansay and Hendricks (2008: 135) acknowledge that SA has experienced acceleration in urbanization as people move from rural to urban areas, often surviving on meagre incomes and in unsatisfactory living conditions. This has had a profound effect on the dietary habits of these 'urbanites' with the traditional diet being almost abandoned and eating habits reflecting a more multicultural influence (Oniang'o, Mutuku and Malaba, 2003: 236). More legumes and cereals are reported to be present in a rural African diet (Mbhenyane et al., 2008: 203) whilst snacks and fast foods are more

popular in the city, resulting in the consumption of foods high in sugar, fat and energy (Oniang'o, Mutuku and Malaba, 2003: 236). An urban African diet contains more meat, wheat products, fruit and soft drinks than a rural diet (Mbhenyane et al., 2008: 203).

Dietary food intake trends have been reported on by Senekal, Mchiza and Booley (2008: 498) in relation to the SA FBDGs (Vorster, 2001: S3). Fibre intake decreases with urbanization as the intake of white bread increases and rice and wheat replace maize as the starch. An increase in the consumption of products high in sugar is evident with urbanization which may contribute to micronutrient deficiency. In SA in general, insufficient fruit and vegetables are eaten daily and urbanisation has resulted in a lower intake of green leafy vegetables and an increase in potatoes, butternut, pumpkin, carrots, peas and beans. However, the consumption of some fruits has almost doubled. A small percentage of adults eat dry beans, peas, lentils and soy. Slightly more of these products are eaten in the cities than in the rural areas. Due to the health benefits more legumes should be consumed. The revised FBDGs recommend the daily consumption of fish, chicken, lean meat or eggs as well as milk, maas or yoghurt (Schönfeldt and Hall, 2012: 14). Urbanisation has also resulted in a decreased intake of offal. There has been an increased intake of full cream milk and high fat cheese; beef products; pies and sausages; mutton; pork products such as bacon; Russian sausages; chicken and eggs. With regard to the fish intake urbanization had no effect (Senekal, Mchiza and Booley, 2008: 498).

The FBDGs advocate the use of fats sparingly with vegetable oils recommended rather than hard fats (Schönfeldt and Hall, 2012: 14). However, in urban areas there is a large increase in the use of vegetable fat due to the use of brick margarine and a decrease in the use of non-dairy creamers, a highly saturated plant fat. Urbanised dwellers have a more varied diet covering most of the food groups with a few poor choices of foods high in sugar and fat. Micronutrient intake is generally better in an urban diet than a rural one although an urban diet can be deficient in Ca, Fe and folate (Senekal, Mchiza and Booley, 2008: 498).

Vorster and Bourne (2008: 236) state that Chronic Diseases of Lifestyle (CDL) are evident in most urbanized groups. There is an increase in obesity amongst Black people in urban areas due to the more refined diet high in sugar and fat and a decrease in physical activity (Senekal, Mchiza and Booley, 2008: 490). With the rapid increase in the rate of urbanization (5% in sub-Saharan Africa), there is a change in dietary habits and consumption patterns and a shift from traditional staple foods towards convenience products (Senekal, Mchiza and Booley, 2008: 499).

3.4.2 Eating away from home

Lucas and Feucht (2008: 235) report that studies on six to eight-year-olds revealed improved intellectual performance when breakfast was consumed. In the United States (US), the school breakfast programmes have had positive results on increased attendance, enhanced memory and better academic test results besides benefitting the child's nutritional state.

The National School Nutrition Programme (NSNP) provides school feeding to all learners in needy schools in mainly rural areas and informal settlements in SA. The quality and quantity of food served to children as well as the number of feeding days impacts on the effectiveness of the School feeding programmes (SFPs) (Department of Basic Education, Programmes, 2014; Moeng and de Hoop, 2008: 294).

Lucas & Feucht (2008: 235) emphasise the importance of teaching young children healthy eating habits. This will enable the children to make sensible decisions when eating away from home. Studies have shown that children pack their favourite foods, with not much variety, for their school lunches. Choices are often limited by what is available at home, what travels well and does not require reheating or needs to be kept chilled. Home-packed food usually contains less fat than meals provided at school. Unhealthy snacks are often purchased at school.

In Australia (2003–2004) a cross-sectional study on the content of lunchboxes was conducted amongst 1681 five to 12 year olds. Although an alarming figure revealed that over 90 percent had junk food in the lunchboxes, the fruit intake of the primary school children was good with 68 percent bringing fruit to school. Bread being consumed the most, accounted for 20 percent of the energy intake at school, then biscuits (13.00 percent); fruit (10.00 percent), muesli/fruit bars (8.00 percent), packaged snacks (7.00 percent) and sweetened drinks (6.00 percent). Ten percent of the children preferred to buy items at the canteen or tuck shop and as a result obtained more total energy from this food than from food brought from home (Sanigorski et al., 2005:1310-1314).

Lucas and Feucht (2008: 234) mention that children participating in SFPs can spend a long time in queues for food. This, together with the time allowed for eating can affect the choice of meal.

3.4.3 Cultural beliefs, traditions and religion

The socio-cultural aspect of a population is a factor that can contribute to child under-nutrition. What is eaten, when and how is influenced by one's culture which is passed down from generation to generation but these patterns can change over time. Culture influences a person's acceptance of food and food taboos are common in Africa. These taboos can relate to either a specific situation or group of people, usually women and children. For example, in some cultures women of child-bearing age should not eat eggs as this is believed to upset the reproduction process (Mbhenyane et al., 2008: 218-219). Cultural influences also affect attitudes to breastfeeding and infant feeding practices (Oniang'o, Mutuku and Malaba, 2003: 335).

Sharing is a food practice observed by Muslims whilst other cultures display gluttonous behaviour (Mbhenyane et al., 2008: 213, 220). Distributing food within a family often relates to hierarchy. The male head of the house, the most important person, receives the most food whilst the mother and

children eat after the man is satisfied and sometimes male children are fed before female children. Receiving an inadequate intake results in under-nutrition (Oniang'o, Mutuku and Malaba, 2003: 335). Mbhenyane et al. (2008: 216) indicate that worldwide religious beliefs affect dietary patterns. Religions where dietary practices are observed include Buddhism; Hinduism; Judaism; Islam; Rastafarianism, and different Christianity groups. The latter comprises of Roman Catholics; Eastern Orthodox Christianity; Mormons and Seventh Day Adventists. Escott-Stump and Earl (2008: 358) describes the variation encountered in different religions. Some foods are prohibited or strongly discouraged whilst Halaal and Kosher foods are permissible to Muslims and Jewish people respectively. Foods that are permitted are also avoided at certain times, as is the case of eggs and dairy in the diet of Buddhists. Some foods, for example fish, must be completely avoided by devout Seven Day Adventists. Mbhenyane et al. (2008: 214-215) explain the restrictions as to when a food can or cannot be consumed. Roman Catholics eat meat except on Fridays whilst in a Jewish diet, meat and milk cannot be eaten in the same meal. Religious fasting can vary from partial fasting, where abstinence from certain meals or foods occurs, to complete fasting where no food or drink is consumed (Escott-Stump and Earl, 2008: 359).

Following a vegetarian diet can be due to religious reasons and if well planned can meet the nutritional needs of the person. Depending on the diet, the vegetarian needs to ensure a sufficient intake of Ca, Zn, Fe and Vits B12 and D (Escott-Stump and Earl, 2008: 359-360). Different types of vegetarian diets are consumed: lactovegetarian, lacto-ovo-vegetarian, vegan or fruitarian (Arab and Steck-Scott, 2004: 350).

3.5 STRATEGIES TO ADDRESS MALNUTRITION IN SOUTH AFRICA

The 159 countries represented at the ICN (1992) in the World Declaration on Nutrition stated a firm commitment to working together to ensure sustained nutritional well-being for all people. "We recognize the fact that each government has the prime responsibility to protect and promote food security and the nutritional well-being of its people, especially the vulnerable groups. However, we also stress that such efforts of low-income countries should be supported by actions of the international community as a whole" (FAO, 1997). Food insecurity in SA affects the nutritional status of a large percentage of the population. To reduce food insecure households in SA by half in 2015, a national Integrated Food Security Strategy (IFFS) was approved in 2002. During that year it became the Integrated Food Security Nutrition Programme (IFSNP) with the INP and the National School Nutrition Programme (NSNP) directly linked to the IFSNP (Khuzwayo, 2008: 164,169,189).

3.5.1 Integrated Nutrition Programme

The new South African government in 1994 recognised the seriousness of the problem of malnutrition in this country. Therefore, the Department of Health (DoH) formulated an Integrated Nutrition Strategy (INS) which developed into the INP to prevent and manage malnutrition (Labadarios, Dhansay and

Hendricks, 2008: 152). Behr (2008: 42-43) explains that the eight current (amended in 2006) focus areas in the INP target nutritionally-at-risk populations. The focus areas are as follows:

- Disease-specific nutrition support, treatment and counselling
- Maternal nutrition
- Infant and young child feeding
- Youth and adolescent nutrition
- Nutrition education, promotion, and advocacy
- Micronutrient malnutrition
- Food-service management
- Community-based nutrition
- Insufficient health services and unhealthy environment

Policies need to be developed to enhance the objectives of the INP and nutrition needs to be promoted in general to improve nutrition related knowledge whilst the awareness of nutrition issues need to be raised to change policies or programmes (Behr, 2008: 51).

Certain aspects of the INP have been most successful. Comparing the NFCS 1999 and 2005 results in respect of underweight and stunting in children, there was a reduction in these percentages. For underweight there was a one percent reduction from ten to nine percent whilst stunting decreased from 22.00 to 18.00 percent. However, wasting in children increased from 3.70 (1998) to 4.50 percent (2005) (Behr, 2008: 47). The success of a nutrition intervention programme can be assessed on the improvement of wasting percentages due to its response to short-term interventions (Zere and McIntyre, 2003).

Micronutrient malnutrition control is an important INP focus area (Moeng and De Hoop, 2008: 298). The elimination of vitamin and mineral deficiencies in the diet can be achieved by food fortification, supplementation and promoting food diversification discussed in more detail below (Schümann and Solomons, 2007: 38).

One of the objectives of the INP focus area for infants and young child feeding was for all new-born babies to receive a Road to Health Chart (RTHC). In 1994, only 59.00 percent of all new-born babies had a RTHC. This improved and by 2003, according to the SADHS, 68.00 percent of children under 23 months old had a RTHC. Strengthening growth monitoring will enable early detection of malnutrition (Behr, 2008: 49).

Another strategy in the INP focus area resulted in the launch in 1994 of the BFHI and this initiative became one of the key performance areas in the INP focus domain of infant and young child feeding (Behr, 2008: 49). In 2011 in Pretoria, the SA Minister of Health (Dr SA Motsoaledi), at a breastfeeding consultative meeting emphasized that SA had the lowest exclusive breastfeeding rate (8%) worldwide. Baby-friendly hospitals had been achieved in 44.00 percent of SA health facilities with a maternity section. This will help strengthen the practice of breastfeeding which is vital for a child's nutrition and

health (DoH, 2011). For optimal growth and increased chances of survival exclusive breastfeeding for six months is an objective of the INP with a longer breastfeeding period being ideal. The SADHS (2003) reveals that only 12.00 percent of babies under four months old were exclusively breastfed thus identifying that this is not a common practice. However, appropriate options need to be given to the mothers who choose not to breastfeed. It is important that food specifically aimed at infants and young children should be more carefully regulated with regard to the marketing of it (Behr, 2008: 49).

Charlton, Ferreira and du Plessis (2008: 576) iterate that the community-based nutrition (CBN) focus area of the INP now falls under the control of the Directorate of Social Development. The Community-Based Nutrition Programme (CBNP) includes various strategies for interventions at the community level to reduce malnutrition. Some of these are micronutrient-rich vegetable gardens, simple screening for dietary lifestyle diseases, and weighing of children at community clinics as well as home visits (Behr, 2008: 54).

3.5.2 National School Nutrition Programme

The PSNP was implemented in 1994 by the DoH as part of the Reconstruction and Development programme to combat short-term hunger and malnutrition which would have an impact on a child's ability to learn (Moeng & de Hoop, 2008: 294). It was seen as a health intervention rather than an educational one that could contribute to the fulfilment of the country's MDGs especially in halving poverty by 2015. Poor primary public schools were targeted and these were ranked on the quintile system (1-5) according to their facilities and the poverty of the surrounding community (Public Service Commission, 2008). Consequently, meals were given to children in primary schools in Quintiles one, two and three (DoE, 2009).

Since 2004 this programme has been administered by the DoE and renamed the NSNP (Moeng and de Hoop, 2008: 296). The interventions aim at improving the learning capacity and healthy lifestyles of primary school children from Grade R to 7. Community participation was important to the programmes implementation which is monitored by a School's Governing Body (SGB) and a School Nutrition Committee (DoE, 2009).

In 2006 the Fiscal and Finance Committee confirmed the need for the NSNP to be run in government secondary schools and this commenced in 2009. The NSNP was introduced to Quintile 1 secondary schools serving a balanced meal including indigenous foods and providing at least 30% of the daily RDAs of learners. In 2010 and 2011, Quintile 2 and 3 secondary schools were added respectively (DoE, 2009). The Education Portfolio Committee (Parliamentary Monitoring Group, 2007) confirmed that the NSNP for the 2006/2007 year had fed about 6M learners in 17 757 schools, for 156 days out of the 197 school days, at a cost of R1 090 639. A report from the Portfolio Committee on Basic Education (2012) indicates an increase to 8.8M children in Quintile 1-3 schools (primary, secondary and special) benefitting from the NSNP (DBE, 2012).

The Public Service Commission (2008) evaluated the NSNP in primary schools in two of the poorest and predominately rural provinces, the EC and Limpopo. Some key findings highlighted the negative aspects of the programme. It was noted that the NSNP guidelines were not always adhered to as learners did not receive food every day of the week in the EC. Meals are prepared at the school but it is problematic without the correct infrastructure. Delayed and non-delivery of supplies, quantity of food and poor quality or substitution of items due to shortages were a concern. The majority of the school vegetable gardens were dysfunctional due to serious drought in those areas. Positive findings relate to the impact on the learner with an improvement in school attendance and improved health and concentration levels and increased participation in physical activities. Job creation resulted as food supplied by local suppliers and the community contributed to the local economic development (LED). Numerous challenges still exist, especially in the EC, in respect of the implementation and monitoring as highlighted in the 2012 Department of Basic Education Portfolio Committee report (DBE, 2012).

3.5.3 Food fortification

Food fortification is one of the interventions recommended in the INP focus area of micronutrient malnutrition (Behr, 2008: 52) and saw the implementation of the National Food Fortification Programme (NFFP) (Moeng and de Hoop, 2008: 302). Kruger, Hendricks and Puoane (2008: 683-684), advocate food fortification as an essential cost-effective medium to long-term strategy to reduce micronutrient deficiencies. The government and the food industry need to work closely to achieve affordable fortified products for the low income earners. For a fortification programme to be successful the fortified food must be consumed on a regular basis in significant quantities. It needs to be acceptable to the consumer with no changes in appearance or taste. A variety of foods can be fortified either with single or multiple micronutrients. Foods fortified are sugar; salt; rice; cereals; instant noodles; soy sauce; infant formula; fats; vegetable oils; milk; milk powder and tea (Kraemer et al., 2012: 80).

It is reported by Labadarios, Dhansay and Hendricks (2008: 137) that in SA white sugar, maize, whole milk, tea and bread are the five most popular consumed foods. According to researchers the 1999 NFCS revealed concerning statistics relating to important micronutrients in the diets of children and those in rural areas. These micronutrients include Vit. A, B6, and C, Fe, Ca, riboflavin, niacin, folate and Zn. In 2003, as a result of these findings, Labadarios, Dhansay and Hendricks (2008: 138) report that the SA government passed legislation to enforce multiple micronutrient fortification of the two staple foods (maize meal and wheat flour) (Act no. 54 of 1972, 2003). In 2005 the DoH implemented the NFCS: FB-1 to check on micronutrient concentrations of staple food fortification, discussed in more detail below (Labadarios, Dhansay and Hendricks, 2008: 138).

To prevent and control iodine deficiency illnesses in SA, mandatory iodisation of salt occurred in 1995 (Act no. 54 of 1972, 2000) (Labadarios, Dhansay and Hendricks, 2008: 138). In the National Iodine Survey (NIS) in 2000, 11.00 percent of the population were reported to be iodine deficient (Behr, 2008:

52). The findings of the NFCS: FB-1 indicated that households were consuming sufficient iodized salt so iodine deficiency was no longer a problem in SA, especially in children (Labadarios, Dhansay and Hendricks, 2008: 139).

Fe fortification of food is more difficult than other nutrients as the colour and taste of the food can be affected. Sugar, flour, milk powder, maize meal porridge and infant formula are fortified with Fe (Kruger, Hendricks and Puoane, 2008: 684). However, the NFCS: FB-1 showed that one out of five children in SA suffered Fe depletion and IDA, double the number identified in 1994 (Labadarios, Dhansay and Hendricks, 2008: 144). The 2005 NFCS reported that 11 percent suffered Fe deficiency compared to five percent in the 1994 SAVACG survey (Behr, 2008: 52).

Wheat flour, maize meal and milk powder are fortified with Zn for the benefit of high-risk children and infants (Kruger, Hendricks and Puoane, 2008: 684). The NFCS: FB-1 revealed that 45.00 percent of children between one and nine years were Zn deficient (Labadarios, Dhansay and Hendricks, 2008: 146).

Kraemer et al. (2012: 63) commented that in 2003 mandatory folic acid fortification of maize meal and wheat flour commenced in SA. This resulted in a noteworthy decrease (31.00 percent) in the prevalence of neural tube defects in babies in 12 hospitals in four provinces in SA. Therefore, due to successful food fortification, folate deficiency in SA is no longer considered a serious nutritional disorder (Labadarios, Dhansay and Hendricks, 2008: 145).

3.5.4 South African Food-Based Dietary Guidelines

The guidelines for the development of FBDGs were formulated by the FAO and WHO. The country-specific, positive action and scientific-based messages are an influential tool, needed to inform government on nutrition policy and educate the populace in this regard (Behr and Ntsie, 2008: 339; Keller and Lang, 2007: 867).

Due to the failure of the nutrient-based guidelines to change the dietary behaviour of all South Africans, the DoH, in 2003, adopted the first set of SA FBDGs (Vorster, 2001: S3) for children over seven years old, adolescents and adults, as illustrated in Table 3.1 (Bourne, 2007: 227). In the FBDGs, physical activity and drinking clean safe water is included as a lack of these are considered indirect nutritional risk factors (Vorster, Badham and Venter, 2013: S7). Unfortunately the DoH did not create any educational visual tools to complement the first set of FBDGs yet it was considered an important aspect of the country's nutrition policy. Keller and Lang (2007: 868) comment that WHO and FAO recommend that a variety of media at different literacy levels are required to implement FBDGs.

The DoH envisaged that the South African specific FBDGs would educate and motivate the multicultural population to change their eating and consumption patterns to optimal health within the means of affordability. This would in the same instance address over-and under-nutrition in SA (Vorster, 2001:

S3-S4). In addition, FBDGs were to impact on food, nutrition and agricultural policies and the food industry and be observed by all catering units or institutions where meals are prepared and served to consumers (Keller and Lang, 2007: 868, 873). It was recommended that the FBDGs be used by the DoH in the INP and the PSNP; and by the former DoE for NE in the school curriculum (Vorster, 2001: S6). The FBDGs were ignored by relevant government sectors and not reflected in their policies, one example being the Education department (Keller and Lang, 2007: 870-871).

Table 3.1: Comparison between the SA PFBGDs (2007) and the FBDGs of 2003 and 2012 (Bourne, 2007: 228; Schönfeldt and Hall, 2012: 14)

SOUTH AFRICAN FOOD-BASED DIETARY GUIDELINE COMPARISON		
PFBGDs 2007 for one to seven years old	FBDGs	
	2003 for persons older than seven years	REVISED in 2012 for persons older than five years
10. Encourage children to enjoy a variety of foods.	1. Enjoy a variety of foods.	1. Enjoy a variety of food.
7. Encourage children to be active everyday.	2. Be active.	2. Be active.
3. Make starchy foods the basis of a child's main meals.	3. Make starchy foods the basis of most meals.	3. Make starchy foods the basis of most meals.
4. Children need plenty of vegetables and fruits every day.	4. Eat plenty of vegetables and fruits every day.	4. Eat plenty of vegetables and fruit every day.
5. Children need to drink milk everyday.	Milk is mentioned in FBDG 6.	5. Have milk, maas or yoghurt daily.
6. Children can eat chicken, fish, meat, eggs, beans, soya or peanut butter every day.	5. Eat dry beans, peas, lentils and soy regularly.	6. Eat dry beans, split-peas, lentils and soya regularly.
	6. Chicken, fish, milk, meat or eggs can be eaten daily.	7. Fish, chicken, lean meat or eggs can be eaten daily.
	7. Eat fats sparingly.	8. Use fats sparingly: choose vegetable oils rather than hard fats.
	8. Use salt sparingly.	9. Use salt and food high in salt sparingly.
8. Offer children clean, safe water regularly.	9. Drink lots of clean, safe water.	10. Drink lots of clean, safe water.
7. If children have sweets or drinks, offer small amounts with meals.	11. Use food and drinks containing sugar sparingly and not between meals.	11. Use sugar and food and drinks high in sugar sparingly.
	10. If you drink alcohol, drink sensibly.	
2. Feed children five small meals a day.	-	-
6. Take children to the clinic every 3 months.	-	-

Schönfeldt and Hall (2012: 14) indicate there was a need to revise the original FBDGs due to some misinterpretations as well as the acquisition of new dietary knowledge which would decrease diet-

related non-communicable diseases (NCDs) and obesity (Vorster, Badham and Venter, 2013: S6, S8). In addition, relevance of the FBDGs to a growing urbanising population whose dietary habits are modernising was required. The revised FBDGs from age five years and older were therefore introduced in 2012 (Vorster, Badham and Venter, 2013: S6).

In 2007 the SA Paediatric Food Based Dietary Guidelines (PFBDG) were introduced for children, between the ages of one to seven years old, due to a lack of significant nutritional improvements in this age group in the previous twenty years (Vorster, Badham and Venter, 2013: S9). These guidelines addressed the INP focus area relating to disease specific nutrition support and tackled nutritional problems of under-and overnutrition in pre-school children (Swart and Dhansay, 2008: 418).

Vorster, Badham and Venter (2013: S9, S11) insist that FBDGs need to be the starting point of any nutrition intervention programme. Different factors specific to the target group must be taken into consideration when developing educational material essential for implementation. Keller and Lang (2007: 872-873) reviewed FBDG implementation in four countries (New Zealand, Chile, SA and Germany) and observed success when children, through the education sector, became familiar with the guidelines. Educational materials need to be provided free of charge and supported by the use of various mass media that is culturally acceptable in addition to an online presence to disseminate guidelines to the public. Greater success can be achieved if professionals in sectors other than health, who have an impact on the dietary habits of children and adults, are trained to implement FBDGs.

3.5.5 Micronutrient supplementation

The PEM scheme became known as the Nutrition Supplementation Programme (NSP) (2003) part of the INP (Charlton, Ferreira and du Plessis, 2008: 576). The NSP of the DoH targets different nutritionally-vulnerable population groups: children under five, pregnant women, lactating women and those with chronic illness who could require food supplements (Kruger, Hendricks and Puoane, 2008: 677).

Kruger, Hendricks and Puoane (2008: 685) mention that food supplementation to reduce micronutrient deficiencies is usually used as a short term measure until dietary diversification and food fortification is in place. This supplementation is in the form of capsules or tablets to provide the required vitamins or minerals namely Vit. A, Fe, Folic acid and Zn (Kraemer et al, 2012: 80). Moeng and de Hoop (2008: 310) highlight the essential need for Folic acid supplementation during the first trimester of pregnancy with 5mg folic acid tablets as stated in the DoH Maternity Care guidelines.

The Vit. A supplementation programme in SA provides all post-partum women within six to eight weeks of delivery, with a high single dose of Vit. A. An infant is also given a single dose at six weeks (bottle fed) or between six and 11 months (breast fed), followed by a dose at one year and thereafter every six months until the child is five (Kruger, Hendricks and Puoane, 2008: 685-686). Behr (2008: 52) observed a marked increase (22.00 percent) of poor Vit. A status in children younger than six between the 2005

NFCS: FB-1 (55.00 percent) and the 1994 SAVACG survey (33.00 percent). This is irrespective of the province, urban or rural area or the age of the child (Labadarios, Dhansay and Hendricks, 2008: 141-142).

The use of Fe supplementation with Vit. A has been more successful than Fe alone for reducing IDA. There is often poor compliance with Fe supplementation due to the side effects like diarrhoea and constipation. For Fe supplementation, the cheapest and most common tablet is Ferrous Sulphate (Kruger, Hendricks and Puoane, 2008: 685-686) needed during pregnancy (Moeng and de Hoop, 2008: 309).

Kruger, Hendricks and Puoane (2008: 686) mention two options suitable for iodine supplementation in rural areas where iodised salt is unavailable: either iodized oil or a 10.00 percent Potassium Iodide solution given monthly.

3.5.6 Promoting the diversity of food intake

NE of communities has a vital role to play in promoting an understanding of food diversification (Mbhenyane et al., 2008: 228). Khuzwayo (2008: 165) states that a variety of food is required to provide the required macro- and micronutrients in sufficient quantities. Kraemer et al. (2012: 80) emphasises that the food-based approach is a long term strategy to combat micronutrient deficiency and improve dietary diversification through a variety of activities including homestead production, nutrition and maternal education. However, access to sufficient and varied food does not guarantee food or nutrition security (Khuzwayo, 2008: 165).

Small-scale food producers are encouraged to plant a mixture of crops and introduce new nutritious crops like soybean. The growing of traditional food crops is promoted due to good nutritional value and flavour (FAO, 2007). The FAO (1997) also advocates the involvement of school learners in school food gardens as the poor rely on food plants for nutrients. Raising small livestock and chickens will improve the animal protein and micronutrient content of the diet. Fish farming is encouraged to increase the consumption of fish and reduce overfishing. Any surplus food can generate income and drying is a successful preservation technique which can be used to supplement income (FAO, 2007). The use of preservation and appropriate storage techniques will reduce the effect of fruit and vegetable seasonality and prevent wastage when fruit and vegetables are in excess. According to the FAO (2007) the use of plants and animals from the forest can supplement a diet providing essential nutrients and diversity.

3.5.7 Nutrition education and promotion

As nutrition problems are of an interdisciplinary nature affected by political, social and economic issues, NE alone will not be sufficient to eliminate nutrition problems in a country. However, it will assist individuals in making informed nutritional choices of healthy food to meet nutritional needs from limited

resources. A motivation to change undesirable nutrition-related practices is required with education being the motivating factor (FAO, 1997).

NE plays a role in the objectives of the INP focus area of disease-specific nutrition support, in order to achieve a reduction of low birth weight; the under-five mortality rate; wasting, stunting and underweight in children, and a reduction in the lifestyle diseases of overweight and obesity. NE for pregnant and lactating women is a strategy in the INP to contribute to maternal health. The focus area for infant and young child feeding advises early childhood NE to contribute to the optimal growth and survival of the child (Behr, 2008: 47-49). NE is also one of the interventions advocated for the INP focus area of micronutrient malnutrition prevention and control (Behr, 2008: 52).

Behr and Ntsie (2008: 334) explain that primary school children are one of the target groups in SA for NE. In 1994, the National Department of Health (DoH) initiated HPS based on the WHO concept (Wenhold, Kruger and Muehlhoff, 2008: 459) as it is important for a school to provide a supportive environment to contribute to a child's good health and nutrition. Such initiatives include a feeding programme, a school garden, school food services, a school nutrition policy, maintaining a healthy school environment, NE in the classroom, exercising or sport as part of the school programme, school health services, and school community projects (FAO, 2005). In each province the success of the HPS varies according to Wenhold, Kruger and Muehlhoff (2008: 459) with the Western Province region having the most success. NE will be discussed in detail in chapter 3.

3.5.8 Other government initiatives

3.5.8.1 Government grants

The global financial crisis has impacted heavily on the poor and the destitute in SA. From October 2013, eligible children (over 11.3M) between the ages of 0-17 received a R300 monthly Child Support Grant (CSG) with KwaZulu-Natal (KZN) having the highest number of CSG beneficiaries, over 2.7M (Hall, 2013b: 92). A means test determines the financial status of the care giver. A non biological parent is limited to six children for whom child support can be requested (South African Government Services, 2009a).

The Old-Age Grant of R1200 per month, often used to support families, benefitted 2.7M pensioners in 2011 of which 570 000 were in KZN. Those receiving CSGs and the old-age pension constitute the two largest groups of social-assisted beneficiaries (Government Communication and Information System (GCIS), 2012: 449-450; DoH, 2003). There is proof that these grants are used for the purchasing of food and basic goods and education (Hall, 2013b: 92).

In 2012 foster parents received a Foster Care Grant (FCG) of R800 per month to provide for a child placed in their care by a court order. In SA there were 532 159 children in foster care receiving this grant with 135 442 children from KZN (Hall, 2013b: 93).

Care Dependency Grants (CDG) of R1 260.00 per month was provided to caregivers of severely disabled children and those with a chronic disabling illness. KZN paid out the largest number of these grants (36 000) from a total of 120 000 grants in SA (Hall, 2013b: 94).

The Social Relief of Distress (SRD) grant provides temporary relief for three to six months for certain categories of persons. It may be either a food parcel or voucher (GCIS, 2011: 447). Sixty-six thousand South Africans of whom 28 000 lived in KZN, benefitted from this aid during the 2011-2012 tax year (GCIS, 2012: 450).

The SA government through the Food Security Services provides food parcels to vulnerable households especially those of child-headed households and orphaned children (South African Government Services, 2009b).

3.5.8.2 Government programmes

Over the years different SA programmes with comparable MDGs or targets have been implemented to address the country's development. These programmes are mentioned in the MDGs Country Report (Stats SA, 2013a: 17-18) as the Reconstruction and Development Programme (RDP) to provide housing and basic services, the Accelerated Shared Growth Initiative (ASGISA) to halve unemployment and poverty (MDG 1), the Integrated Sustainable Rural Development Programme (ISRDP) and the Urban Renewal Programme (URP) to address housing provision and free basic services as well as decreasing poverty levels (MDGs 1 and 7).

3.5.8.3 The National Development Plan

The 2012 approved National Development Plan (NDP) for 2030 was aligned to the 2009 New Growth Path (NGP), for employment creation in SA, to combat the challenges of SA: unemployment, poverty and inequality. The NDP will continue to drive the country in addressing the MDG targets as there is a synergy between eight of the 12 SA government outcomes and the MDGs as shown in Table 3.2 (Stats SA, 2013a: 18-20).

Table 3.2: Eight SA Government Outcomes and related MDGs (Stats SA, 2013a: 19-20)

SA GOVERNMENT OUTCOMES	RELATED MDGS
Outcome 1: Improved quality of basic education	Goal 2: Achieve universal primary education
Outcome 2: A long and healthy life for all in SA	Goal 4: Reduce child mortality

	Goal 5: Reduce maternal mortality Goal 6: Combat HIV and AIDS, malaria and other diseases
Outcome 4: Decent employment through inclusive economic growth	Goal 1 (Target 1B): Achieve full and productive employment and decent work for all, including women and young people
Outcome 5: A skilled and capable workforce	Goal 2: Achieve universal primary education Goal 3: Promote gender equality and empower women
Outcome 7: Vibrant, equitable and sustainable rural communities with food security for all	Goal 7 (Target 7A): Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources Goal 1 (Target 1C): Halve, between 1990 and 2015, the proportion of people who suffer from hunger
Outcome 8: Sustainable human settlements and improved quality of life for households	Goal 7 (Target 7C): Halve by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation (Target 7D): Achieve significant improvement in the lives of slum dwellers
Outcome 10: Environmental assets and natural resources that are well protected and continuously enhanced	Goal 7 (Target 7B): Reduce biodiversity loss, achieving by 2010, a reduction in the rate of loss
Outcome 11: Create a better SA and contribute to a better and safer Africa and world	Goal 8: To develop a global partnership for development. Develop an open, rule-based, predictable, non-discriminatory trading and financial system.

The National Planning Commission (NPC) is of the opinion that by the end of the next decade, through the implementation of the NDP, poverty could be eliminated in SA and this will have a positive influence on the health of the nation. Nearly all of the MDGs (1, 2, 4, 5, 6 and 7) are linked to the objectives of the NDP as summarised in Table 3.3 (Stats SA, 2013a: 18-19).

In this plan education is recognised as being central to poverty reduction as it enables the raising of healthy families. In addition, values and knowledge learnt at school will filter through into society. There should be widespread admission to Grade R by 2030. In addition, all children must attend two years of pre-school learning before starting Grade 1 as early childhood development, for all children 3-5 years in age, is a top priority. This period is for the child's holistic development for school readiness, including health and NE. To reduce poverty, the unemployment target rate in the NDP for 2030 is 6.00 percent (MDG 1). Moreover, the government aims to improve the public health system (MDG 4, 5 and 6) and implement programmes for sustainable development (MDG 7) (Stats SA, 2013a: 18-19).

Table 3.3: The development objectives of the NDP with comparable MDGs or targets (Stats SA 2013a: 18-19)

NATIONAL DEVELOPMENT PLAN	
DEVELOPMENT OBJECTIVES	COMPARABLE MDGS OR TARGETS
1. Eliminate poverty and reduce unemployment	Goal 1: Eradicate extreme poverty and hunger
2. Improve the quality of school education	Goal 2: Achieve universal primary education
4. Reduce unemployment from 27% to 24% by 2020 and to 6% by 2030	Goal 1, Target 1B: Achieve full and productive employment and decent work for all
6. Become a resource intensive economy and adopt sustainable development practices	Goal 7: Ensure environmental sustainability
7. Improve the public health system which is confronting a massive disease burden	Goal 4: Reduce child mortality Goal 5: Reduce maternal mortality Goal 6: Combat HIV and AIDS, malaria and other diseases

3.5.8.4 Campaigns

- **The War on Poverty Campaign**

This government campaign, aimed at approximately 15M of the poorest, is in the process of being implemented in SA. By 2014, all of the identified 1 128 wards where people live in abject poverty will receive service delivery and benefit from anti-poverty programmes (GCIS, 2012: 448). This links with the INP strategy for the provision of water and sanitation in the focus area: Disease-specific nutrition support, treatment and counselling, for the prevention of malnutrition and the under-five mortality rate (Behr, 2008: 47).

- **National Nutrition week**

Annually, in October in SA for the past fifteen years, the DoH together with various partners and sponsors has held a National Nutrition week (NNW) focusing on a nutrition priority in SA. In 2010, UNICEF was one of the partners for this NNW with the theme “Healthy Eating for Preschool Children”. The target group was children between four and six years and staff in preschools or crèches. Stated on the NNW website are the four messages from the FBDGs which were the focus of this education campaign:

1. Make starchy foods the basis of a child's main meal
2. Children need plenty of vegetables and fruit every day
3. Child need to drink milk every day
4. Children can eat chicken, fish, meat, eggs, beans, soya or peanut butter every day. (National Nutrition Week, 2010).

Browne (2011) of The Association for Dietetics in South Africa (ADSA) makes mention of the 2011 NNW theme, “Feeding Smart from the Start”. The aim of this theme was to enable a child to receive correct complementary feeding from the age of six months. The 2012 NNW campaign was to encourage healthy eating choices using the new SA Food Guide and the updated FBDGs to help prevent diet-related NCDs (National Nutrition Week, 2012). Portion control was the thrust in the 2013 NNW, named “Eat less - choose your portion with caution”, as overweight in adult women as well as preschool children has escalated in the past ten years, the latter from 10.60 percent to 18.20 percent. This campaign was aimed at educating the target audience to consume the recommended portion size of an assortment of food items from the different food groups (DBE, Newsroom, 2013). The aim of the 2014 NNW was to continue the drive to educate the public in respect of “Choosing your portion with caution”. Portion control needs to become part of daily living. In addition the DOH emphasised eating fewer foods containing sugar and unhealthy fats as well as a reduction of salt in the diet (DoH, 2014).

- **Zero Hunger Challenge**

It is reported in the SA Yearbook 2011/2012 that as part of the Zero Hunger Challenge (ZHC) campaign in SA, more than 1M people were able to access food through distribution initiatives (GCIS, 2012: 49). The ZHC is a UN initiative, launched in May 2012, to reduce to zero the rate of stunted children under-two years of age (Scaling up Nutrition (SUN), 2012). The agricultural sector plays a key role in achieving this food security. The ZHC aims for:

- nutritious food being available throughout the year,
- a 100.00 percent increase in smallholder income through increased productivity,
- no food loss as it moves through the production process to use and
- the sustainability of all food production systems.

3.5.8.5 Food Banks

The Department of Social Development has been instrumental in the establishment of a national organization called Foodbank SA. This organization obtains donated food from various sources and distributes it to the needy via various food-aid agencies (GCIS, 2012: 451-452).

3.6 GLOBAL STRATEGIES

3.6.1 The Millennium Development Goals and South Africa’s progress towards attainment

The MDGs established by the UN (Table 1.1) include global nutrition strategies with measurable goals to be achieved by 2015. To assist governments to develop action plans to accelerate progress and achieve the MDGs targets; a UN Development Programme (UNDP) acceleration framework was developed as an outcome of the 2010 MDG Summit (UNDP, 2012). To reduce malnutrition in children, extreme poverty and hunger needs to be eliminated (MDG 1) (UNICEF-WHO-The World Bank, 2012).

The State of Food Insecurity (SOFI) 2012 report emphasises social protection and effective government policies being vital to achieve hunger reduction (FAO, 2012).

The 2013 MDG Report (MDGR) acknowledges that in relation to the MDGs targets SA has had varied success in meeting the 2015 deadline. The target achievability is categorised as 'achieved', 'likely to be achieved' or 'unlikely to be achieved' (Stats SA, 2013a: 15). For each MDG there are UN stipulated indicators; however in addition to these, there are SA domestic relevant indicators (Stats SA, 2013a: 25). The data sourced to determine progress made with regards MDG1 in SA (Table 3.4) was from the 2005/2006 Income and Expenditure Survey (IES), the GHS released by Stats SA in 2012, the 2001-2007 Labour Force Survey, the 2008/2009 Living Conditions Survey (LCS), the 2011 Non-Financial Census of Municipalities, Census 2011, and the SA Social Security Agency (SOCPEN) 2001-2011 (Stats SA, 2013a: 25-26,119).

Table 3.4: MDG 1 and the 2015 target achievability by SA (Statistics SA, 2013a: 25-26)

THE MILLENNIUM DEVELOPMENT GOAL 1 AND THE ACHIEVABILITY OF THE SOUTH AFRICAN TARGETS BY 2015					
GOAL 1: ERADICATE EXTREME POVERTY AND HUNGER					
Indicators	1994 Baseline (or nearest year)	2010 Status (or nearest year)	Current status (2013 or nearest year)	2015 Target	Target achievability
TARGET 1A:					
Halve between 1990 and 2015 the proportion of people whose income is less than one \$ a day.					
Proportion of population below \$1.00 (PPP) per day	11.3 (2000)	5.0 (2006)	4.0 (2011)	5.7	Achieved
Proportion of population below \$1.25 (PPP) per day	17.0 (2000)	9.7 (2006)	7.4 (2011)	8.5	Achieved
Proportion of population below \$2.00 (PPP) per day	33.5 (2000)	25.3 (2006)	20.8 (2011)	16.8	Likely
Poverty gap ratio (\$1.00 (PPP) per day)	3.2 (2000)	1.1 (2006)	1.0 (2011)	1.6	Achieved
Poverty gap ratio (\$1.25 (PPP) per day)	5.4 (2000)	2.3 (2006)	1.9 (2011)	2.7	Achieved
Poverty gap ratio (\$2.00 (PPP) per day)	13.0 (2000)	8.1 (2006)	6.5 (2011)	6.5	Achieved
Poverty gap ratio (\$2.50 (PPP) per day)	18.0 (2000)	12.5 (2006)	10.3 (2011)	9.0	Likely
Share of the poorest quintile in national consumption	2.9 (2000)	2.8 (2006)	2.7 (2011)	5.8	Unlikely
TARGET 1B:					
Achieve full and productive employment and decent work for all, including women and young people.					
Percentage growth rate of GDP per person employed	4.7 (2002)	1.9 (2009)	1.5 (2011)	6.0	Unlikely
Employment-to- population ratio	44.1 (2002)	42.5 (2009)	40.8 (2011)	50-70	Unlikely
Percentage of employed people living below \$1 (PPP) per day	5.2 (2000)	No data	3.9 (2009)	0	Likely
Percentage of own-account and contributing family workers in total employment	11.0 (2000)	9.9 (2010)	10.0 (2011)	5	Unlikely

TARGET 1C: Halve between 1990 and 2015, the proportion of people who suffer from hunger					
Prevalence of underweight children under five years of age (%)	13.2 (1993)	10.2 (2005)	8.3 (2008)	4.7	Likely

Key: PPP=Purchasing Power Parity, GDP= Gross Domestic Product

In SA the MDG 1 achievability targets vary. The poverty rate has declined; however young people and women remain more vulnerable to poverty than others. Most MDG indicators in target 1A: to halve the proportion of people whose income is less than one dollar a day, which is extreme poverty, have already been achieved. The US poverty thresholds are adjusted to suit the SA cost of living through Purchasing Power Parity (PPP). Having a positive impact in this regard, and benefiting 14M people, is the social wages package which includes social grants, free schooling and primary health care, RDP housing and free electricity, water and sanitation. Unlikely to be achieved are the majority of target 1B MDG indicators relating to the achievement of full and productive employment for all. The global financial crisis and related higher food prices have impacted negatively on the poor in SA. Due to the disparity between the supply of and demand for jobs, the high unemployment rate remains. It is likely that the MDG indicator in target 1C, relating to the prevalence of underweight in under five years of age, will be achieved by 2015 as positive progress has been made in this regard thereby contributing to halving the proportion of people who suffer from hunger (Statistics SA, 2013a: 21-36).

Reduction of malnutrition is essential for under-five child survival (DGC 4). The target between 1990 and 2015 was to decrease the rate of under-five child mortality by two thirds. During 1990 and 2010, sub-Saharan Africa reduced this rate by 30.00 percent with 121 deaths in 1000 live births (2010). In 2010 this region in Africa had the highest level of under-five and neonatal deaths (35 per 1000 live births) (Statistics SA, 2013a: 63).

The results for the progress in SA for the attainment of the MDG indicators for Goal 4, to reduce child mortality, are presented in Table 3.5. The data for this goal was obtained from the 1998 SADHS, District Health Information system (DHIS), Statistics SA mid-year population estimates 2011 and the Civil and Registration and Vital Statistics Systems (CRVS) (Stats SA, 2013a: 63,120).

Numerous initiatives have been implemented by the SA government to address child mortality. The immunisation programme and HIV prevention of mother-to-child transmission (PMTCT) have had a positive impact on reducing the IMR and the under-five mortality rate (U5MR) in SA. Moreover, there has been a decrease in the incidence of diarrhoea and pneumonia. It is therefore most likely that the majority of MDG indicators related to MDG 4 will be achieved in SA by 2015 except for improving the child survival rate. This rate has been increasing since 2002 but is unlikely to achieve the 2015 target (Stats SA, 2013a: 61-69).

Table 3.5: MDG 4 and the 2015 target achievability by SA (Statistics SA, 2013a: 63)

MILLENNIUM DEVELOPMENT GOAL 4 AND ACHIEVABILITY OF THE SOUTH AFRICAN TARGETS BY 2015					
GOAL 4: REDUCE CHILD MORTALITY					
Indicators	1994 Baseline (or nearest year)	2010 Status (or nearest year)	Current status (2013 or nearest year)	2015 Target	Target achievability
TARGET 4: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate					
Under 5 mortality rate (per 1000 live births)	59 (1998)	67 (2007)	53 (2010)	20	Likely
Infant mortality rate (per 1000 live births)	54 (1998)	48 (2007)	38 (2010)	18	Likely
Proportion of one-year-old children immunized against measles (%)	68.5 (2001)	97.1 (2009)	99.1 (2011)	100	Likely
Immunization coverage under one year of age (%)	66.4 (2001)	93 (2009)	92.8 (2011)	100	Likely
Life expectancy at birth (years): • Males	50.0 (2002)	51.7 (2007)	56.8 (2012)	70	Unlikely
Life expectancy at birth (years): • Females	55.2 (2002)	56.1 (2007)	60.5 (2012)		

Improving the nutrition status of young children impacts positively on achieving other MDGs namely: universal primary education (MDG 2), promoting gender equality in primary school education (MDG 3), improving maternal health (MDG 5) and reducing HIV and AIDS (MDG 6) (UNICEF-WHO-The World Bank, 2012; UNDP, 2012).

Table 3.6: MDGs 2 and 3 and the 2015 target achievability by SA (Stats SA, 2013a: 38-40, 52)

MILLENNIUM DEVELOPMENT GOALS 2 AND 3 AND ACHIEVABILITY OF THE SOUTH AFRICAN TARGETS BY 2015					
GOAL 2: ACHIEVE UNIVERSAL PRIMARY EDUCATION					
Indicators	1994 Baseline (or nearest year)	2010 Status (or nearest year)	Current status (2013 or nearest year)	2015 Target	Target achievability
TARGET 3: Ensure that by 2015 boys and girls alike will be able to complete a full course of primary schooling					
Adjusted net enrolment ratio in primary education • Male • Female	96.5 (2002) 96.8 (2002)	98.8 (2009) 99.0 (2009)	98.9 (2011) 99.2 (2011)	100	Likely
Proportion of learners starting Grade 1 who reach last grade of primary school • Male • Female	89.2 (2002) 90.1 (2002)	91.8 (2009) 93.4 (2009)	93.4 (2012) 96.1 (2012)	100	Likely

GOAL 3: PROMOTE GENDER EQUALITY AND EMPOWER WOMEN					
TARGET 4: Eliminate gender disparity in primary education (other levels omitted from table)					
GPI primary education	0.97:1 (1996)	0.98:1 (2009)	0.96:1 (2011)	1:1	Likely

GPI= Gender Parity Index

As illustrated in Table 3.6, by 2015 it is most likely that all children will complete all the primary school grades (MDG 2) and gender disparity (MDG 3) in the primary school will be eliminated. Generally more boys are born than girls; however there are a similar number of both genders in primary school with slightly fewer girls than boys. SA is recognised internationally as a country of minimal gender disparities except with regard to the earnings of males and females. The data for MDG 2 and 3 was sex disaggregated data from the GHS, and Census 2011 (Stats SA, 2013a: 37-43, 51-53, 59,119).

The data relating to MDG indicators for improving maternal health (Goal 5) was ascertained by data obtained from the 1998 and 2003 District Health Information System (DHIS), 2001 Census, the 2007 Community Survey, DHIS and 2010 CRVS as presented in Table 3.7 (Stats SA, 2013a: 72,120).

Table 3.7: MDG 5 and the 2015 target achievability by SA (Stats SA, 2013a: 72)

MILLENNIUM DEVELOPMENT GOAL 5 AND ACHIEVABILITY OF THE SOUTH AFRICAN TARGETS BY 2015					
GOAL 5: IMPROVE MATERNAL HEALTH					
Indicators	1994 Baseline (or nearest year)	2010 Status (or nearest year)	Current status (2013 or nearest year)	2015 Target	Target achievability
TARGET 5A: Reduce by three quarters, between 1990 and 2015, the maternal mortality rate					
Maternal mortality ratio (per 100 000 live births)	150 (1998)	299 (2007)	269 (2010)	38	Unlikely
Proportion of births attended by skilled health personnel (%)	76.6 (2001)	94.3 (2009)	No update available	100	Likely
TARGET 5B: Achieve by 2015 universal access to reproductive health					
Antenatal care coverage (at least one visit and at least four visits) (%)	76.6 (2001)	102.8 (2009)	100.6 (2011)	100	Achieved

Various levels of achievability are stated for the different MDG 5 indicators in SA. One of the most important indicators, reduction in the maternal mortality ratio to 38 per 100 000 live births, is unlikely to be achieved in SA. Good progress has been made towards achieving the attendance of skilled health practitioners at 100.00 percent of births (Stats SA, 2013a: 70-77).

The antenatal care coverage indicator (Target 5B, MDG 5) has already been achieved with the probability that large numbers of foreigners have entered SA to use the antenatal facilities resulting in statistics greater than 100.00 percent being achieved in 2009 and 2011 (Stats SA, 2013a: 70-77).

Data was obtained from the GHS, the SA National HIV Prevalence register, the Incidence and Behavioural Survey 2012, the TB Electronic register (DoH) and the Malaria Information System (DoH) was used for Goal 6. In relation to this goal, Table 3.8 indicates that success was achieved before 2015 for some of these MDG indicators, namely the reduction of the TB death rate, the malaria incidence and death rate. Achievement of the same ratio of orphans to non-orphans attending school has been possible as the government has enabled orphaned children to continue their education. Encouraging is the likely attainment in SA of decreasing the prevalence of HIV in the 15-24 year age group. However it is most unlikely that 95.00 percent of this age group will have comprehensive correct HIV and AIDS knowledge by 2015 (Stats SA, 2013a: 78-88).

Table 3.8: MDG 6 and the 2015 target achievability by SA (Statistics SA, 2013a: 80-81)

MILLENNIUM DEVELOPMENT GOAL 6 AND ACHIEVABILITY OF THE SOUTH AFRICAN TARGETS BY 2015					
GOAL 6: COMBAT HIV AND AIDS, MALARIA AND OTHER DISEASES					
Indicators	1994 Baseline (or nearest year)	2010 Status (or nearest year)	Current status (2013 or nearest year)	2015 Target	Target achievability
TARGET 6A:					
Have halted by 2015 and begun to reverse the spread of HIV and AIDS					
HIV prevalence among population aged 15-24 years (%)	9.3 (2002)	8.7 (2008)	7.3 (2012)	4.2	Likely
Condom use at last incidence of high risk sex (%)	27.3 (2002)	62.4 (2008)	59.9 (2012)	100	Unlikely
Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV and AIDS (%)	66.4 (2005)	42.1 (2008)	48.5 (2012)	95	Unlikely
Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years	1:1 (2002)	1:1 (2008)	1:1.01 (2011)	1.1	Achieved
TARGET 6B:					
Achieve universal access to treatment for HIV and AIDS for all those who need it					
Proportion of population with advanced HIV infection with access to antiretroviral drugs (%)	13.9 (2005)	41.6 (2009)	75.2 (2011)	80	Likely
TARGET 6C:					
Have halted and begun to reverse the incidence of malaria and other major diseases					
Death rates associated with tuberculosis per 100 000 population	147	50	49	<147	Achieved
Incidence of malaria per 100 000 population	64 622 (2000)	8 066 (2010)	6 846 (2012)	32 311	Achieved
Death rates associated with malaria per 100 000 population	459 (2000)	87 (2010)	72 (2012)	229	Achieved

The data for MDG 7, presented in Table 3.9, was from the 2002-2011 GHS and the Population Census of 1996, 2001 and 2011. The 2015 target for 88.30 percent of the population using an enhanced source of water for drinking in SA has been reached. It is likely that 74.65 percent of the population will have better sanitation facilities by 2015. The lack of water and sanitation services is reported in the rural areas in SA (Stats SA, 2013a: 90, 93-94, 100-101).

Table 3.9: MDG 7 and the 2015 target achievability by SA (Stats SA, 2013a: 93-94)

MILLENNIUM DEVELOPMENT GOAL 7 AND ACHIEVABILITY OF THE SOUTH AFRICAN TARGETS BY 2015					
Goal 7: ENSURE ENVIRONMENTAL SUSTAINABILITY					
Indicators	1994 Baseline (or nearest year)	2010 Status (or nearest year)	Current status (2013 or nearest year)	2015 Target	Target achievability
TARGET 7C:					
Halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation					
Proportion of population using an improved drinking water source (%)	76.6 (1996)	84.4 (2001)	90.8 (2011)	88.3	Achieved
Proportion of population using an improved sanitation facility (%)	49.3 (1996)	53.6 (2001)	66.5 (2011)	74.65	Likely
TARGET 7D:					
By 2020 to have achieved a significant improvement in the lives of at least 100M slum dwellers					
Proportion of urban population living in slums	No data	No data	No data	N/A	N/A

3.6.2 Micronutrient Initiative Strategy

The Micronutrient Forum (MF) was formed in 2006 with subsequent global meetings in 2009 and 2011. The primary focus of this forum is on worldwide populations deficient in the “big five” micronutrients: Vit. A; Fe; Folate; Iodine, and Zn. (Kraemer et al., 2012: 27).

In 2008 the world’s leading economists at the Copenhagen Consensus ranked micronutrient supplementation as vital for MDG 1 to eradicate extreme poverty and hunger (Copenhagen Consensus Centre, 2008).

The Micronutrient Initiative (MI) Strategic Plan (2013-2018) is committed to the eradication of hidden hunger in developing countries especially in the two vulnerable groups of women and children (The Micronutrient Initiative, 2012). With an increase in the Vit. A and Zn intake in children under five, the mortality rate will decrease (MDG 4). Increased Fe and iodine intake will impact on a child’s cognitive development and consequently their educational achievements, enabling the achievement of universal primary education (MDG 2). To improve maternal health (MDG 5), the MI was intent on improving the

Fe, Iodine and Folic acid intake and thereby decreasing the effects of IDA (The Micronutrient Initiative, 2012).

3.6.3 Scaling up Nutrition

In 2010 a global Scaling up Nutrition (SUN) movement was formed bringing organisations together to establish and support initiatives for increased investment for countries to diminish hunger and undernutrition by 2015. Dr Nabarro, the UN leader of SUN, stressed that the main investors are national governments. However, there is support by The World Bank, the U.S. Agency for International Development (USAID) and different UN sectors (UNICEF, World Food Programme (WFP), FAO, WHO) (Kraemer et al., 2012: 111-112). By 2012, 28 countries mostly from Africa joined the network to benefit from the nutrition-sensitive programmes in five different sectors: Public Health, Agriculture and Food security, Poverty reduction, Social protection and Education (SUN, 2012). Mid 2014 there were 54 member countries (SUN, 2014).

Numerous SUN interventions relate to micronutrient deficiencies. These are outlined by Kraemer et al. (2012:11) as Vit. A, Zn and Iron-Folic acid supplementation, multiple micronutrient powders, salt iodization or iodized capsules and Fe fortification of staple foods. During 2012, the positive role and achievements of the SUN initiative were highlighted at the G20 Summit, the Sustainable Development Conference Rio+20 and at the 'Global Hunger Event'. The latter was held at the close of the London Olympic Games with international leaders intent on a 25M reduction in stunting by the start of the 2016 Brazil Olympic Games (SUN, 2012; UNICEF-WHO-The World Bank, 2012). Half of the SUN countries have a stunting prevalence of at least 40.00 percent with varying rates of achievement (SUN, 2012).

3.6.4 WHO and FAO new global nutrition strategy for 2012-2025

The WHO and FAO devised a new nutrition strategy (2012- 2025) culminating in the World Health Assembly (2012) publishing six global nutrition targets for achievement by 2025 to impact on the health and economic status of individuals globally. The nutrition targets relating to children and infants aims for improved anthropometry by reducing the prevalence of stunting by 40.00 percent, wasting to lower than five percent, no increase in overweight prevalence and a 30.00 percent decrease in low birth weight (SUN, 2012).

3.7 CONCLUSION

The SOFI report emphasises that an excessive number (852M) of people in developing countries were still malnourished (FAO, 2012). Globally, this percentage is unacceptable but differs between countries and regions.

The SA government has recognised the necessity to reduce malnutrition which affects millions of children. This cannot be achieved unless poverty is eliminated, unemployment reduced, basic services are provided for an improved quality of life, and basic education is improved with an increase in Grade R attendance and an emphasis on quality Early Child Development (ECD). NE is required to facilitate dietary shifts for a healthy lifestyle which will impact on increasing occurrence of obesity in children (Stats SA, 2013a: 19-20, 35, 40).

The following chapter describes the methodology and results of the baseline study conducted as part of this research.

CHAPTER 4: BASELINE STUDY METHODOLOGY AND RESULTS

4.1 INTRODUCTION

The aim of this baseline study was to establish the need for nutrition education (NE) and to identify effective nutrition educational tools (NETs) for Grade R learners in government and private urban schools in built-up areas of Durban.

A study conducted by Matvienko (2007: 284) established that six and seven year olds receiving nutrition and food education can result in these children selecting healthier food options. Effective NE will result in a general understanding of food and nutrition with the individual realising the need for the behaviour and attitude change (Contento, 2011: 45). Many different teaching methods have been identified by the Food and Agricultural Organisation (FAO) (2005) for teaching nutrition concepts to this age group. The FAO advocates that the learning activities must be fun, age-appropriate, stimulating and encourage active participation. It is suggested that NE is taught through art, singing, games, stories, field trips, role play, puzzles, the computer and food models.

Proper planning, research design and measuring instruments are critical components in gathering good quality data. The methods for each of these and the results are discussed in this chapter.

4.2 PERMISSION

The research proposal was submitted and approved in 2010 by the Faculty of Applied Sciences Faculty Research Committee (FRC) and the Higher Degrees Committee (HDC) at the Durban University of Technology (DUT) prior to the commencement of the study (proposal ratification letter attached). Approval from the FRC is part of the proposal approval which includes a section on ethics (section C), attached. The human study was categorised as Category 2: reviewed as minimal risk to humans, animals or environment. The study was not approved by the DUT Institutional Research Ethics Committee (IREC) as this committee was only constituted during 2011. Prior to this date all Faculty applications were dealt with at FRC and HDC level.

Consent was obtained from Professors Oldewage-Theron and Napier, to use the primary school English medium nutrition knowledge questionnaire (NKQ) that was developed for a baseline study survey in 2007 for Life Skills educators in the Vaal region (Oldewage-Theron and Napier, 2011: 285). An email requesting permission for the Grade R teacher/s to complete a nutrition education questionnaire (NEQ) was sent to a member of the management team (Annexure A) at the schools identified to take part in the Durban baseline study. A letter (Annexure B) outlining the purpose of the survey, the benefit and the confidentiality of the information, accompanied the questionnaire that was sent to the Grade R educators. No incentives were offered nor were the educators pressurised into answering the questionnaire. The identity of the Grade R teacher was protected as no names were required on the

questionnaire. Confidentiality was applied as the participating schools were allocated numbers and no school names were recorded in the data.

The questionnaires were locked away in a cupboard in an office in the Department of Food and Nutrition, DUT, with only the supervisor and researcher having access to the data. After a period of five years the questionnaires will be shredded and disposed of.

4.3 STUDY DESIGN

An empirical study design was used to collect data regarding the need for nutrition education in Grade R and the appropriate NETs. The baseline study was designed as a survey using quantitative measures.

This baseline study was carried out in four phases:

Phase 1: Literature review

This phase involved a study of scientific literature significant to the study.

Phase 2: Planning of the baseline study

This phase included various activities:

- obtaining consent to use an existing NKQ
- obtaining permission from schools for Grade R educators to participate in the survey.

Phase 3: Implementation of the survey

The surveys were sent to the schools and the completed questionnaires were returned to the researcher.

Phase 4: Reporting on results

The results will be discussed in this chapter.

4.4 STUDY TYPE

A descriptive observational study design was used in the form of a survey to quantify the need for NE in Grade R in Durban and to identify the most suitable NETs for this group of learners. No intervention on the part of the researcher took place during the research data collection as it was a self-administered questionnaire (Annexure C).

4.5 STUDY VARIABLES

The questionnaire used included questions about which grades offer NE, what NETs are used in Grade R and how much time is allocated to NE. In addition, the educator's opinion was sought on: the need for NE in Grade R; the type of NETs that may work for this age group; the most suitable visual representation of food items, and the choice of colours and language appropriate for Grade R NETs.

4.6 STUDY POPULATION AND SAMPLING

The Department of Basic Education (DBE) indicated that in KZN, the only urban district in this province is part of the Coastal Cluster which has 13 government and 13 private pre-primary schools (KZN Department of Education (DoE), 2012: 3).

For this baseline study, the stratified random sampling procedure was used to select 25 primary schools: government or private, boys' or girls' or co-educational, in the urban built-up areas of Durban. However, four of these schools did not have a Grade R class. Principals at the remaining 21 schools agreed to allow the Grade R teachers to participate with twelve government and 8 private schools completing the survey.

The following was excluded in the baseline study: educators of other grades, schools outside the Durban urban built-up areas and schools which did not have a Grade R.

4.7 DATA COLLECTION

The measuring instrument that was used by the researcher for this descriptive study was a self-administered NEQ. As there was no interviewer, instructions were clear for the completion and return of the questionnaire. Confidentiality was maintained as the participating school was allocated a number, with no names recorded in the data.

An existing validated NEQ tested as part of a study for equivalence reliability by Oldewage-Theron and Napier (2011: 285) was used to determine the need for NE in pre-primary schools and for suitable NE material. This instrument had been evaluated for reliability and validity and was suited to the South African situation. The questionnaire comprised a total of 10 questions with a mixture of open-ended and closed questions, with some of the closed questions having an 'other' category where the respondent could include their own responses to the question.

4.8 ADMINISTRATION OF THE MEASURING INSTRUMENT

Once permission to participate had been granted by the Principal of the school, the NEQ was sent to the school for the attention of the Grade R teacher. The majority of the questionnaires were sent by email, one was faxed and in three instances the questionnaire was hand-delivered to the Grade R teacher.

The Grade R teacher completed the NEQ in their own time. In some schools there was more than one Grade R class which resulted in two or more educators having input into the answering of the questionnaire. The majority of the surveys were returned to the researcher via fax, one via email and three by hand. The researcher checked each questionnaire after receiving it for completeness in order to include it in the final database.

4.9 DATA ANALYSIS AND STATISTICS

Twenty schools (government n=12 and private n=8) of the 21 approached to participate, returned the surveys, a response rate of 95.00 percent. The questionnaire was coded so that every variable had a numeric code. For open-ended questions, the responses were grouped according to themes.

The data was captured onto a Microsoft Excel® spreadsheet before being cleaned and analyzed using the Statistical Package for Social Science (SPSS) program, Windows version 17.0. Descriptive (frequencies) statistics were determined and interpreted with the assistance of a statistician.

4.10 RESULTS AND DISCUSSION

The results and findings of each survey question are discussed in this section.

4.10.1 Is nutrition education in the pre-primary school curriculum?

At the outset it was important to establish if NE was part of the pre-primary school syllabi. One respondent failed to answer this question but the remainder of the educators all confirmed that NE was included in the Grade R syllabus. A similar percentage was indicated in the 2007 Vaal baseline study, where the majority (93.10 percent) agreed that nutrition was part of the Life Orientation (LO) syllabus (Oldewage-Theron and Napier, 2011: 285). This was reiterated by 97.80 percent of SA educators representing the nine provinces in a baseline survey conducted by Oldewage-Theron and Egal (2012: 4). Within the LO Learning Area, is the Life Skills Learning Programme where NE is covered under the Health Promotion Learning Outcome (DBE, 2012: 16-17).

In comparison, currently a five year (2010-2014) European Union funded ToyBox study is being implemented in six countries (Germany, Spain, Belgium-Flanders, Bulgaria, Poland and Greece) for preschool children in the four to six age groups for healthy lifestyle promotion to prevent obesity (Nethe et al., 2012: 118). In the United States (US) there was a dearth of NE programmes for preschool children in relation to increasing healthy behaviours. However, the Head Start Centres offer a Healthy Start curriculum based on recommendations of the American School Health Association which includes a nutrition unit (D'agostino et al., 1999: 217-218).

4.10.2 Which pre-primary grades offer nutrition education?

As seen in Figure 4.1, NE was in the Grade R (Grade 0) syllabi, with NE included in Grades 00 (25.00 percent) and Grade 000 (15.00 percent) to a lesser degree. In most of the schools in this survey, Grade R was the lowest grade, which could account for the responses relating to NE in the lower grades (Grade 00 and Grade 000).

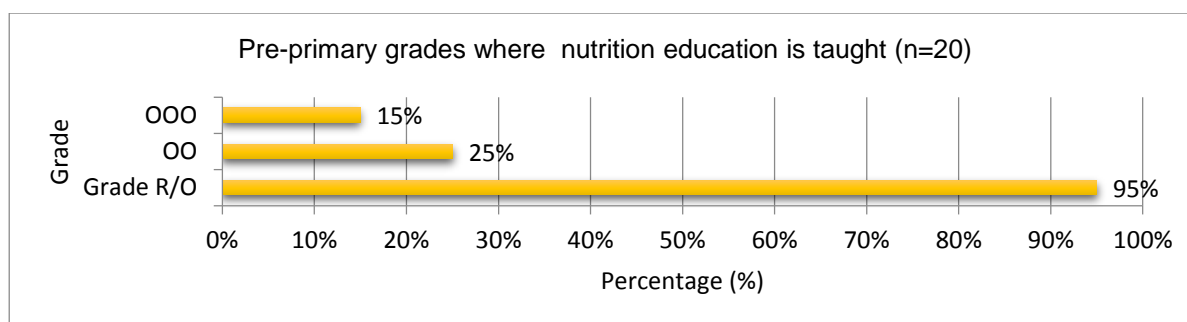


Figure 4.1: Pre-primary grades where nutrition education is taught.

4.10.3 Nutrition education tools currently used by Grade R educators

A variety of tools used for NE were recorded by the educators in this survey. These included actual food samples such as fruit, tasting sessions, games, puzzles, charts and posters, books, work books/sheets, pictures, songs, interest tables and fictional stories incorporated into ring times. The educator's opinion of the effectiveness of various NETs will be discussed under 4.10.6.

Similar NETs have been noted in a variety of preschool interventions to improve nutrition and health knowledge. However, Oldewage-Theron and Egal (2012: 4) commented that NE games and puzzles are expensive as they are imported from the US. This means that the majority of schools in SA are not able to purchase these NETs.

The use of games, quizzes, flash cards, and an activity book for home and the tasting of food were used in the 'Be Smart' study (Warren et al., 2003: 289). The Healthy Buddies Programme used memory card games and examples of healthy foods (Stock et al., 2007: 1061). A CD of songs as well as fruit and vegetables offered throughout the day were part of the German Tigerkids study (Bayer et al., 2009: 123). Posters were used in the one year Australian Tooty Fruity Vegies School programme (Adams, Zask and Dietrich, 2009: 113), a study in China by Hu et al. (2009: 255) and one in Greece by Manios et al. (1999: 150). The latter study also used workbooks (Manios et al., 1999: 150) whilst story books were used in the interventions by Adams, Zask and Dietrich (2009: 113) and Hu et al. (2009: 255). Cason (2001: 161,163), in research conducted in the US on a preschool NEP based on the theory of multiple intelligences, observed that "stories, books, cassettes, videotapes, cooking, field trips, games, posters, discussions, computer lessons, tasting parties, songs, puzzles, art puzzles, art projects, role playing, and puppets" were the activity-based learning experiences which supported the eight intelligences and increased nutrition knowledge and improved the attitude of the learners. Food-based activities or experiences are one of the best ways to teach children about nutrition according to the FAO (2005).

Magazines were a valuable nutrition educational resource, indicated by 68.90 percent of the respondents in the SA baseline survey (Oldewage-Theron and Egal 2012: 4) and mentioned by the Durban Grade R educators. No schools in this Durban survey made mention of textbooks as a NET.

It is evident that Grade R educators in this study are not provided with a teaching manual or teaching material. In the SA baseline survey, 95.60 percent of the schools claimed that they had NE textbooks for use (Oldewage-Theron and Egal, 2012: 4). When teaching resources are provided it lessens any inherent variations in the delivery of the NE, with this being evident in a successful intervention by Manios et al. (1999: 150).

Other ways of imparting NE, mentioned by Durban educators, were practical discussions with the children on the difference between healthy and unhealthy food, lunch/snack box content and tuck day purchases. In the Tooty Fruity Vegie in Schools programme, the fruit and vegetable servings in the lunch-boxes of the intervention group significantly increased as a result of the education received by both preschool children and parents to encourage healthy eating. The children were also involved in cooking classes as well as growing fruit and vegetables (Adams, Zask and Dietrich, 2009: 114).

In the SA baseline survey, 62.20 percent of educators made use of visits from health specialists and the local clinic were cited as a source of nutrition information (Oldewage-Theron and Egal, 2012: 4). Similarly, the Tooty Fruity Vegie in Schools Programme invited health professionals periodically to the school for interactive learning sessions to reinforce the link between food intake and health for children, educators and parents (Adams, Zask and Dietrich, 2009: 114).

Some of the Durban schools imparted nutrition knowledge to parents and family through educational talks. If there is a close association between the family, community and school environment it has a positive effect on a classroom curriculum according to the FAO (2005) and they need to be closely linked to determine what will be learnt and how this learning will take place. A number of multi-component school-based NEPs have been found to be successful (Perez-Rodrigo and Aranceta, 2001: 132). It is reported that parental involvement had a positive effect in a number of preschool-based NE interventions (Manios et al., 1999: 150; Hu et al., 2009: 258; Adams, Zask and Dietrich, 2009: 114; Danielzik et al., 2005: S82, and Bayer et al., 2009: 123).

4.10.4 Time allocated to nutrition education in Grade R

Figure 4.2 represents the amount of time allocated to NE in Grade R. The findings reveal that 55.00 percent of the schools spend 30 minutes per week, with 20.00 percent allocating one hour to NE. This is consistent with other findings in SA as the results from the 2007 Vaal baseline study indicate that 58.62 percent of the schools spent between 30 to 60 minutes per week on NE (Oldewage-Theron and Napier, 2011: 285). Similar results were observed in the SA baseline survey which revealed that 60.00 percent of the schools allocated less than 60 minutes per week for NE (Oldewage-Theron and Egal, 2012: 4).

Twenty percent of the Durban educators, as reflected in Figure 4.2, indicated that no specific time was allocated weekly to NE as it varied depending on the term and its theme. Half the educators (50.00 percent) mentioned that NE was continuous, as every day the lunch-boxes were checked to reinforce

healthy and unhealthy eating. This is ideal as the classroom becomes a “laboratory” for practical nutrition related activities (FAO, 1997).

The results of the survey reveal there were inconsistencies in the time devoted to NE in urban schools in built-up areas in Durban. The FAO (2005) Food and Nutrition Division states that in the past NE in schools has been relatively neglected and limited, which is evident in some of the Durban schools surveyed. In different countries the weekly contact time for five to six-year-olds for year-long programmes to improve healthy eating and physical activity was about two hours (Manios et al., 1999: 150, and Hu et al., 2009: 292). In contrast, for the two year Tigerkids intervention five hours per week was allocated. This programme was found to have a significant dietary behaviour impact on the kindergarteners (Bayer et al., 2009: 123-124). Due to the short concentration span of this age group classroom based lessons in The Hip-Hop to Health Programme were limited to 20 minutes (Fitzgibbon et al., 2002: 293) with 30 minute lessons held in the Healthy Buddies Programme (Stock et al., 2007: 1061).

Sherman and Muelhoff (2007: 335) reported that limited time is dedicated to NE in school curricula worldwide as it is often integrated into existing subjects. It is therefore essential that educators use effective and appropriate educational tools to teach nutrition concepts in schools. Appropriate time is emphasised by Perez-Rodrigo and Aranceta (2001: 132) as crucial for the success of a NEP (FAO, 2005).

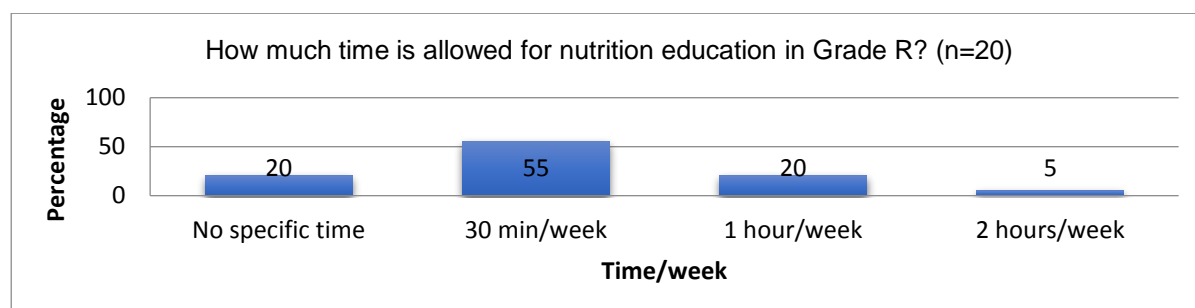


Figure 4.2: Time allocated to nutrition education in Grade R

4.10.5 The need for nutrition education in pre-primary school

Perez-Rodrigo and Aranceta (2001: 132) are of the opinion that NE needs to be school-based. This was confirmed by the Grade R educators in Durban where 95.00 percent were in agreement that NE is needed in the pre-primary school and similarly, 91.00 percent of educators in the SA baseline survey agreed that NE should be in primary schools (Oldewage-Theron and Egal 2012: 4).

In pre-primary school, a multidisciplinary theory-based approach has been recognized by experts as a necessity to accomplish healthy eating behavioural changes (Nethe et al., 2012: 118). Kindergarten children are of an ideal age as they are curious for knowledge and keen to learn although reasoning ability is limited. At this age children are starting to desire independence and food selection is specific

(Contento, 2011: 398). However, nutrition knowledge alone will not necessarily result in the desired behavioural change unless the nutrition education programme (NEP) addresses various biological, sensory-affective, psychological and social environmental determinants of behaviour (Contento, 2011: 37-38, 45).

Various reasons were provided by the Durban Grade R educators as to the need for NE specifically in pre-primary school; the 21st century child has poor eating habits and many have unhealthy diets with prevention being better than cure. In addition, peer pressure at this age resulted in junk food being eaten. The Grade R educators stated it was therefore essential to develop good healthy eating habits from an early age to enable nutritious food choices essential for developmental growth, good health and wellbeing. Research has confirmed that a child will learn from other children, parents and educators through observation so self-regulation needs to be fostered (Contento, 2011: 394,398).

The SA Minister of Basic Education, Angie Motshekga, at a celebratory breakfast event in the Eastern Cape, said that school nutrition was a government priority. Besides providing 8 million (M) school children daily with a nutritious breakfast meal through the Tiger Brands Foundation initiative, Motshekga also stated that children received NE at school where they were taught good dietary and lifestyle habits (DBE, 2013).

The Grade R educators felt that children do need to be aware of health benefits. However, Contento (2011: 394) has established that young children have difficulty understanding the health effects of food in the body. Nevertheless, reaching children at a critical age provides the opportunity for a healthy life, an opinion held by the FAO (2005) and reiterated by Perez-Rodrigo and Aranceta (2001: 132).

Nearly all (97.80 percent) of the educators in the SA survey agreed that NE is required in schools (Oldewage-Theron and Egal, 2012: 4) reiterating the stance of the FAO (2005) Food and Nutrition Division that recognizes schools as the perfect environment for NE. This is due to the interaction and influence of educators, family and the community which would be more beneficial if NE was provided to these different groups. This was agreed by the respondents of the SA baseline survey, where it was indicated that parents (86.70 percent) and educators (82.20 percent) also need NE (Oldewage-Theron and Egal, 2012: 4).

Further comments, from the Durban Grade R educators were that some children have a strong influence on parents' food shopping habits and the parents therefore often succumb to pressure and buy unhealthy foods. Due to time constraints, parents often resort to easy options for school lunches, providing unhealthy foods frequently observed in the lunch-box checks. Therefore it is crucial that parents are involved in the child's NE to enable reinforcement to occur which leads to more effective learning by the preschool child (Contento, 2011: 396).

The results of this Grade R survey indicate that NE is vital for children from pre-primary school upwards and also for the parents.

4.10.6 Educators' perspective on effective nutrition education tools for Grade R

The survey listed nine different educational tools, as shown in Figure 4.3. The teacher was asked to select what was considered to be the most effective NETs for Grade R. All (100.00 percent) of the respondents felt that role-playing would be the most effective NET, a learning activity supported by Contento (2011: 394) as well suited to this age group.

85.00 percent of the Durban educators were in favour of activity books, with a similar response of 75.86 percent in the Vaal region (Oldewage-Theron and Napier, 2011: 285). An age appropriate workbook was used in successful school-based health education intervention studies by Manios et al. (1999: 150) and Warren et al. (2003: 289) which allowed for parental involvement with the homework.

Puzzles were seen as beneficial by 85.00 percent of Durban educators, with 65.52 percent agreement by the Vaal educators (Oldewage-Theron and Napier, 2011: 285) whilst it was not a popular choice of the respondents (26.70 percent) in the SA survey (Oldewage-Theron and Egal, 2012: 4).

Crossword puzzles were not favoured as a teaching tool for nutrition by the majority (95.00 percent) in this survey. Nor was the use of pamphlets, although the educators suggested that this means of communication could be used for imparting NE to parents who are recommended partners in a NEP to ensure success and sustainability (FAO, 1997). According to the SA baseline survey, pamphlets were the second most popular method used for NE by 68.90 percent of schools (Oldewage-Theron and Egal, 2012: 4). A pre-school NE intervention in China (Hu et al., 2009: 255) made use of pamphlets as a tool to educate parents which aided in significantly improving the nutrition knowledge of the parents after one year.

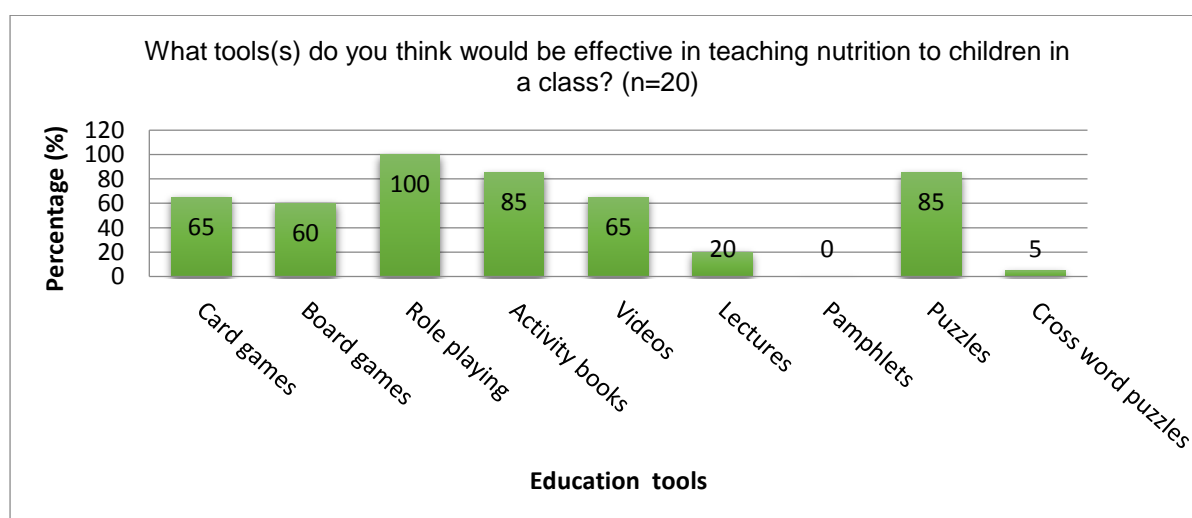


Figure 4.3: Grade R educators' perspective on the effectiveness of nutrition education tools for Grade R children

The choice of lectures as a tool was not a popular choice by the Grade R educators (20%) which was similar to the SA survey; only 24.40 percent used this method for NE (Oldewage-Theron and Egal, 2012: 4).

The majority of Durban educators were in favour of card and board games (65.00 and 60.00 percent respectively) as NETs with a similar trend being observed in Vaal respondents (68.96 percent) (Oldewage-Theron and Napier, 2011: 285). Games were one of the preschool activities used in the curriculum of an effective NEP (Cason, 2001: 163).

Posters were also mentioned under 'other' in the Durban survey as being a successful tool for imparting NE. Posters were one of the educational tools used in a Greek study by Manios et al. (1999: 150) which had a significant impact on improving the healthful eating knowledge of six year olds. In China a kindergarten-based NEP used a series of nutrition pictorial posters covering healthy and unhealthy dietary lifestyles. The posters were displayed in the classroom throughout the one year programme and were one of the educational tools used that contributed to a decrease in unhealthy food choices by these children (Hu et al., 2009: 255,259). Pictorial posters of 'Better Foods' and 'Foods better left out' were used in the Tooty Fruity Veggie School intervention which contributed to the positive effects of this programme on health promotion (Adams, Zask and Dietrich, 2009: 113). Sixty percent of the respondents in the SA survey indicated a need for posters and wall charts. In comparison, colouring books and videos were each favoured more by the participants (71.10 percent) in the SA survey (Oldewage-Theron and Egal, 2012: 4). The educational benefit of videos was acknowledged by slightly fewer Grade R educators (65.00 percent) in Durban.

No suggestion for using the internet or CD-ROMs was made by educators in this survey, a technology which Perez-Rodrigo and Aranceta (2001: 132) propose for providing interactive nutrition learning. For the Tigerkids Study a website was created to provide information and support to parents as well as educators to improve healthy eating and increase physical activity (Bayer et al., 2009: 123). The use of multimedia educational tools was corroborated by Roseman, Riddell, and Haynes (2011: 2) in a review of 2000-2008 school based nutrition interventions from kindergarten to Grade 12.

Other examples of effective NETs mentioned under the 'other' category by 30.00 percent of the educators were songs and hand puppets, as a show or story aid. In a US study by Fitzgibbon et al., (2002: 293) puppet characters were used as representatives of food groups (Miss Dairy, Mr Fat, Miss Sugar, Miss Fruit, Mr Vegetables, Mr Protein and Miss Grain) to help preschool children grasp this concept. Similarly, a fruit and vegetable puppet show was used in the Tooty Fruity Veggie in Schools programme (Adams, Zask and Dietrich, 2009: 114). Story telling with the aid of a nutritionally themed illustrative book was used as one of the educational tools in a successful Chinese pre-school intervention by Hu et al. (2009: 255).

Fantasy games, dances and dramas were also other examples of valuable NETs mentioned in the 'other' category by the Grade R educators. This play approach, based on Piaget's theory of learning, is one of the suggested successful methods of transferring nutritional knowledge (Lucas and Feucht, 2008: 236). The play approach was used in the Tooty Fruity Veggie School Programme to introduce the preschool children to new foods (Adams, Zask and Dietrich, 2009: 114).

Grade R educators also suggested experiences of 'real food and baking' as a beneficial interactive component of NE. This is affirmed in the Tooty Fruity Veggie School intervention by Adams and colleagues (2009: 114) where parents and children were participants of healthy cooking classes. Research has indicated that food-based activities are useful to improve both NE (Contento, 2011: 395) and the consumption of fruit and vegetables for healthier dietary habits in preschoolers (Witt and Dunn, 2012: 113). Snack choices in six year olds improved significantly in a NutriActive Healthy Experience programme as a result of NE combined with a healthy snack (Matvienko, 2007: 282).

The FAO (1997) reports that NEPs implemented in developing countries in the 1970's and 1980's failed to produce any significant food-related behavioural changes due to ineffective methods, inappropriate messages and ignoring the local culture. Learning material for the Zambian Nutrition Education in Basic Schools (NEBS) project featured activities with pictures of local scenes with child characters as well as a remember message and a take-home message. This research revealed that the NE learning materials and activities need to be appropriate to the culture and age group of the community. In addition, it was observed that the educators' need training in the use of the learning materials otherwise activities were ignored due to unfamiliarity (Sherman and Muelhoff, 2007: 340).

It is therefore important that the tools used in NE are developmentally appropriate and effective and the environment in which they are used is nonthreatening (Contento, 2011: 395). For NE to empower a person to change behaviour in the long term, the method of delivery needs to be carefully considered. Unless there is interaction between the learner and the educator the NE will be ineffectual (FAO, 1997).

4.10.7 Educators' perspective of nutrition education tools that children will enjoy

Educators were asked to select from the nine NETs mentioned in the survey, which tools that they thought children would enjoy the most. Research has established that only a small percentage of schools (11.10 percent) in SA currently were using NE games (Oldewage-Theron and Egal, 2012: 4).

Figure 4.4 shows that role playing was perceived by 90.00 percent of the respondents to be the most enjoyable NET for children. Puzzles (70.00 percent) and activity books (65.00 percent) were selected as tools that were popular amongst children in Durban. The use of board games as well as card games (both 60.00 percent) was considered by the Durban Grade R educators to be enjoyable tools for NE. Respondents (51.10 percent) in the SA survey, requested card games as a NET.

The Durban educators were of the opinion that lectures, crossword puzzles and pamphlets brought little or no enjoyment to children (90.00 percent, 95.00 percent and 100.00 percent respectively). These tools are usually neither creative nor engaging and are therefore also considered ineffectual by Perez-Rodrigo and Aranceta (2001: 132).

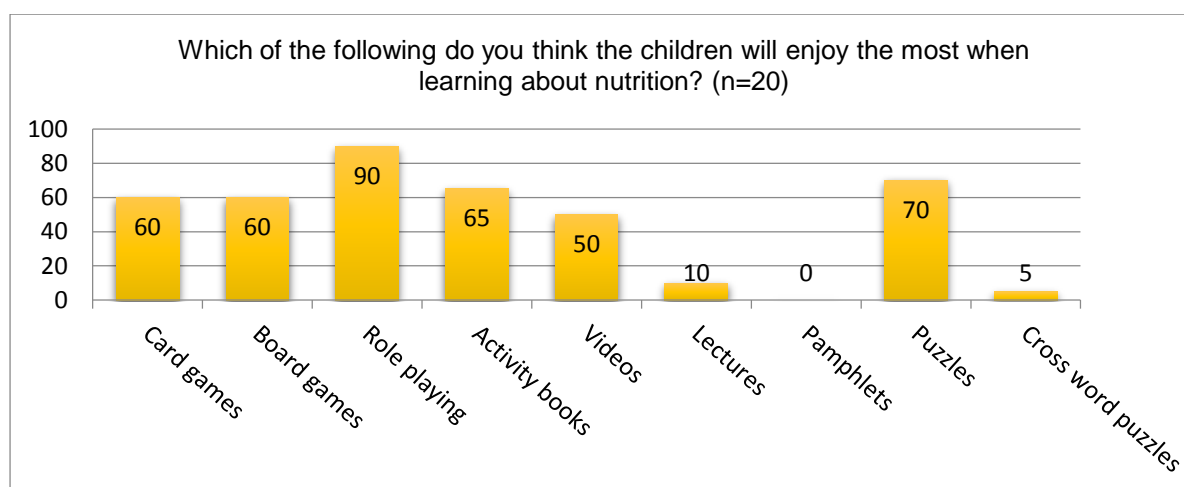


Figure 4.4: Grade R educators' perspective on the children's enjoyment of different nutrition education tools

The enjoyment of preschool children reading a book and tasting food was not gauged in this Grade R survey; however in other interventions these NETs were found to be popular (Cason, 2001: 163). Adams, Zask and Dietrich (2009: 114) included music, art and a drama activity in the educator's manual for the Australian Tooty Fruity Vegie programme to improve healthy eating.

4.10.8 Colours that appeal to children for use in nutrition education tools

All the educators (100.00 percent) unanimously agreed that for NETs the children would enjoy bright colours rather than the use of black and white or pastel colours. This was endorsed with a 95.50 percent agreement in the SA survey (Oldewage-Theron and Egal, 2012: 4). Furthermore, Contento (2011: 371) advocates the use of colour in visuals for NE as it increases attention although it should be used sparingly with a maximum of three colours (refer figure 4.5).

4.10.9 Food pictorial presentation suitability for children

Contento (2011: 413) emphasises that the use of visuals can be powerful to improve learning and motivation. Figure 4.5 indicates that 95.00 percent of the educators' responded to this question, to determine the most suitable pictorial presentation of food items for a child. Photographs as well as colour drawings and cartoons were the different pictorial options for selection in this survey.

The results, as detailed in Figure 4.5, reveal that 48.00 percent of the educators felt that photographs would be the most understandable medium to use. However, Contento (2011: 413) advocates that the photographs need to be culturally appropriate. The second most popular choice (26.00 percent) expressed in the survey was the combination of photographs and colour drawings. Related evidence

is noted where Manios et al. (1999: 151) used colour illustrations and Cason (2001: 162) made use of colour food pictures for NEP evaluation instruments for young children. The choice of either photographs or colour drawings for NETs was endorsed in the SA survey by 62.20 percent of the respondents (Oldewage-Theron and Egal, 2012: 4).

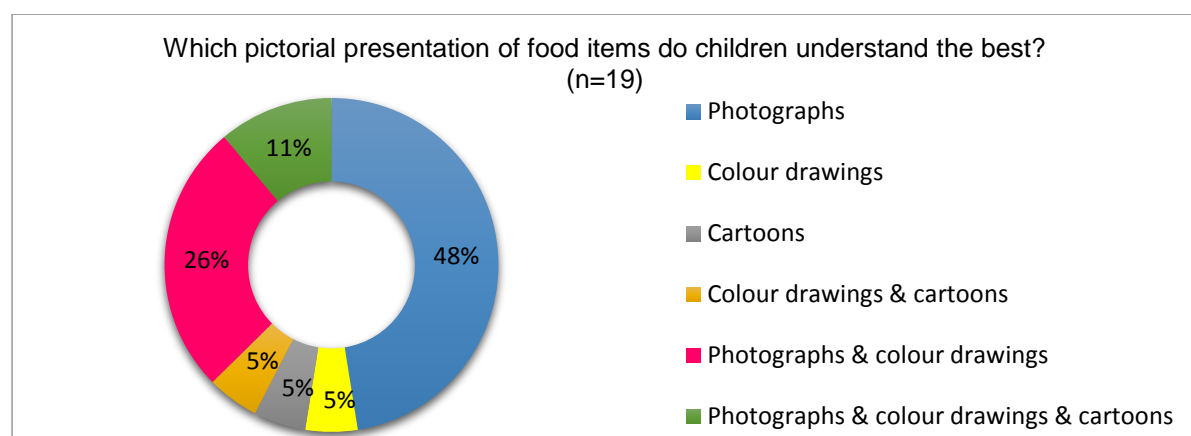


Figure 4.5: Which pictorial presentations of food items do children understand the best?

The use of the three media (photographs, colour drawings and cartoons) was recommended by 11.00 percent of the Durban Grade R educators as being suitable for preschool NETs. Any visual, either artwork or photograph needs to be assessed for its appropriateness to the target audience. Drawings should be clear and simple with the appropriate choice of colour holding attention making an effective visual (Contento, 2011: 413).

Although actual food items were not one of the variables in this question, 11 percent of the respondents stated that having the real food item as a NET would be ideal for a child's understanding. The use of this visual aid is endorsed by Contento (2011: 368) for groups not larger than 20. As the genuine food item can improve motivation and increase knowledge retention it has been used in a few successful preschool education programmes: Tigerkids (Bayer et al., 2009: 123), Hip-Hop to Health (Fitzgibbon et al., 2002: 293), Healthy Buddies Programme (Stock et al., 2007: 1067) and Be Smart (Warren et al., 2003: 289).

4.10.10 Choice of language for nutrition education materials

Educators were requested to identify the preferred language to be used on nutritional educational materials where English was the language of instruction. One respondent (5%) did not select any of the options, as he/she stated this was not applicable in Grade 0, resulting in a 95.00 percent response rate. Figure 4.6 illustrates that the child's home language was the preferred choice of 42.00 percent of the educators.

The use of both English as the second language and the home language on educational tools was considered ideal by 37.00 percent of the respondents but cited as impractical. In comparison, the majority of SA educators (75.60 percent) surveyed, would prefer the use of both languages in the

educational materials (Oldewage-Theron and Egal, 2012: 4). Twenty-one percent of the Grade R educators were of the opinion that only English should to be used on the NETs.

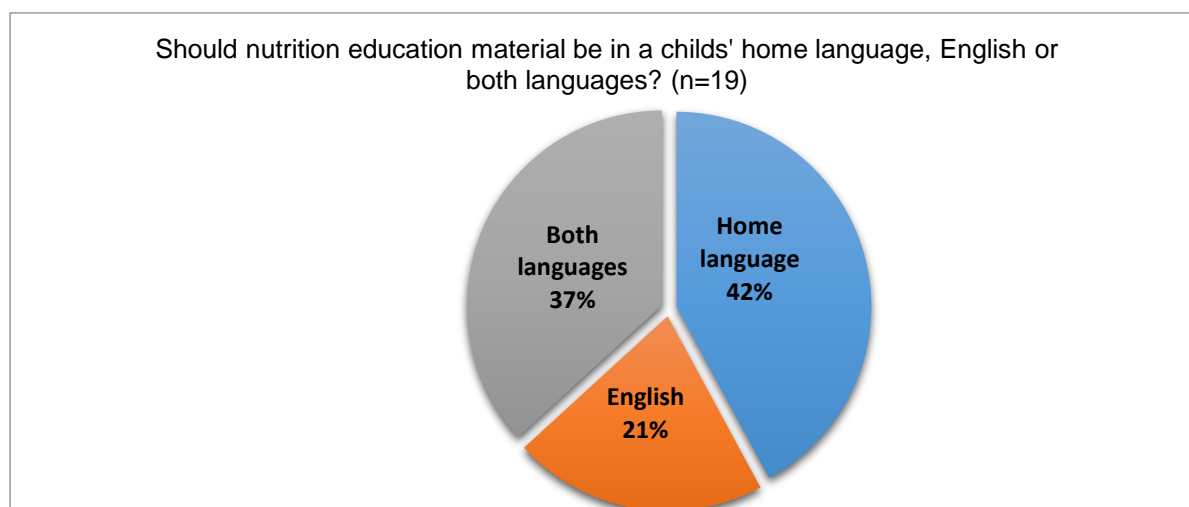


Figure 4.6: Grade R educators' perspective of choice of language on nutrition education materials

To enhance cultural appropriateness, it is recommended by Contento (2011: 409) that there should be an understanding of the style of communication appropriate to that culture. In the preschool Hip-Hop to Health intervention study by Fitzgibbon et al. (2002: 294) both Spanish and English speaking children were accommodated and taught in the language of preference due to the existing bilingual nature of the Head Start education sites. When learning materials are translated into the home language it becomes more accessible (Contento, 2011: 409).

4.10.11 Use of nutrition education games

With regard to making use of nutrition games to enhance learning, the majority of educators (90.00 percent) were in agreement with this idea. This is an encouraging finding as children gain nutrition knowledge through active involvement and will be empowered to make behavioural, life-skill and attitude changes relating to good food choices and eating habits (FAO, 2005). A memory card game was used successfully in the Healthy Buddies Programme (Stock et al., 2007: 1061) and flash cards in the 'Be Smart' Study (Warren et al., 2003: 289) to improve healthy eating.

4.10.12 Unsuccessful nutrition education tools

There was a nil response from ten percent of the educators to this question. Of those who responded, the majority of the educators (89.00 percent) were unaware of any NETs that did not work. The remaining eleven percent mentioned that charts and worksheets were too abstract for preschoolers; poorly-illustrated education tools and those with unclear or complicated directions were also unsuitable. The cognizance of the child's development level is crucial for a beneficial NEP (Lucas & Feucht, 2008: 235).

4.11 CONCLUSION

The scientifically measured results of the Durban baseline study, completed by Grade R educators in twenty urban schools in different built-up areas in Durban clearly indicate that there was a need for NE. It was ascertained that NE was part of the school curriculum with varying amounts of time dedicated to the subject, the average being 30 minutes per week. Using appropriate educational material for NE will impact positively on learners and 90.00 percent of the educators surveyed advocated using nutrition games to enhance nutrition learning. A variety of age appropriate educational tools were affirmed by the educators. The most popular recommendations were role-playing (100.00 percent), activity books (85.00 percent), puzzles (85.00 percent), card games as well as videos (65.00 percent) and board games (60.00 percent). Perez-Rodrigo and Aranceta (2001: 131-132) also emphasised the use of various NETs as a means to create curiosity and eagerness in NE amongst Grade R learners. All (100.00 percent) Durban Grade R educators were of the opinion that bright colours must be used for education tools for nutrition. Photographs were selected by 48.00 percent of the educators as the most understandable medium for the pictorial presentations of food for NE. A child's mother tongue was the preferred choice of educators (42.00 percent) for the use on educational material, with the use of English and the home language selected by slightly fewer educators (37.00 percent).

Furthermore, for a pre-school NEP to be appropriate the cognitive level and language ability of the age group needs to be considered in the design and implementation of such a programme (D'agostino et al., 1999: 217-218).

Research highlights the importance of nutrition knowledge for five to six-year-olds (Grade R) as a child has to learn how to select nutritious foods to establish long-term sound dietary patterns to reduce the incidence of lifestyle diseases (D'agostino et al., 1999: 217). This is due to the fact that a child's attitudes and habits are formed at this age and are likely to form the basis of lifelong eating patterns (Martin and Kern, 1992).

4.12 RECOMMENDATIONS

Malnutrition continues to be issue within Durban, the KwaZulu-Natal (KZN) province, the country, Africa and the world. Various strategies are in place globally and within the country to address this problem with NE being one of these strategies acknowledged by the Department of Health (DoH). The South African Food-Based Dietary Guidelines (FBDGs), created by the DoH, as a strategy to educate the public, have not been effectively communicated to the public. This project focuses on addressing malnutrition through a Grade R NEP by improving the nutrition knowledge of pre-primary school children to allow them to make healthier food choices from an early age and lay the foundation for a healthier adulthood.

Grade R educators (n=20) in urban schools in built-up areas of Durban in this baseline study determined the need for NE in Grade R, as well the most suitable NETs to be used when teaching NE at school.

The NETs selected and used in this NEP were developed by Professor Carin Napier and Professor Wilna Oldewage-Theron and based on the FBDGs. The intervention study using these NETs will be discussed in the chapters that follow. These NETs were used in a NEP in two randomly selected primary schools in the Vaal resulting in an overall significant improvement (18.20 percent) in the number of correct nutrition knowledge answers (Oldewage-Theron and Egal, 2009: 49). Providing educators with a preschool NE resource guide based on the nutrition competencies required at that age with the relevant educational materials is recommended by Scherr et al. (2011) as advantageous in promoting and developing child health. This was affirmed in the Tooty Fruity Vegies at School programme (Adams, Zask and Dietrich, 2009: 116).

The results of the Durban baseline study and the increase in nutrition knowledge in the Vaal schools enabled the researcher to use the already developed NETs and HEAB in the Grade R intervention study in Durban.

CHAPTER 5: INTERVENTION METHODOLOGY

5.1 INTRODUCTION

Nutrition education (NE) is recognised by researchers as a strategy to lessen the incidence of malnutrition in communities. The results of the baseline survey revealed the need for NE in Grade R using a variety of nutrition education tools (NETs) to promote healthier eating and lifestyle. The NETs selected for the Grade R nutrition education intervention in Durban matched the outcomes of the baseline study as the pre-school educators recommended that effective NETs for this age group were activity books, puzzles, card games and board games. In addition, the use of bright colours as used in the selected NETs was considered most appropriate by the Grade R educators.

This chapter outlines the methodology used during the intervention study to collect data using reliable instruments to establish the impact of a nutrition education programme (NEP) on the nutrition knowledge of boys and girls in Grade R in Durban, in a government and private urban school in a built-up area. To improve nutrition knowledge and reduce malnutrition the NEP was based on the South African Food-Based Dietary guidelines (FBDGs) using the existing NETS that had been specifically developed for nutrition education in SA for this age group.

Proper planning, research design and measuring instruments were critical components in the gathering of good quality data.

5.2 PERMISSION

The research proposal was submitted and approved in 2010 by the Faculty of Applied Sciences Faculty Research Committee (FRC) and the Higher Degrees Committee (HDC) at the Durban University of Technology (DUT) prior to the commencement of the study (proposal ratification letter attached). Approval from the FRC is part of the proposal approval which includes a section on ethics (section C), attached. The human study was categorised as Category 2: review it as minimal risk to humans, animals or environment. The study was not approved by the DUT Institutional Research Ethics Committee (IREC) as this committee was only constituted during 2011. Prior to this date all Faculty applications were dealt with at FRC and HDC level.

Permission was obtained to use the NETs illustrated in Figures 5.1- 5.4, which had been used in the Vaal region in a study to determine the impact of NE on pre-school children, ages six and seven years (Oldewage-Theron and Egal, 2009: 46). The researcher also obtained permission from Professors Oldewage-Theron and Napier (2011; 287) for the use of the age appropriate Healthy Eating Activity Book (HEAB) (Figure 5.5) and validated art work for use in the nutrition knowledge questionnaire (NKQ). The NKQ compiled for this Durban study was adapted with permission from an existing validated questionnaire compiled by Oldewage-Theron and Egal (2009: 48) for the Vaal study.



Figure 5.1: NEP Food Group Plate Puzzle



Figure 5.2: NEP Card Game



Figure 5.3: NEP ‘My Little Books’



Figure 5.4: NEP Board Game

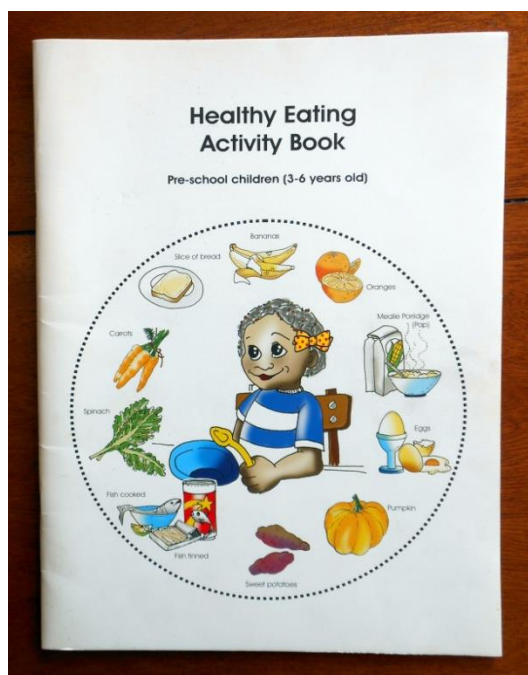


Figure 5.5: NEP Healthy Eating Activity Book

To test the reliability of the NKQ, a randomly selected Durban government school was approached telephonically and permission was received from the principal on 20 May 2010. For the testing of the refined questionnaire, the head of a randomly selected private school granted permission on 24 August 2010 for Grade R learners to complete the questionnaire.

To gain permission for the study in the schools an email was sent to either the Principal or Head of Department of each school randomly selected for the study informing them of the programme and requesting their participation (Annexure D). On 20 May 2010 one principal gave permission for the Grade R participation as the control group (Annexure E). On 27 May 2010 a positive response to the NEP request was received from the head of the private pre-primary school (Annexure F). On 2 June 2010 the principal of the government school informed the researcher in an email that they were unable to fit the NEP into their already full and busy day. Consequently another government pre-primary school was randomly selected, with the Head agreeing on 7 June 2010 to the Grade R's participation in the study (Annexure G). The researcher was allowed to conduct the research in the school classrooms during the school day as part of the Life Orientation (LO) programme in the school curriculum. No anthropometric measurements were taken and no invasive procedures were performed and the names of the children were not used in any part of the study. The objectives and methods of the NEP were explained to staff at the three participating schools.

Prior to the study being implemented, numbers were allocated to each participant in order to ensure confidentiality and anonymity. The child's first name was recorded on a separate list by the researcher against a given number. The only personal information supplied by the teacher verbally to the researcher was the age of the child. All school information in the study remained confidential. The

schools where the NE was conducted were referred to as government or private school and the control school was referred to as such. The questionnaires and personal information were locked away in a cupboard in an office in the Department of Food and Nutrition at DUT with only the supervisor and researcher having access to the data. After a period of five years it will be shredded and disposed of.

5.3 STUDY DESIGN

This study was carried out in four phases:

Phase 1: Literature review

This involved a scrutiny of scientific literature on malnutrition and nutrition education significant to the study with this information presented in chapters two and three.

Phase 2: Planning of the study

The planning for this study comprised of various activities:

- Development of the NKQ
- Obtaining consent for Grade Rs to test the NKQ
- Obtaining consent for Grade Rs in a government and private suburban school in a built-up area of Durban to participate in the NEP
- Obtaining consent for Grade Rs in an suburban school in a built-up area of Durban to be the control group
- Meeting with the Grade R teachers participating in the NEP
- Sourcing and training suitable fieldworkers for the Grade R nutrition knowledge testing
- Sourcing and training a qualified Foundation Phase teacher for the delivery of the NEP
- Devising the eight hour NEP.

Phase 3: The nutrition education intervention

The study took place in 2010, in the fourth term, between 7 October and 7 December.

Phase 4: Reporting on results

The results will be discussed in detail in chapter 6.

5. 4 STUDY TYPE

An experimental randomised control trial intervention study was used to find the answer to this study question.

A validated and reliable NKQ tested the nutrition knowledge and healthy eating habits of Grade R learners in three randomly selected schools in built-up urban areas of Durban before and after the

intervention. A government (n=37) and private (n=40) school formed the intervention groups with a private school participated as the control group (n=43).

Only the children in the intervention group received eight hours of NE which included the use of the NETs.

5.5 PLANNING OF THE PROJECT

5.5.1 The measuring instrument

5.5.1.1 The development process of the nutrition knowledge questionnaire

An existing validated pre-primary school NKQ developed by Oldewage-Theron and Egal (2009: 48) for use in the Vaal region in 2007 was consulted. In May 2010 discussions for the adaption of the pre-primary school NKQ took place with the qualified foundation phase teacher and the supervisor of this research study. The questionnaire items were required to test the specific learning outcomes stated in the HEAB for pre-primary school children aged three to six years (Oldewage-Theron and Napier, 2011: 286). These learning outcomes were as follows:

- The identification of the five food groups
- The identification of the five different coloured fruit and vegetable groups
- The importance of regular meals
- The daily sufficient intake of water
- The importance of exercise
- Good hygiene practices are vital
- Sweet foods should be limited (Napier and Oldewage-Theron, 2008: 4).

The nutrition knowledge concepts were based on the SA FBDGs for the population older than seven years (Vorster, 2001: S3). Although the majority of children in pre-primary school are six years old, the Paediatric FBDGs were not available when the HEAB and NETs were developed (Oldewage-Theron and Napier, 2011: 284).

The FBDGs used in this study are as follows:

1. Enjoy a variety of foods.
2. Be active.
3. Make starchy foods the basis of most meals.
4. Eat plenty of fruit and vegetables every day.
5. Eat dry beans, peas, lentils and soy regularly.
6. Chicken, fish, meat, milk, or eggs can be eaten daily.
7. Eat fats sparingly.
8. Use salt sparingly.
9. Drink lots of clean safe water.
10. Omitted as this FBDG is not used in this study.
11. Eat and drink food and drinks that contain little sugar and not between meals.

(Vorster, 2001: S3)

To ensure the content validity of the developed NKQ, a Dietician was consulted to check the measuring instrument, to ensure that all the elements being investigated had been correctly covered in the questionnaire. In addition, for face validity, the foundation phase teacher assessed the suitability of the knowledge level for the target group, being Grade R learners (Joubert and Ehrlich, 2008: 120). These assessments resulted in some questions remaining unchanged, others being deleted or amended including some picture changes. All the artwork for the NKQ was used from the HEAB. The developed NKQ to assess the nutrition knowledge and healthy hygiene practices of Grade R learners comprised 31 items.

5.5.1.2. Reliability testing

For assessing internal consistency of the developed questionnaire, permission was received from the headmaster of an urban government school in a built-up area of Durban for a random sample of Grade R learners (n=14) to participate. This school was not participating in the NEP study. These learners were unaware that the questionnaire would be administered to them for a second time to test the equivalence reliability. The initial testing was held on 7 June 2010 and the second one occurred six weeks later (19 July 2010) due to the long mid-year school holiday for the 2010 Soccer World Cup. The internal consistency was calculated, based on each test, in June and July as a whole. The Cronbach's Alpha coefficient was calculated because the questions were binary (correct and wrong). The test-retest reliability measures the similarity of results over a period of time when the same test is repeated on the same group (Joubert and Ehrlich, 2008: 117).

5.5.1.3 Refining of the questionnaire

When the NKQ was found to be unreliable, feedback was requested from a Grade R class teacher who had been present during the administration of the NKQ. Valuable comments were received from this teacher via email. In addition, a consultation with two qualified Grade R teachers from a government and private school took place. The suggestions and input received were used in making the NKQ more appropriate for Grade Rs.

The original questionnaire took one and a half hours to complete and the pupils' concentration span for that length of time was not sustainable. By removing questions that tested the same concepts, the numbers of items were reduced to fifteen and the required time to complete the questionnaire was reduced. It therefore took between fifteen and twenty minutes to complete.

The refined NKQ (Annexure H) comprised of two parts: the instructions for the fieldworker and questions that the fieldworker would pose to the children, and secondly, a nutrition knowledge questionnaire answer sheet for the pupil to complete. For reporting purposes the questionnaire was divided into two sections due to different types of knowledge being tested in each.

- Section one

The ten questions in section one (Table 5.1) tested the children's knowledge of the FBDGs.

Table 5.1: Questions in section one and the related FBDGs

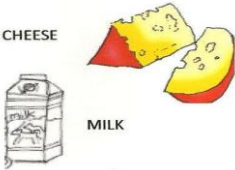

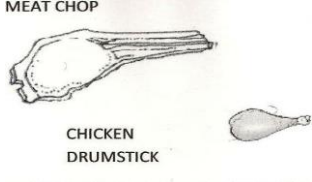
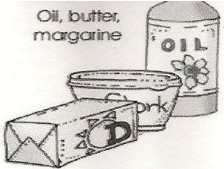
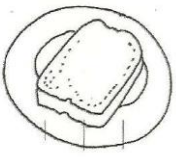
NO.	QUESTIONS IN SECTION ONE	RELATED FBDGs
1.1	Is 10 hours of sleep required at night?	Be active.
1.2	Must 5 fruit and vegetables be eaten every day?	Eat plenty of fruit and vegetables every day.
1.3	Should a child play outside every day?	Be active.
1.4	Must a child eat different types of foods?	Enjoy a variety of foods.
1.5	Must fruit be washed before being eaten?	Hygiene is important.
1.6	Must hands be washed before eating?	Hygiene is important.
1.7	Will meat and fish give strong muscles?	Chicken, fish, milk, meat or eggs can be eaten daily.
1.8	Is it healthy to eat lots of sweets, cakes, biscuits?	Use food and drinks containing sugar sparingly and not between meals.
1.9	Is milk, yoghurt, cheese needed for healthy bones and teeth?	Chicken, fish, milk, meat or eggs can be eaten daily.
1.10	Must a child drink 6 glasses of water daily?	Drink lots of clean safe water.

In the refined questionnaire a quicker and easier method of answering was devised by the researcher in consultation with Grade R teachers. Next to each question in section one was a decently sized diagram of a circular face with two eyes but no mouth, where the required YES or NO response was to be recorded by the child. For the 'yes' response, the child was required to draw a smile on the face to create a happy face☺; alternatively the child had to draw a sad face ☹ for a 'no' response.

- Section two

In section two (Table 5.2), there were five questions testing knowledge of the different food groups assessed through the matching of black and white pictures of different food items in column one with the corresponding food group's name appearing in column two. These pictures were identical to the pictures used in the HEAB (Oldewage-Theron and Egal, 2009:48). The children were required to draw a line to connect each of the appropriate matches. The teachers consulted emphasised that very clear explanations would need to be given to the learners as they cannot all read and therefore they might find difficulty identifying the words of the different food groups. This suggestion was implemented.

Table 5.2: Section two: matching the food pictures to the correct food group

NO.	FOOD PICTURES	CORRESPONDING FOOD GROUP
2.1	 <p>CHEESE</p> <p>MILK</p>	DAIRY
2.2	 <p>CARROTS</p> <p>ORANGES</p>	VEGETABLE AND FRUIT
2.3	 <p>MEAT CHOP</p> <p>CHICKEN DRUMSTICK</p>	PROTEIN
2.4	 <p>Oil, butter, margarine</p>	FAT
2.5	 <p>BREAD</p>	STARCH/ CARBOHYDRATE

5.5.1.4 Reassessment of reliability of the questionnaire

The content validity of the refined NKQ was assessed by the dietician who also ensured that the items covered all the learning outcomes of the NEP. Permission for testing the refined questionnaire was obtained from the management of a private Durban school in a built-up area that was not participating in the NEP. This occurred on 2 September 2010 and was administered by the researcher and field worker to a class of Grade R learners (n=11) in. Six children were absent that day resulting in a small sample. The children took between fifteen to twenty minutes to complete the NKQ depending on how

quickly they worked. These learners were unaware that the questionnaire would be administered to them again on 21 September 2010. The NKQ was tested using The Cronbach's Alpha coefficient and were found to be reliable; the results will be discussed in detail in chapter 6.

5.5.2 Field workers

The researcher conscripted and trained four teachers as fieldworkers to assist her in administering the questionnaire during the testing phase of the intervention. The same fieldworkers were also involved in the pre-and post-testing of the Grade R learners for the study. Each fieldworker was proficient in English which was the medium of instruction for the training session. All guidelines were printed in English which was also the medium of instruction at the schools where the study was conducted. The guidelines for how the children were to complete the questionnaire was explained to the fieldworkers and the instructions were on the cover page of the questionnaire. As the class teachers in all schools were involved in administering the questionnaire, they were also trained in this regard. The training of all involved was to ensure consistency in the testing of each group of learners.

5.5.3 Nutrition programme educator

A qualified Bachelor of Education Degree teacher with a Foundation/ Intermediate phase specialization conducted the NEP for the intervention study. This teacher was trained by the researcher on how to conduct this specific NEP according to an eight week lesson plan and programme schedule devised by the researcher. The teacher was instructed on the nutrition content of the programme, the use of the HEAB and the NETs provided for this study.

5.5.4 Study population and sampling strategy for the intervention study

The following were the inclusion criteria for this intervention study:

- Grade R learners in 2010, irrespective of age
- both genders
- Government and private schools in built-up urban areas of Durban.

The exclusion criteria for this study were:

- any pupil not in Grade R in 2010
- any government or private school that had not participated in the baseline survey
- Grade R learners that were not present for both the pre-and post-test at the participating schools.

For the intervention a purposive sampling method was used to randomly select three schools from a total of 21 schools (13 government and eight private) that had participated in the Grade R baseline study. One government and one private school were selected for the NE intervention programme and from the remaining schools one was randomly selected as the control group.

Table 5.3 reflects the composition of the study sample participating in the study. The study sample originally comprised of 130 Grade R learners with a 120 fully participating in the study. Completing the pre-and post-test and attending the nutrition intervention education programme was part of the daily classroom activities. A total of 10 children (four boys and six girls) were lost to follow up and removed from the data base. The reason for the non-participation of students was varied, with teachers citing illness as the main reason for absenteeism.

Table 5.3: Composition of the study sample

INTERVENTION STUDY											
EXPERIMENTAL SCHOOL								CONTROL GROUP			
SCHOOL A				SCHOOL B				SCHOOL C			
GOVERNMENT				PRIVATE				PRIVATE			
Group A		Group B		Group A		Group B		Group A		Group B	
19		18		20		20		21		22	
boys	girls	boys	girls	boys	girls	boys	girls	boys	girls	boys	girls
10	9	9	9	0	20	0	20	11	10	12	10
Total boys sample A				Total boys sample B				Total boys sample C			
19				0				23			
Total girls sample A				Total girls sample B				Total girls sample C			
18				40				20			
Total sample A				Total sample B				Total sample C			
37				40				43			
Lost to follow up				Lost to follow up				Lost to follow up			
1				4				5			

Of the 120 participants: the experimental Group (EG) (n=77, n=19 boys and n=58 girls) comprised two schools: a co-educational government school (EGG), school A, (n=37, 31.00 percent), comprising 19 boys and 18 girls, and a private all-girls' school (EPG), (school B), with 40 girls (33.00 percent). The control group (CG) (School C) consisted of 43 students (36.00 percent) both boys (n=23) and girls (n=20). The total sample comprised of 35.00 percent boys (n=42) and 65.00 percent girls (n=78). There were two grade R classes in each school (Group A and B) with a similar number of children in each. For the NEP the classes were not combined. Having a smaller number of children in a class allowed the teacher to devote more time to each student to facilitate the learning process. Therefore, at a school on a specific day, the NEP of one hour was repeated twice, with one class immediately following the other.

5.5.5 Formulating the nutrition education programme

A NEP comprising eight one hour lessons was developed by the researcher in consultation with the qualified foundation phase teacher who was to conduct the nutrition education. The content of this

Grade R programme was based on the HEAB and NE games for pre-schoolers, developed by Oldewage-Theron and Napier (2011: 286).

The learning tasks in this NEP incorporated various cognitive levels of thinking. Table 5.4 presents examples of the NEP activities associated with the different cognitive levels of thinking.

Table 5.4: The Cognitive Domain: Levels of thinking and the related NEP activities (Contento, 2011: 226)

THE COGNITIVE DOMAIN		RELATED NEP ACTIVITIES
LEVELS OF THINKING	DESCRIPTION of the level	
Knowledge	Recall information	Card game, My Little Books, Food group poster game
Application	Shows an understanding	Card game, activities in the HEAB, Board game, My Little Books, Food group poster game
Synthesis	Putting elements together and creating a new structure	Food Group Plate Puzzle, My Little Books
Evaluation	Make judgements	Food Group Plate Puzzle

The supervisor approved the programme on 24 May 2010, as outlined in Table 5.5, which detailed the theoretical content of each lesson, the related HEAB activities, the NETs for the group activities and the supplementary teaching aids to be used.

For theory-based NE Contento (2011: 256,258) suggests the use of Gagne's theory of instruction to organise the sequence of events in a lesson. They are as follows:

- Gaining attention (A)
- Present stimulus and new material (S)
- Provide guidance and practice (G)
- Apply and close (C).

The lessons for this Grade R NEP were therefore designed so that at the start awareness of the new topic was created and a recap of knowledge from the previous lesson occurred. The new stimulus was then presented to meet the desired outcomes of the lesson. The educator provided guidance to the children as they engaged in education activities to practice what had been learnt and to increase self-

efficacy. Lastly, the educator summarized the lesson by reinforcing the central message for the children to remember as a take-home message.

Table 5.5: The lesson outline of the Grade R nutrition education programme

WEEK	TOPICS COVERED	HEAB Informatio n page numbers	HEAB activity page numbers	TEACHING AIDS
1	Five different food groups. Importance of regular meals. Healthy eating so eat a variety of foods. Drink sufficient water. The use of salt.	5,6,8, 12	8,18,20, 24,27,29, 32, 35,	Food pictures, board, water jug, glasses, salt, card game.
2	Fruit and vegetables and the daily serving amount.	10	19,21,25, 30,31	Variety of different coloured fruit and vegetables, various group activity games.
3	Carbohydrates and the daily serving amount.	7	2,7,17,27	Actual food examples, food plate puzzle for breakfast, various group activity games.
4	Protein and the daily serving amount.	9	9,23	Food group poster game using food pictures, group activity games.
5	Milk and the daily serving amount.	11	11,18,28	Group activity games not been done before.
6	Fats and the daily serving amount. Dangers of too many sweet foods and drinks.	11,13	11,13,16, 17,26	Card game or read the 'My little books' to each other.
7	Being active. Recap different functions of food.	14	14,15,19, 22,33,28	Group activity games not done before.
8	Good hygiene practices.	13	13,21,24, 34	Group activity games not done before.
GROUP ACTIVITIES: The children were to participate in different nutrition education activities: card games, board game and food group plate puzzle.				

In September 2010 the researcher and nutrition programme educator met with the Grade R teachers from the schools selected for the study. The NEP was outlined to the experimental schools and suitable dates in the fourth term for the delivery of the eight lessons to the two classes in each school were decided upon. Dates and times for the pre-and post-tests were arranged with the class teachers in the three participating schools. The pre-tests took place in the week prior to the start of the education intervention. The post-tests were scheduled the week after the completion of the NEP, on a day to suit the school, to fit in with the end of year activities in Grade R. Each school was sent, via e mail, their own NEP schedule with a composite one presented in Table 5.6. The first lesson commenced on 13 October 2010 with the last lesson was held on 1 December 2010.

Table 5.6: Grade R nutrition education programme schedule

TESTS AND LESSONS	2010 DATES	TIMES	SCHOOLS
Pre-test:	7 October	8.15 - 9.15	Government
	8 October	8.15 - 9.15	Control
	11 October	9.00 - 10.00	Private
Lesson 1	13 October	8.15 – 10.15	Private
	14 October	8.15 – 10.15	Government
Lesson 2	18 October	8.15 – 10.15	Government
	20 October	8.15 – 10.15	Private
Lesson 3	26 October	8.15 – 10.15	Private
	28 October	8.15 – 10.15	Government
Lesson 4	4 November	8.15 – 10.15	Private
	5 November	8.15 – 10.15	Government
Lesson 5	10 November	8.15 – 10.15	Private
	17 November	8.15 – 10.15	Government
Lesson 6	16 November	8.15 – 10.15	Private
	24 November	8.15 – 10.15	Government
Lesson 7	22 November	8.15 – 10.15	Private
	25 November	8.15 – 10.15	Government
Lesson 8	23 November	8.15 – 10.15	Private
	1 December	8.15 – 10.15	Government
Post -test	12 November	8.15 - 9.15	Control
	7 December	8.15 - 9.15	Government
	29 November	8.45 – 9.45	Private

Each pupil had to use school stationery to work in their own HEAB book. Each class group participating in the NEP was given a set of the NE games which the school would retain for future use. The set, contained in a sponsored zip bag, comprised a food group plate puzzle; a box containing two sets of NEP playing cards; a slides and ladders board game with dice and four different coloured plastic tokens for two to four players; and a box which contained six 'My Little Books'. All these activities were used to reinforce the principles of the FBDGs as well as the good hygiene practices that the learners had been taught (Oldewage-Theron and Napier, 2011: 287).

5.5.6 Data collection pre-and post-intervention

Trained fieldworkers and the nutrition educator under the researcher's supervision conducted the pre- and post-test NKQ with the Grade R children. The first data collection commenced on 7 October 2010

(government school) followed on 8 October 2010 (control school) and lastly on 11 October 2010 (private school) with the completion of the NKQ by the Grade R children. The data collection took place in the mornings, between 8.15 am and 10.00 am, one Grade R group immediately followed by the next.

To assess the impact of the NEP the post-test was conducted to collect data for analysis and interpretation. The second and final data collection, after the completion of the NEP, started on 12 November 2010 (control school), then 29 November 2010 (private school) and lastly on 7 December 2010 at the government school. At all schools this testing was between 8.15 and 9.15am with a group taking a maximum of half an hour to complete it.

The interval between the pre-and post-test was approximately nine weeks. The pre-and post-test questionnaires were correlated and checked for completeness. If a learner had not completed both of these questionnaires the child was excluded from the study, resulting in n=120 usable pre-and post-test questionnaires.

5.6 ADMINISTRATION OF THE MEASURING INSTRUMENT

The researcher, nutrition programme educator and field workers were involved in administering both the pre-and post-test at the three schools participating in the study. The same administration procedures were followed on all occasions.

The nutrition programme educator explained to each class that the questionnaire was aimed at finding out their current nutrition knowledge and hygiene practices. Explanations had to be given to the learners for section one, on how to create the smiley face for the 'Yes' answer and the sad face for the 'No' answer. This concept was also illustrated on the board.

Each fieldworker had a group of between five to six learners who they guided methodically through the process of completing the two page structured questionnaire at a pace suitable for their group. The learners were told not to call out the answers to the questions nor copy from each other. To prevent this they were asked to sit far apart or requested to cover their answers. Learners were allowed to cross out or erase an answer on the questionnaire. The fieldworkers were asked to make sure that the child answered all the questions but there were occasions when this was not done.

For section one the fieldworker read out a question to their group and told the learners to respond by making either the happy or sad face expression to denote the 'Yes' or 'No' response. With each question in section one the fieldworker would remind the group of learners about the happy and sad face meanings.

For section two of the questionnaire the fieldworker had to make sure at the outset that all the learners in the group recognised the illustrations of the food items. It was explained to the children that in this section they had to draw a line to join the pictures of the food items to the names of the five basic food

groups. The fieldworker worked through section two question by question with her group of children. The learners were told to draw a line from the Dairy food group; number one in the first column, to the group of food items in the second column that they thought belonged to this food group. This process continued with each of the remaining food group questions.

A maximum of half an hour was taken to complete the questionnaire including the time spent on the explanations to the children. The child's gender and year of birth was provided by the class teacher and recorded on the questionnaire.

5.7 NUTRITION EDUCATION INTERVENTION

5.7.1 Nutrition education programme tools

The NETs used in a study in the Vaal region were assessed for appropriateness through the Grade R educator's baseline study in Durban and therefore used in this NEP. These NETs used were the Food group plate puzzle, the NEP 'My Little Books' and card games, the 'Good for you, not good for you' board game and the pre-school children's HEAB. The objective of the food group plate puzzle (Figure 5.6) was to teach learners how to create balanced meal plates for breakfast, lunch or dinner with the food puzzle pieces representing the different food groups. The children could also learn to exchange food items within a particular food group (Oldewage-Theron and Napier, 2011: 287).



Figure 5.6: Children creating a meal with the Food Group Plate Puzzle

The objective of the card game was to introduce learners to 'good for you' and 'not so good for you' foods and activities. The two packs of cards enabled different games to be played with the picture cards or the alphabet cards (Figure 5.7). The game of Snap could be played or the learners could match the picture cards with the 'good for you' and the 'not so good for you' cards. These cards could be used for memory development and to introduce a variety of foods into the diet by matching the picture card to the correct alphabet card (Oldewage-Theron and Napier, 2011: 287).



Figure 5.7: Children playing the NEP Card Game



Figure 5.8: NEP activity with 'My Little Books'

In groups the children were engaged in discussions lead by the teacher on the content of the Little Books. Alternatively, the children made up stories to each other relating to the content of the six different My Little Books: Protein; Carbohydrates; Fruit; Vegetables; Good Habits and Things that are not so good for me (Figure 5.8).

The purpose of the board game, (Figure 5.9) is to show the learners that it is good for them to practice healthy eating and hygienic habits and to be active. Players are rewarded and progress on the board when they land on a square of a 'good habit' and have to move back when they land on a 'bad habit' (Oldewage-Theron and Napier, 2011: 287).



Figure 5.9: Children playing the NEP Board Game

The HEAB was used in every lesson with at least one relevant exercise or page completed according to the schedule. The children were allowed to take this workbook home only at the end of the programme.

5.7.2 Nutrition education content in each lesson

Lesson one related to three of the FBDGs: enjoy a variety of foods, use salt sparingly, and drink lots of clean safe water (Vorster, 2001: S3). This lesson covered the five different food groups, breakfast as the most important meal of the day, the importance of regular meals, eating a variety of foods to be healthy, good healthy living habits, drinking sufficient water every day, and the use of salt in food. Teaching aids such as food pictures, a water jug, glasses and salt were used to help illustrate certain concepts with the same food pictures being used throughout the NEP.

On 13 October 2010 and 14 October 2010, between 8.15 and 10.15, the first lessons were held at the government and private schools respectively. Children were asked to identify the different food items in the pictures and were taught which food group they belonged to. The pictures and the new food group terms were displayed on the board. The learners were tasked with colouring in any of the pictures in their HEAB on pages 8, 27, 29 and 35 which related to the content of that lesson. Each child managed to complete at least one picture in the HEAB (Figure 5.10). In their first lesson, the card game was played to reinforce the 'good' versus the 'not so good for you' eating and healthy living practices.



Figure 5.10: The private school experimental group children working in their HEABs joining food items to the relevant food group (page 27)

Lesson two covered the Vegetable and Fruit food group which relates to the fourth FBDG: eat plenty of fruit and vegetables every day (Vorster, 2001: S3). For the fruit and vegetable food group, the five different colours, the functions and importance for good health and the daily recommended serving amounts for this food group were taught. Teaching aids used for this section were a variety of differently coloured fruit and vegetables. This lesson was conducted on 18 October 2010 at the government school and on 20 October at the private school with the first class at 8.15am and the second at 9.15am. The children used the various senses of touch, sight and smell for this lesson. During activity time the learners could choose from the HEAB exercises on pages 25, 30 and 31. The children participated in various group activities.

The topic for Lesson three was carbohydrates, which relates to the third FBDG which states: Make starchy foods the basis of most meals (Vorster, 2001: S3). The different food items in this group, the energy it provides and the number of servings required every day were taught. Actual food examples were used for teaching aids. Lesson three was presented at 8.15am and then repeated at 9.15am at the private school on 26 October 2010 and at the government school on 28 October 2010. The food plate puzzle was used to recap food groups, with the children having to make a breakfast plate of food. In the HEAB pages 7, 17 and 27 had exercises for the learners to complete relating to this lesson. All children participated in one activity and completed at least one page in the HEAB.

Lesson four related to two FBDGS: Eat dry beans, lentils and soy regularly as well as the guideline that states that chicken, fish, meat, milk or eggs can be eaten daily (Vorster, 2001: S3). Therefore different protein foods, the function of protein in the body and the serving amount per day were taught in this lesson. All classes completed pages 9 and 23 in the HEAB, with any spare time being used for colouring in other pages previously not completed. There was not enough time in this lesson for the children to play the games. The lessons at the private school were held on 4 November 2010 starting at 7.45am with all the lessons that day being reduced to 45 minutes due to an unscheduled school activity. The government school lessons were on 5 November 2010 starting at 8.15am and the lengths of the lessons

were reduced to 45 minutes so that both schools in the intervention received the same amount of NE time.

Lesson five, covered dairy products which should be consumed daily and is the sixth FBDG (Vorster, 2001: S3). Different dairy products, their function and daily serving amount were imparted to the children. The lessons at the government school were on 17 November 2010 and at the private school on 10 November 2010 and classes at both schools commenced at 8.15am. The children could choose to complete pages 11, 18 or 28 in the HEAB and they had to try out a game they had not done before. The Fat group and the dangers of too many sugary foods was the topic for Lesson six. This was based on the FBDG number 11: Eat and drink food and drinks that contain little sugar and not between meals (Vorster, 2001: S3) thus focusing on examples of fatty foods and those containing sugar, the maximum daily amount to be consumed as well as the dangers of too many fatty foods, sweets and drinks in the diet. The sessions at the private school for this topic were on 16 November 2010 and at the government school on 24 November 2010, between 8.15 and 10.15. Most children completed pages 11, 13 and 26 in the HEAB and then played 'the good for you' and the 'not so good for you' card game or read the Little Books to each other.

The theory for Lesson seven relates to the second FBDG, to be active (Vorster, 2001: S3). The learners were therefore encouraged to be active every day and the functions of the different food groups were recapped. This lesson was given at the private school on 22 November 2010 and at the government school on 25 November 2010 (Figure 5.11). The HEAB exercises relating to this lesson were on pages 14, 15, 19, 22, 23 and 33 with most children completing two of these pages. The children were involved in any group activity that had not participated in previously.



Figure 5.11: The government school experimental group children colouring-in food items in the HEAB

The final lesson, Lesson eight, took place on 23 November 2010 at the private school and on 1 December 2010, at the government school between 8.15 and 10.15. Good hygiene practices were the topic for this lesson and the exercises in the HEAB on pages 13, 21, 24 and 34 related to Lesson eight.

For recap purposes, the programme educator tested each group of children with the 'good for you' card game and the children were questioned on the different food groups. By the end of the programme, each child had played every game as part of the group activities.

5.7.3 Implementation of the nutrition education programme

The NEP was taught over an eight-week period, one period a week, by the qualified foundation phase teacher who had been trained by the researcher to conduct the education programme. Each school had two Grade R classes, and the nutrition lesson in one class was immediately followed by the same nutrition lesson with the second group.

Each lesson was one hour in duration, with the theoretical part of the lesson being approximately fifteen minutes long with the learners seated on the carpet in front of the board as seen in Figure 5.10. This was an interactive session and the blackboard was used for key words to enhance learning. At the start of Lesson two to eight, the educator recapped concepts taught in the previous lesson.

For the remainder of the lesson, the children moved to their tables to work in the related exercises in the HEAB and play with the fun NETs. Some of these activities required the children to work in a group. Each child also worked on their own as in Figure 5.14 for about 30 minutes on activities which included colouring in, joining the dots, crossing out inappropriate items and connecting appropriate ones in the HEAB. This allowed for reinforcement of the nutrition concepts learnt. Raman et al. (2010: 250-251) postulates that structuring a NEP in this manner of spaced delivery and learning is beneficial for the enhancement of knowledge as cognitive load and fatigue is minimized. In addition, long-term retention of knowledge is improved.

The activities and the rules of the games (Annexure I) were explained to the whole class with the educator going to each group to ensure the children fully understood the activity. Fifteen minutes were devoted to one or more group activity: the little books, the card games, the food plate puzzle and the board game. The educator checked that the students completed the minimum tasks set for the lesson. The researcher and nutrition educator devised an activity to use to recap information learnt during the NEP. Pictures representing each food group were placed on a table and four children at a time went to fetch a specific food group and placed it on the poster under the correct food group name. Quick rounds took place so each child had a turn.

At both schools, the identical work was covered and the same teaching aids were used throughout the NEP. At each session, the names of any absent learners were recorded from the HEABs that had not been handed out.

5.8 STATISTICAL ANALYSIS OF DATA

The NKQ was coded so every variable had a numeric code. The data was then captured onto a Microsoft Excel® spreadsheet. The data was checked and cleaned before being analyzed using the Statistical Package for Social Science (SPSS) for Windows (version 17.0) programme. Descriptive statistics were determined and interpreted with the assistance of a statistician.

Various appropriate statistical analysis tests were completed to determine statistical significant differences for the comparisons which were made in this study as outlined in the table 5.7. The comparisons were based on correct answers.

Table 5.7: Statistical analysis tests used for percentage comparisons in this nutrition education study

THE COMPARISONS MADE	TEST USED FOR THE STATISTICAL ANALYSIS
1. Girls' percentage correct answers between three schools for pre-test	One-way ANOVA
2. Boys' percentage correct answers between two schools for pre-test	Independent <i>t</i> -test
3. Total group percentage correct answers between three schools for pre-test	One-way ANOVA
4. Boys' percentage correct answers between two schools for post-test	Independent <i>t</i> -test
5. Girls' percentage correct answers between three schools for post-test	One-way ANOVA
6. Boys' percentage correct answers between pre-and post-test between the two schools that contain boys	Independent <i>t</i> -test
7. Girls' percentage correct answers between pre-and post-test between the three schools	One-way ANOVA
8. Total group's percentage correct answers between pre-and post-test between the three schools	One-way ANOVA
9. Total group's percentage correct answers between pre-and post-test between the two schools that contains boys and girls	Independent <i>t</i> -test

The results will be discussed in chapter six.

5.9 CONCLUSION

In this chapter, all the instruments used to determine the impact of this NEP has been discussed. The instruments used were appropriate in gathering data to achieve the purpose of this study. Therefore, with the information obtained from this study, the researcher would be able to ascertain the impact of a specifically developed NEP, of this design, on a group of Grade R boys and girls in an urban government and private school situated in built-up areas in Durban.

CHAPTER 6: RESULTS AND DISCUSSION

6.1 INTRODUCTION

The aim of the study was to determine the impact of a Grade R classroom-based nutrition education programme (NEP) on boys and girls in a government and private school both situated in built-up urban areas of Durban. The children's nutrition knowledge of the South African Food-Based Dietary Guidelines (FBDGs) (section one of questionnaire) and the food groups (section two) was ascertained. This chapter will focus on reporting the results obtained in this study prior and post the nutrition education (NE) intervention. The Grade R learners' pre-and post-test knowledge are reported and analysed for the whole test and then as section one and two:

- within each of the three participating schools
- for the total group between the three schools
- for the group of boys and the girls in the study.

The results for section one are presented according to the 2003 FBDGs: Enjoy a variety of food; Be active; Eat plenty of fruit and vegetables every day; Chicken, fish, milk, meat or eggs can be eaten daily; Drink lots of clean, safe water; Use food and drinks containing sugar sparingly and not between meals; Hygiene is important, and Sufficient sleep is required at night. Section two results are discussed under the different food groups: Dairy, Vegetable and Fruit, Protein-rich foods, Fat, and Starch/Carbohydrate.

6.2 LOST TO FOLLOW UP

Ten of the original 130 children (7.69 percent) did not complete the post-test and were therefore lost to follow up (LTFU). The control group (CG) had the highest number of drop-outs (five) followed by four from the experimental private group (EPG) and one child from the experimental government group (EGG). These children were therefore eliminated from the final data base. The pre-test nutrition knowledge questionnaire (NKQ) results of the LTFU children from the CG (n=5) and the EPG (n=4) students were captured on a Microsoft Excel spreadsheet and Statistical Package for Social Sciences (SPSS) Version 19. Independent t-tests (2-tailed) was used to analyse the data for statistical significant differences between the results of the LTFU group and the results of the pre-test for the total group. The EGG (n=1) data was not included here as there was only one drop-out in this group.

For the questions in Section one, there was a non-significant difference between the LTFU group and the CG students. Only 3 out of 10 questions (Q1.1, 1.3 and 1.9) showed a significant difference in the pre-test answers of the LTFU group and main intervention group. The average percentage of children with correct answers of the total group being lower than the average percentage of drop out children with correct answers in these three questions relating to 10 hours of sleep required at night (Q1.1), should a child play outside every day (Q1.3) and is milk, yoghurt, cheese needed for healthy bones and teeth (Q1.9). It is therefore assumed that the LTFU group would not have made a significant contribution to the results for section one.

In Section two, only Question 2.3 (matching meat chop and chicken drumstick with protein food group) revealed statistical significance ($p=0.000$) where the average correct answer of the total group was significantly lower than the average correct answers of the LTFU CG group. For the EPG, statistical significance was observed in knowledge for Questions 2.3 (Protein-rich food group, $p=0.001$) and 2.4 (Fat food group, $p=0.006$) with the average correct answers of the total group for these two questions being higher than the average correct answers of the drop-outs.

It is therefore assumed due to the significance of a limited number of questions that the LTFU group would not have significantly impacted on the section two results should they have completed the study.

6.3 AGE AND GENDER DATA

The age of the school children in Grade R in both the CG and the experimental groups (EGs) was obtained from the school records. It revealed that the children were between the ages of five and seven with the majority (95.80 percent) being six years old (Table 6.1).

Table 6.1: Age of children per school and per gender at baseline

Age of children in years	Experimental Government group (n=37)		Experimental Private group (n=40)	Control Group (n=43)	
	Boys (n=19)	Girls (n=18)	Girls only (n=40)	Boys (n=23)	Girls (n=20)
5	-	1	1	-	-
6	17	16	39	23	20
7	2	1	-	-	-

The gender of the participating children in the EG and CG is shown in Figure 6.1. The EPG was a girl's only school. In the control and experimental groups (EGG and EPG) there was no statistically significant difference in the number of boys and girls, however the groups were not corrected for gender distributions and may reflect differently if done differently.

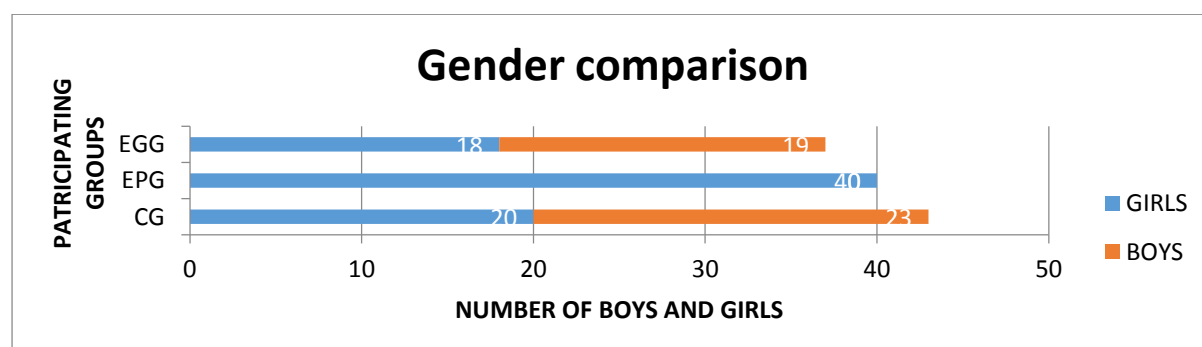


Figure 6.1: The gender composition of the different groups in the study

6.4. RELIABILITY TESTING OF THE NUTRITION KNOWLEDGE QUESTIONNAIRE

The NKQ was tested for validity and reliability as discussed in Chapter 5. The initial testing of the NKQ for validity and reliability indicated that the internal consistency of the questionnaire was low with an average Chronbach's Alpha score of 0.296.

The NKQ, once refined, resulted in an improvement of the internal consistency with the Cronbach's Alpha score at 0.532. The Kappa test was computed to assess the test retest reliability and Table 6.2 indicates that four of the 15 questions showed substantial agreement (Kappa=0.610–0.800), four fair agreement (Kappa=0.210–0.400) and one slight agreement (Kappa=0.000–0.200).

Table 6.2: Kappa Scores for the test retest reliability

QUESTIONS	TEST RE-TEST RELIABILITY SCORE
1.1 Is 10 hours of sleep required at night?	0.740*
1.2 Must 5 fruit and vegetables be eaten every day?	0.026**
1.3 Should a child play outside every day?	0.338**
1.4 Must a child eat different types of foods?	a
1.5 Must fruit be washed before being eaten?	a
1.6 Must hands be washed before being eaten?	a
1.7 Will meat and fish give you strong muscles?	0.621*
1.8 Is it healthy to eat lots of sweets, cakes and biscuits?	0.001***
1.9 Is milk, yoghurt, cheese needed for healthy bones and teeth?	a
1.10 Must a child drink six glasses of water daily?	0.621*
2.1 Dairy food group	0.338**
2.2 Vegetable and Fruit food group	a
2.3 Protein food group	0.387**
2.4 Fat food group	a
2.5 Starch/ Carbohydrate (CHO) food group	0.621*

*Kappa = 0.610 - 0.800 substantial agreement

** Kappa = 0.210 - 0.600 fair agreement

*** Kappa = 0.000 - 0.200 slight agreement

a=no statistics were computed because the question is a constant

There existed a weak positive correlation, as shown in Table 6.3, for all the questions between the two tests for the test retest reliability results. For questions in section one, significance was found with a moderate positive correlation ($r=0.694$) and in question two, a weak negative correlation exists ($r=-0.295$).

Table 6.3: Pearson's correlation coefficients for test retest reliability

QUESTIONS in	r-values	p-values
Total test	0.422	0.196
Section 1	0.694	0.018*
Section 2	-0.295	0.378

* $p<0.05$ – statistical significant difference

6.5 PRE-AND POST-TEST NUTRITION EDUCATION INTERVENTION PROGRAMME RESULTS

In this study a comparison is made between the percentage of children with correct answers in the pre- and post-test results for the whole test, section one and section two. Firstly, the comparison was made of the percentage of children that correctly answered between the pre- and post-test results within each school (EGG, EPG and CG). Secondly, the results between the three schools have been compared for the total group, the group of boys and the group of girls.

6.5.1 Comparison of the pre-and post-test results within each school group

6.5.1.1 Experimental government school (EGG) results

- **EGG whole test results**

The percentage results for the whole test for the entire EGG, the boys and the girls' correct answers are illustrated in Figure 6.2.

At baseline the majority of children in the EGG (72.43 percent) answered correctly and the NEP resulted in 15.87 percent more children providing the correct answers at post-test (88.30 percent). For the whole test, the girls (71.47 percent pre- to 89.62 percent post-test) when compared to the boys (73.32 percent pre- to 87.00 percent post-test) had a greater percentage of correct answers with the difference between baseline and post-test results being 18.15 percent, and 13.68 percent, respectively.

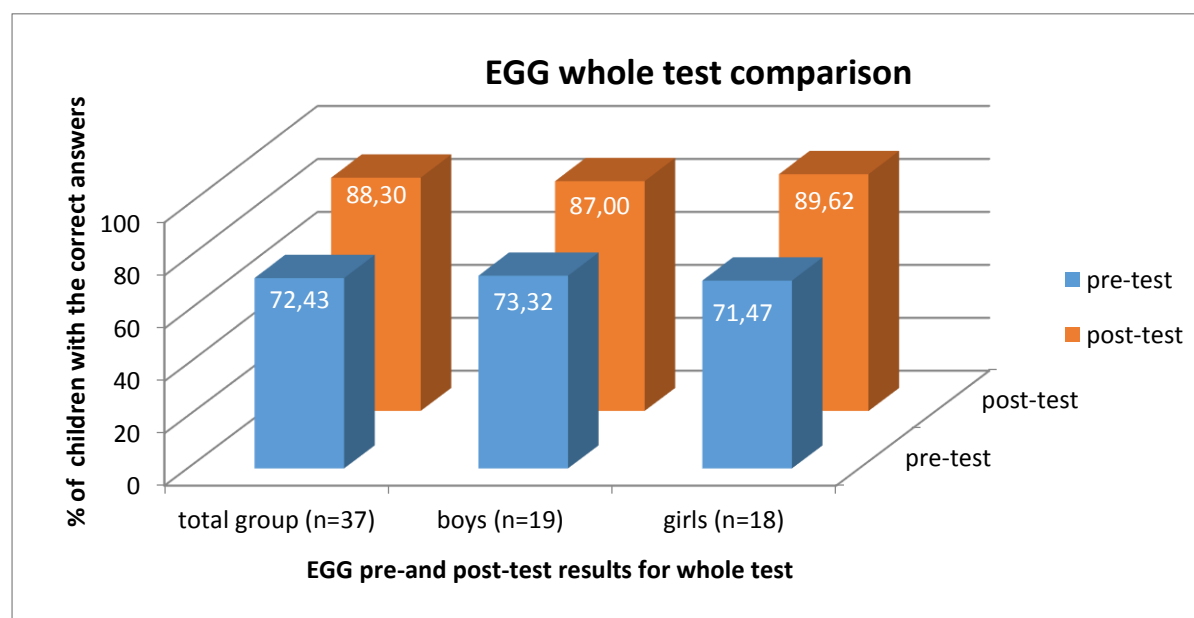


Figure 6.2: Comparison of percentage of children with correct pre-and post-test answers for the whole test for the experimental government school total group, boys and girls

- **EGG Section one results**

Section one questions relating to the FBDGs required the child to select either a 'Yes' or 'No' answer. As observed in Figure 6.3, most of the children (87.58 percent) answered all the questions correctly before the intervention as the majority of the participants had FBDG knowledge.

There was a similar trend between boys and girls with the lowest percentage of children with correct answers for the FBDG (Q1.3) relating to playing outside every day (Table 6.4). All girls and boys were knowledgeable (100.00 percent) about washing hands before eating (Q1.6) and all remained knowledgeable (100.00 percent) after the intervention.

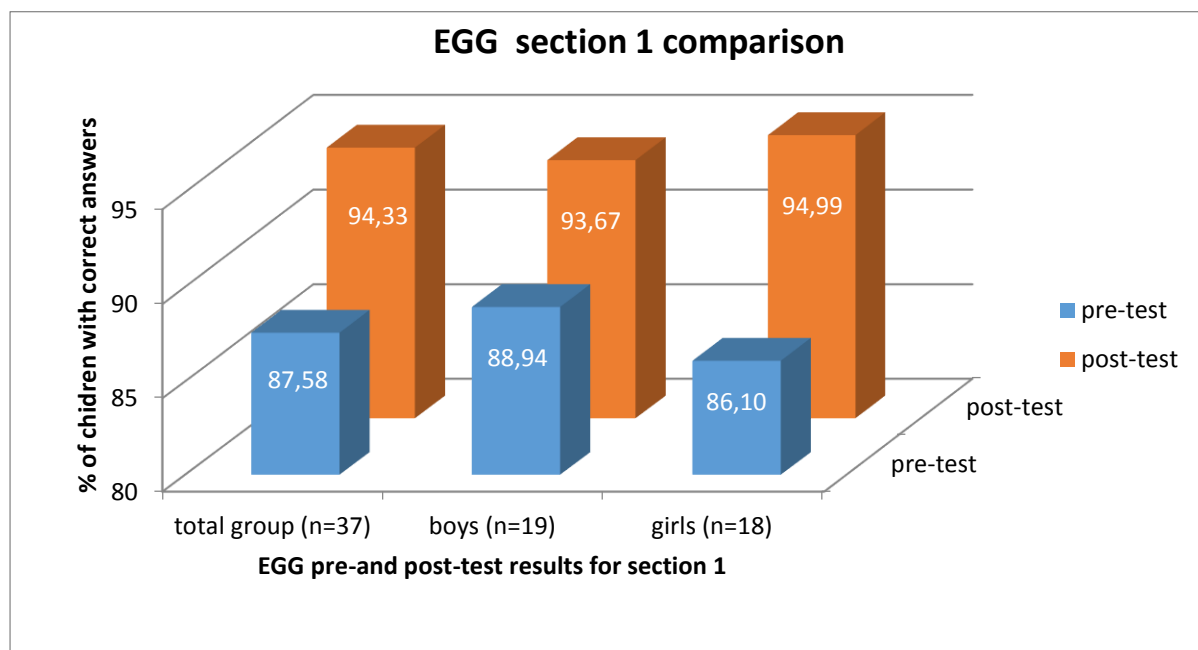


Figure 6.3: Comparison of percentage of children with correct pre-and post-test answers for Section one for the experimental government school total group, boys and girls

The post-test results for the whole group indicate that in three of the 10 questions the percentage of children with correct answers decreased (Qs 1.1 (10 hours of sleep required), 1.4 (eat different types of food) and 1.8 (healthy to eat lots of sweets, cakes)). The percentage of children with correct answers remained identical for one question (Q 1.6, wash hands before eating) and increased in six questions (Qs 1.2 (5 fruit and vegetables daily), 1.3 (play outside daily), 1.5 (wash hands before eating), 1.7 (meat and fish give strong muscles), 1.9 (milk products needed for healthy bones and teeth) and 1.10 (drink six glasses of water daily)).

Table 6.4: Experimental government school group: Section one: percentage of children with correct answers for the pre-and post-test for the total group, boys and girls with effect on knowledge

EXPERIMENTAL GOVERNMENT SCHOOL GROUP (n=37) - SECTION ONE									
Question number	TOTAL GROUP OF BOYS AND GIRLS (n=37)			BOYS ONLY (n=19)			GIRLS ONLY (n=18)		
	PRE-TEST % (n)	POST-TEST % (n)	E O K	PRE-TEST % (n)	POST-TEST % (n)	E O K	PRE-TEST % (n)	POST-TEST % (n)	E O K
1.1 10hrs of sleep	83.80 (31)	81.10 (30)	↓	84.20 (16)	78.90 (15)	↓	83.30 (15)	83.30 (15)	↔
1.2 Daily 5 F & V	91.90 (34)	100.00 (37)	↑	89.50 (17)	100.00 (19)	↑	94.40 (17)	100.00 (18)	↑
1.3 Play outside daily	51.40 (19)	86.50 (32)	↑	52.60 (10)	84.20 (16)	↑	50.00 (9)	88.90 (16)	↑
1.4 Eat diff. types of food	91.90 (34)	86.50 (32)	↓	100.00 (19)	84.20 (16)	↓	83.30 (15)	88.90 (16)	↑
1.5 Wash fruit	97.30 (36)	100.00 (37)	↑	94.70 (18)	100.00 (19)	↑	100.00 (18)	100.00 (18)	↔
1.6 Wash hands	100.00 (37)	100.00 (37)	↔	100.00 (19)	100.00 (19)	↔	100.00 (18)	100.00 (18)	↔
1.7 Meat & fish give strong muscles	89.20 (33)	97.30 (36)	↑	94.70 (18)	94.70 (18)	↔	83.30 (15)	100.00 (18)	↑
1.8 Lots sweet, cakes	100.00 (37)	94.60 (35)	↓	100.00 (19)	94.70 (18)	↓	100.00 (18)	94.40 (17)	↓
1.9 Milk – healthy bones & teeth	81.10 (30)	97.30 (36)	↑	84.20 (16)	100.00 (19)	↑	77.80 (14)	94.40 (17)	↑
1.10 Daily six glasses of water	89.20 (33)	100.00 (37)	↑	89.50 (17)	100.00 (19)	↑	88.90 (16)	100.00 (18)	↑

n=number of participants, EOK= Effect on knowledge, F & V= Fruit and Vegetables, diff=different

❖ Enjoy a variety of food

In Question 1.4 (Figure 6.4), the children were asked if they must eat different types of food. The majority of children knew the correct answer (91.90 percent) in the pre-test; however; the percent of boys with correct answers decreased after the NEP resulting in the total group post-test correct answers reducing to 86.50 percent from 91.90 percent.

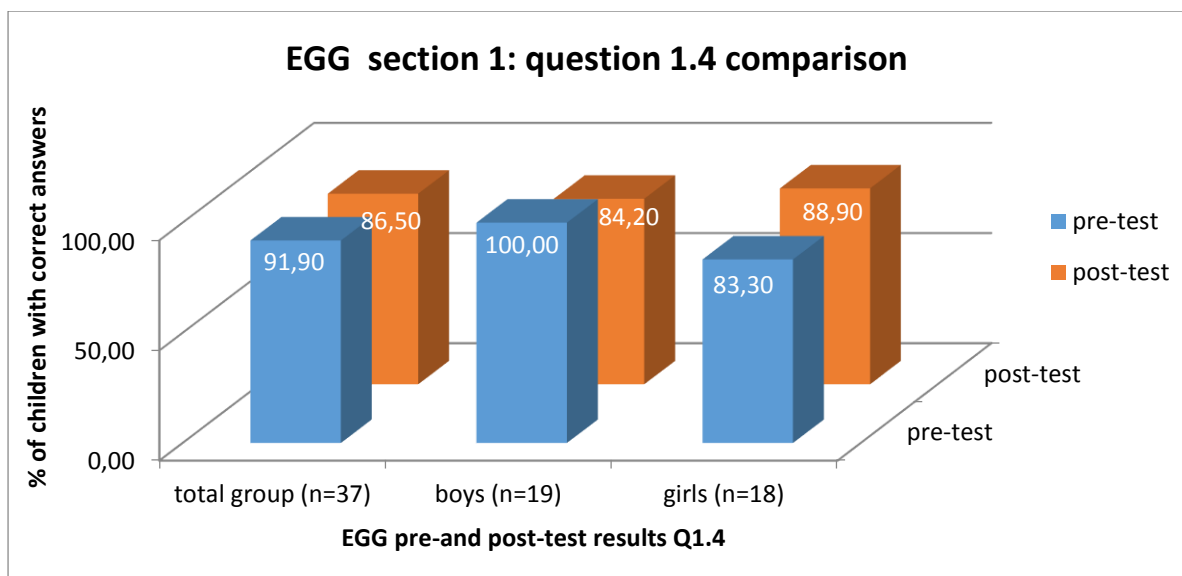


Figure 6.4: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.4 for the experimental government school total group, boys and girls

❖ **Be active**

Question 1.3 (Figure 6.5), referred to playing outside every day. For the total group an improvement in the percentage (35.10 percent) of children with correct answers was noted between pre-and post-test (51.40 and 86.50 percent respectively) resulting in the majority of children knowing the importance of playing outside every day. The girls and boys as individual groups each showed an improvement in the percentage of correct answers after the intervention, with the girls showing a greater percentage increase than the boys (38.90 percent and 31.60 percent respectively).

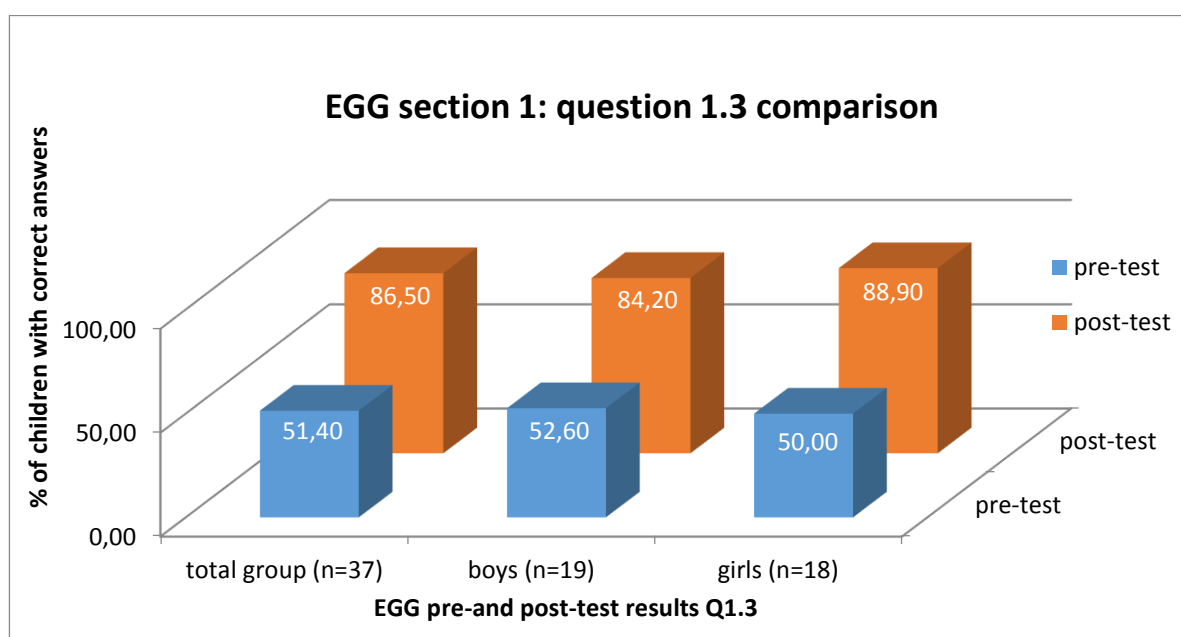


Figure 6.5: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.3 for the experimental government school total group, boys and girls

❖ **Eat plenty of fruit and vegetables every day**

The children were asked in Question 1.2 whether five fruit and vegetables must be eaten daily. The majority of boys (89.50 percent) and girls (94.40 percent) knew the answer prior to the intervention and both groups scored 100.00 percent in the post-test (Figure 6.6).

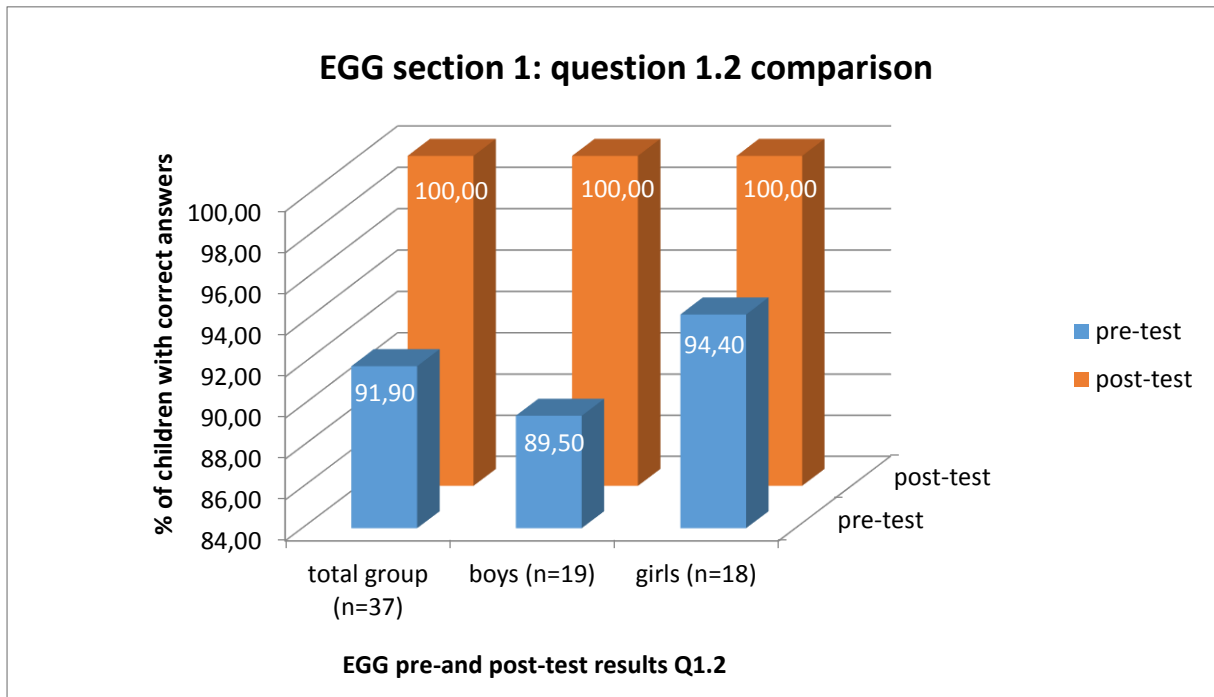


Figure 6.6: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.2 for the experimental government school total group, boys and girls

❖ **Chicken, fish, milk, meat or eggs can be eaten daily**

Will meat or fish give strong muscles was asked in Question 1.7 (Figure 6.7). The majority of boys (94.70 percent) and girls (83.30 percent) knew the answer prior to the intervention. In the post-test, all the girls (100.00 percent) answered this question correctly whilst the boys obtained an identical percentage score for correct answers (94.70 percent) for both pre-and post-tests.

For Question 1.9 (Figure 6.7), referring to milk, yoghurt and cheese needed for healthy bones and teeth, for the whole group, an improvement in the percentage of correct answers (16.20 percent) was observed after the intervention with all the boys (100.00 percent) correctly answering this question post-test.

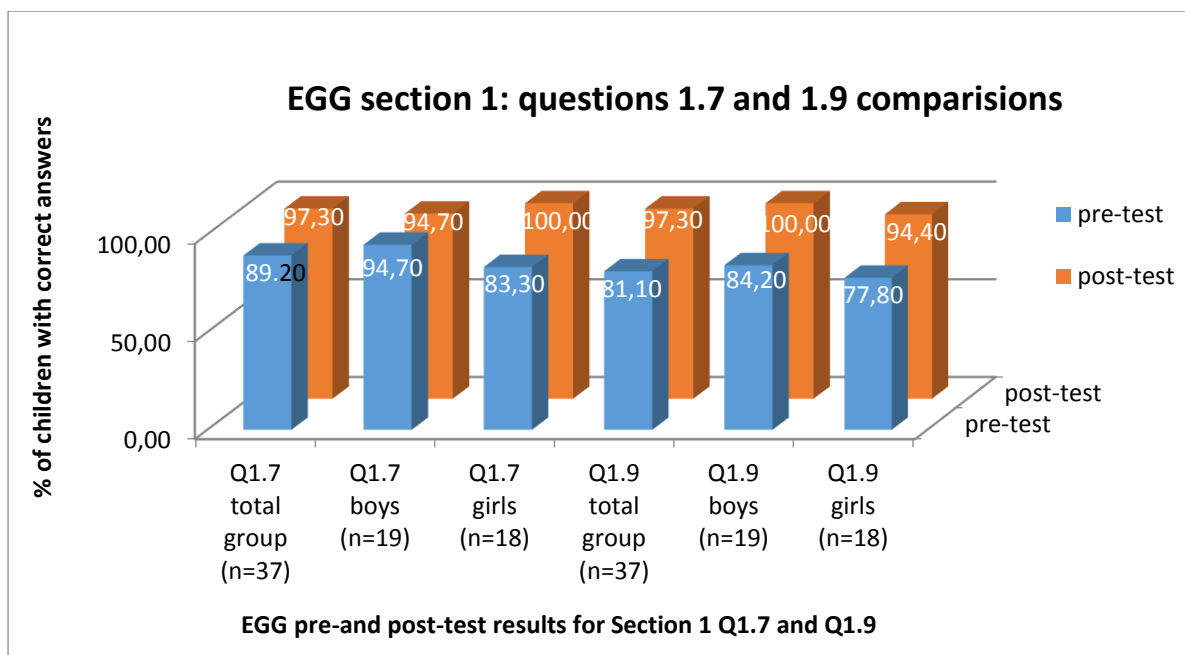


Figure 6.7: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.7 and 1.9 for the experimental government school total group, boys and girls

❖ **Drink lots of clean safe water**

The results for Question 1.10 are illustrated in Figure 6.8. In the pre-test the majority of the boys (89.50 percent) and the girls (88.90 percent) knew that a child should drink six glasses of water daily. Post-test the whole EGG group (100.00 percent) answered correctly with an improvement of knowledge being observed.

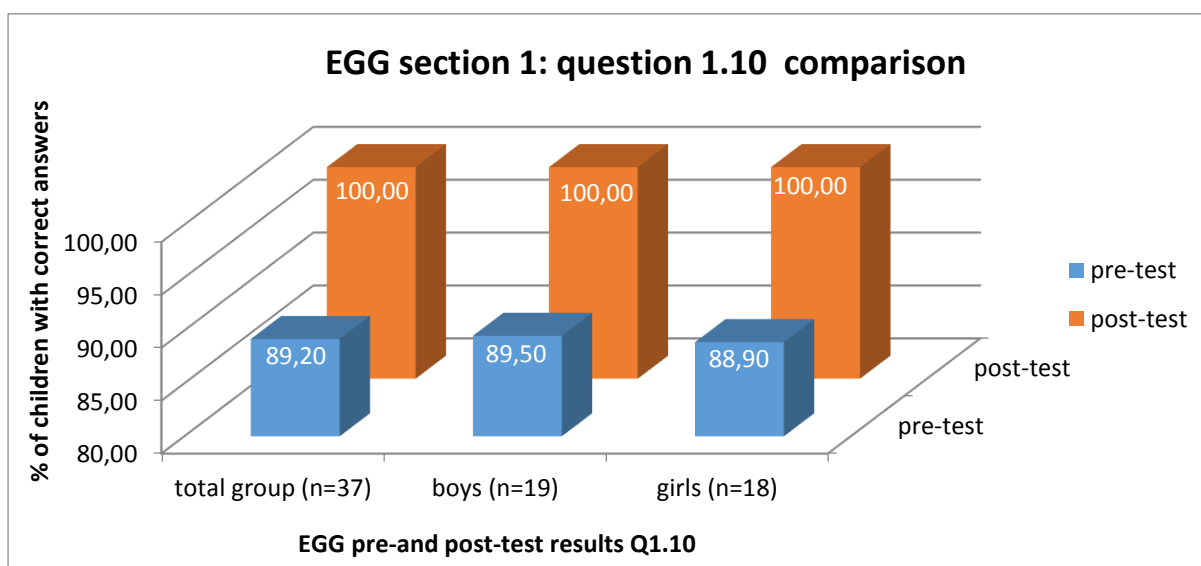


Figure 6.8: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.10 for the experimental government school total group, boys and girls

❖ **Use food and drinks containing sugar sparingly and not between meals**

Question 1.8 (Figure 6.9), related to whether eating lots of sweets, cakes and biscuits was healthy. In the pre-test, all boys and girls (100.00 percent) answered correctly; however, the post-test percentage of the boys (94.70 percent) and the girls (94.40 percent) as individual groups with correct answers decreased slightly.

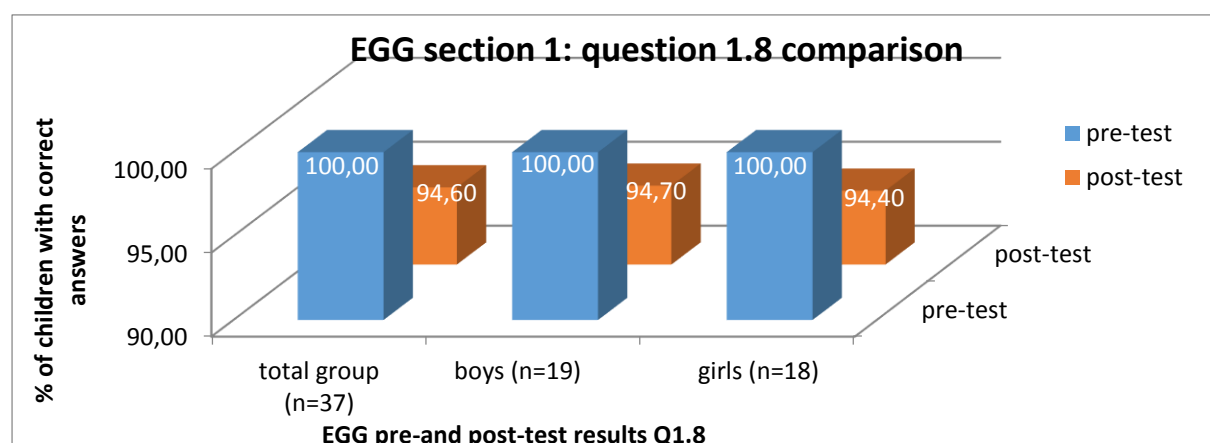


Figure 6.9: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.8 for the experimental government school total group, boys and girls

❖ **Hygiene is important**

The results of Question 1.5 (Figure 6.10) showed that prior to the NEP all the girls (100.00 percent) and the majority of the boys (94.70 percent) knew that fruit must be washed before being eaten. Post-intervention, the whole EGG (100.00 percent) answered correctly.

Question 1.6 (Figure 6.10) refers to hands being washed before eating. All children (100.00 percent) knew the answer to this question in both the pre-and post-test.

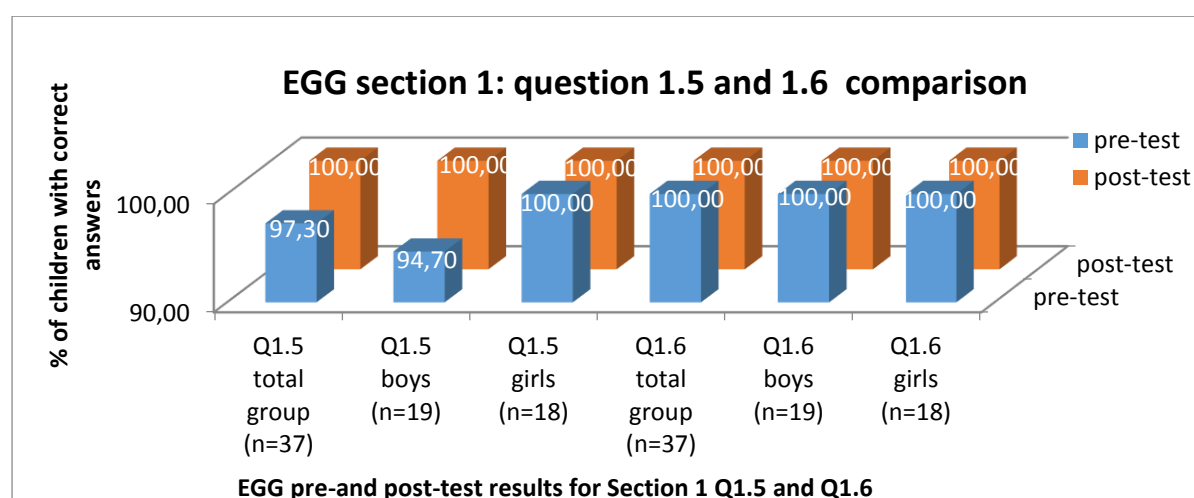


Figure 6.10: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.5 and 1.6 for the experimental government school total group, boys and girls

❖ Sufficient sleep required at night

Question 1.1 asked whether 10 hours of sleep is required for children at night (Figure 6.11). The pre-test results show that the majority of boys and girls knew the answer (84.20 and 83.30 percent respectively) to this question. The post-test results indicate identical knowledge for the girls as in the pre-test (83.30 percent). Whilst, the boys (78.90 percent) showed decrease in correct answers after the NEP relating to the number of hours sleep they require each night.

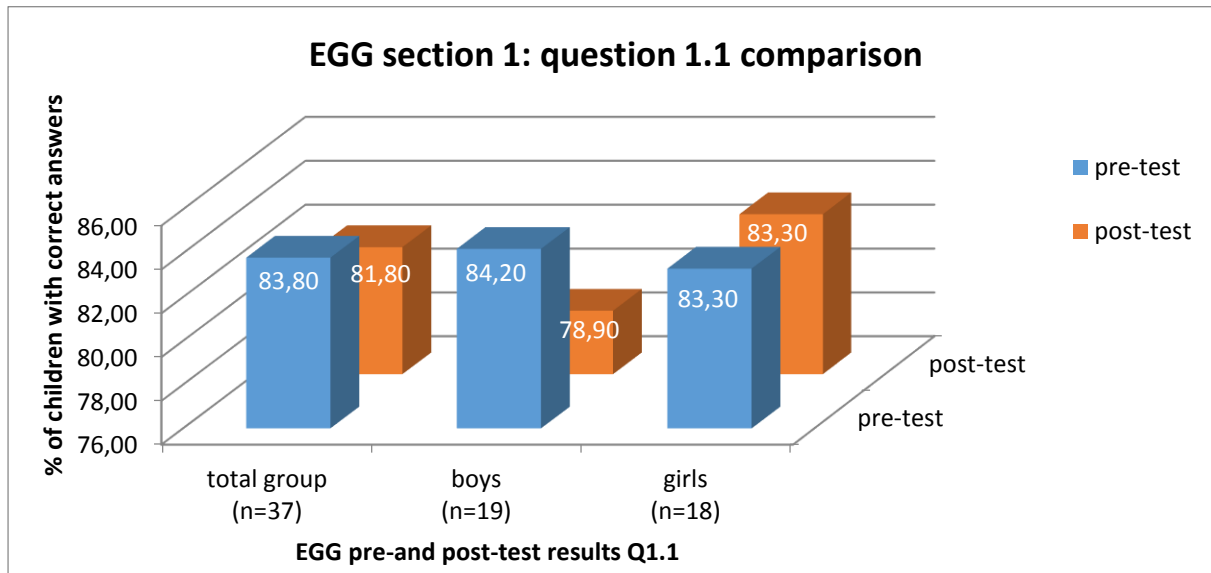


Figure 6.11: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.1 for the experimental government school total group, boys and girls

• EGG Section two results

Section two was based on the five Food groups and the children had to match the drawings of food items to the food group names.

It is observed (Figure 6.12) that for the total group in Section two, after the NEP, there was an increase in the percentage of children with correct answers (34.10 percent). A minority (42.14 percent) knew the correct answers in the pre-test compared to the majority (76.24 percent) after the intervention. For the individual group of boys and girls, there was an improvement in percentage of children with correct answers (31.58 percent and 36.68 percent respectively) with the girls achieving the highest percent of post-test correct answers (78.88 percent), compared to the boys at 73.66 percent.

The results for each question in Section two for the EGG are presented in Table 6.5. For this section, before the intervention most of the EGG children lacked knowledge in four (Qs 2.1 (Dairy), 2.3 (Protein), 2.4 (Fat) and 2.5 (Carbohydrate (CHO))) of the five questions as they answered incorrectly in the pre-test. Very poor food group knowledge (29.70 percent) was observed in both Questions 2.1 (Dairy) and 2.4 (Fat). However, an exception was noted in Question 2.2 (Vegetable and Fruit) where the majority

(83.80 percent) of the EGG answered correctly before the NEP. A similar trend in pre-test knowledge was observed between boys and girls for all questions in section two.

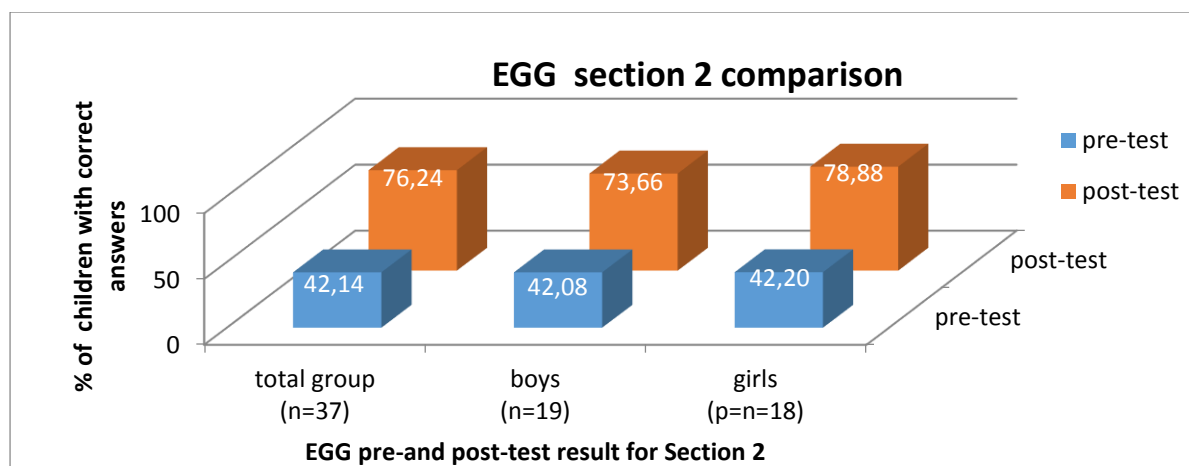


Figure 6.12: Comparison of percentage of children with correct pre-and post-test answers for Section two for the experimental government school total group, boys and girls

After the NEP, for the whole group, for each of the five questions in Section two, there was an increase in the percentage of children with correct answers with the greatest increase (51.40 percent) observed in Question 2.4 (Fat). As individual groups of boys and girls, there was an increase of the percentage of children with correct answers in each of the questions, discussed in detail here.

Table 6.5: Experimental government school group: Section two: percentage of children with correct answers for the pre-and post-test for the total group, boys and girls with effect on knowledge

EXPERIMENTAL GOVERNMENT GROUP (n=37) – SECTION TWO									
Question number	TOTAL GROUP OF BOYS AND GIRLS (n=37)			BOYS ONLY (n=19)			GIRLS ONLY (n=18)		
	PRE-TEST % (n)	POST-TEST % (n)	EOK	PRE-TEST % (n)	POST-TEST % (n)	EOK	PRE-TEST % (n)	POST-TEST % (n)	EOK
2.1 Dairy	29.70 (11)	70.30 (26)	↑	26.30 (5)	68.40 (13)	↑	33.30 (6)	72.20 (13)	↑
2.2 V & F	83.80 (31)	100.00 (37)	↑	84.20 (16)	100.00 (19)	↑	83.30 (15)	100.00 (18)	↑
2.3 Protein	32.40 (12)	62.20 (23)	↑	36.80 (7)	52.60 (10)	↑	27.80 (5)	72.20 (13)	↑
2.4 Fat	29.70 (11)	81.10 (30)	↑	26.30 (5)	78.90 (15)	↑	33.30 (6)	83.30 (15)	↑
2.5 CHO	35.10 (13)	67.60 (25)	↑	36.80 (7)	68.40 (13)	↑	33.30 (6)	66.70 (12)	↑

n=number of participants, EOK=Effect on knowledge, V & F= Vegetable and Fruit, CHO= Carbohydrate

❖ Dairy food group

Question 2.1 (Figure 6.13), required the matching of the cheese and milk pictures to the Dairy food group name. The majority of the boys (73.70 percent) and girls (66.70 percent) were unable to accomplish this prior to the NE. However, increase percentage of children with correct answers was observed post-test for the whole group, the boys and the girls. For this question, the boys achieved a greater percentage of correct answers (42.10 percent) than the girls (38.90 percent).

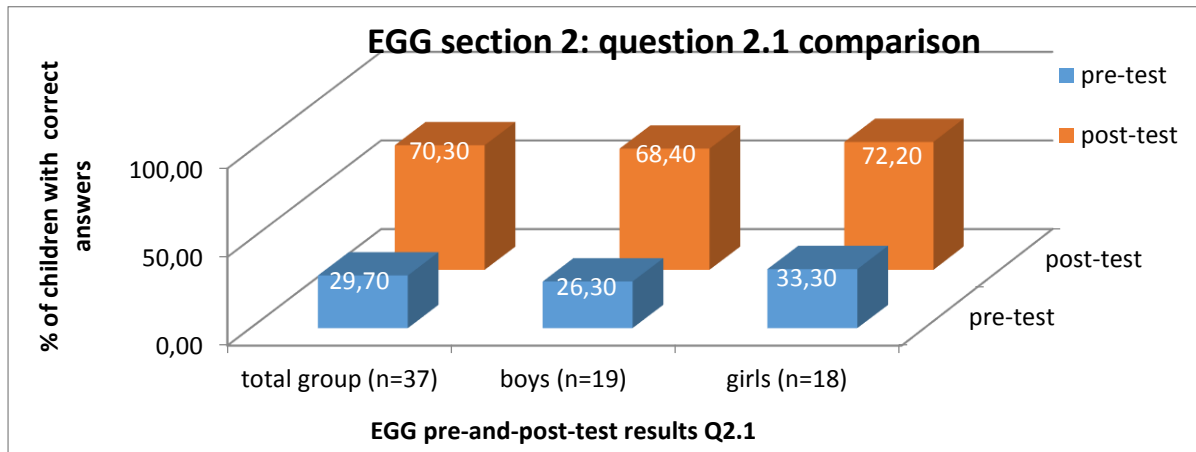


Figure 6.13: Comparison of percentage of children with correct pre-and post-test answers for Section two, Question 2.1 for the experimental government school total group, boys and girls

❖ Vegetable and Fruit food group

In Question 2.2, the children had to link the picture of a carrot and orange to the Vegetable and Fruit food group. The pre-test results presented in Figure 6.14 show that a similar majority of boys (84.20 percent) and girls (83.30 percent) knew the correct answer. The percentage of boys and girls with the correct answer increased after the intervention to 100.00 percent, with all learners in each of these groups answering correctly in the post-test.

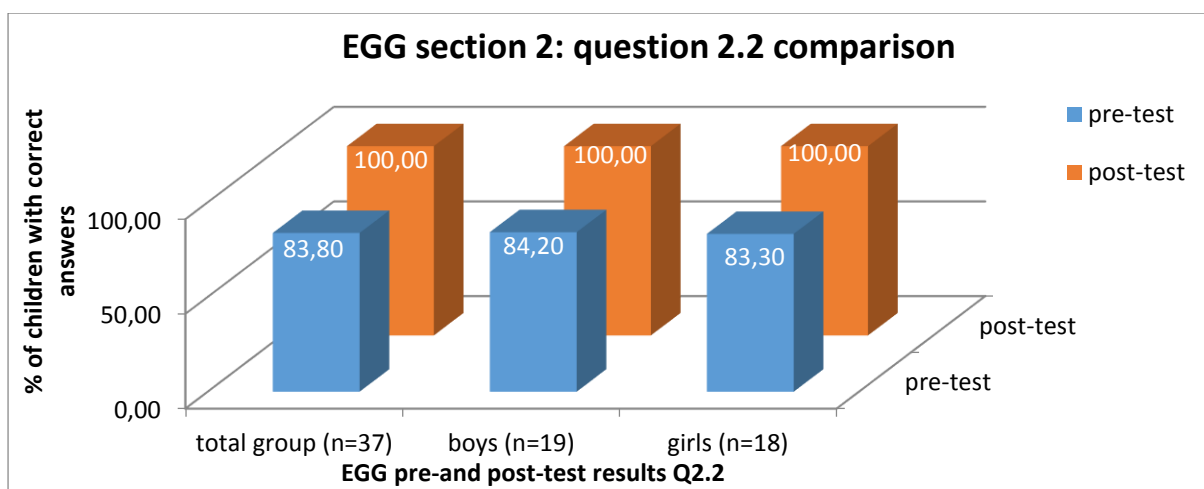


Figure 6.14: Comparison of percentage of children with correct pre-and post-test answers for Section two, Question 2.2 for the experimental government school total group, boys and girls

❖ Protein-rich food group

In Question 2.3, the children needed to match the picture of a meat chop and chicken drumstick to the Protein-rich food group. In the pre-test the minority of boys (36.80 percent) and girls (27.80 percent) knew the correct answer (Figure 6.15). At post-test the percentage of girls' answering the question correctly (44.40 percent) was greater than the boys' (15.80 percent).

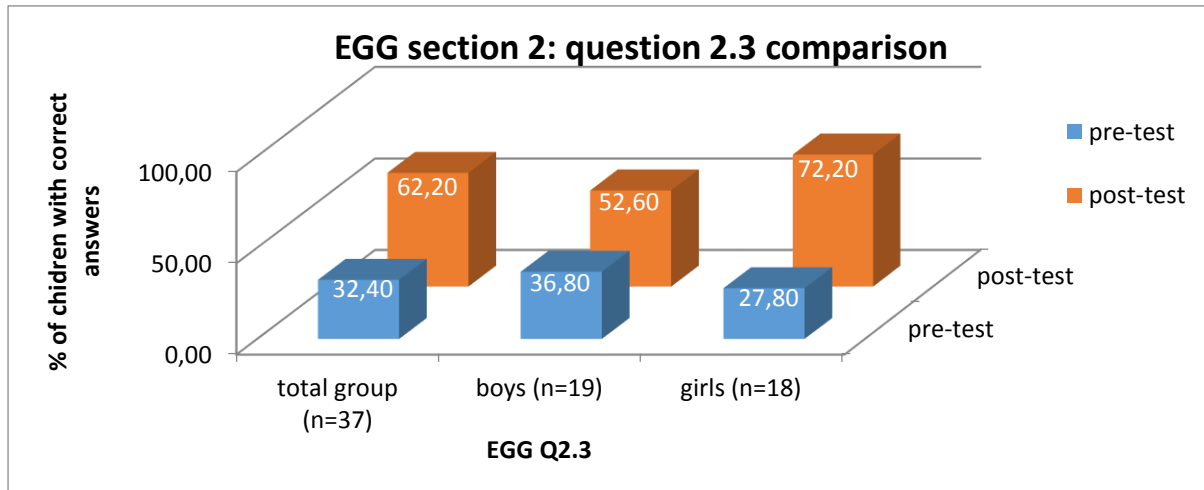


Figure 6.15: Comparison of percentage of children with correct pre-and post-test answers for Section two, Question 2.3 for the experimental government school total group, boys and girls

❖ Fat food group

Oil, butter and margarine needed to be matched with the Fat food group in Question 2.4 (Figure 6.16). Only a minority of the boys (26.30 percent) and girls (33.30 percent) had this knowledge prior to the NEP. As a whole group in the post-test, an improvement in the percentage of correct answers was observed (51.40 percent). The percentage improvement of correct answers in Question 2.4 for the individual group of boys and girls was similar (52.60 percent and 50 percent respectively).

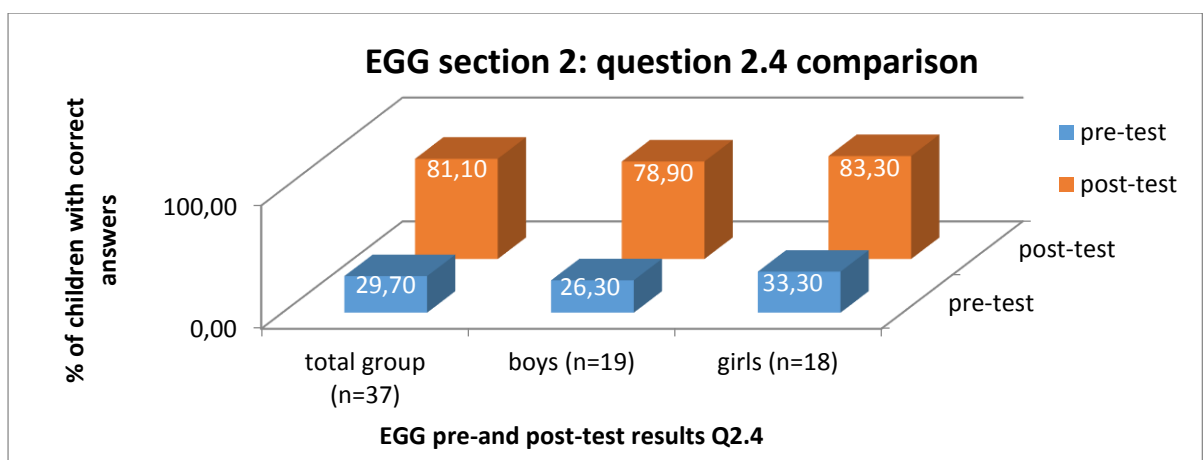


Figure 6.16: Comparison of percentage of children with correct pre-and post-test answers for Section two, Question 2.4 for the experimental government school total group, boys and girls

❖ Starch/Carbohydrate food group

Figure 6.17 illustrates the results for Question 2.5, for matching the Starch/Carbohydrate food group with the bread picture. Prior to the intervention, only a minority of boys (36.80 percent) and girls (33.30 percent) were knowledgeable in this regard. After the intervention an improvement in the percentage of correct answers (32.50 percent) was observed for the whole group with a similar increase occurring in the individual group of boys and girls.

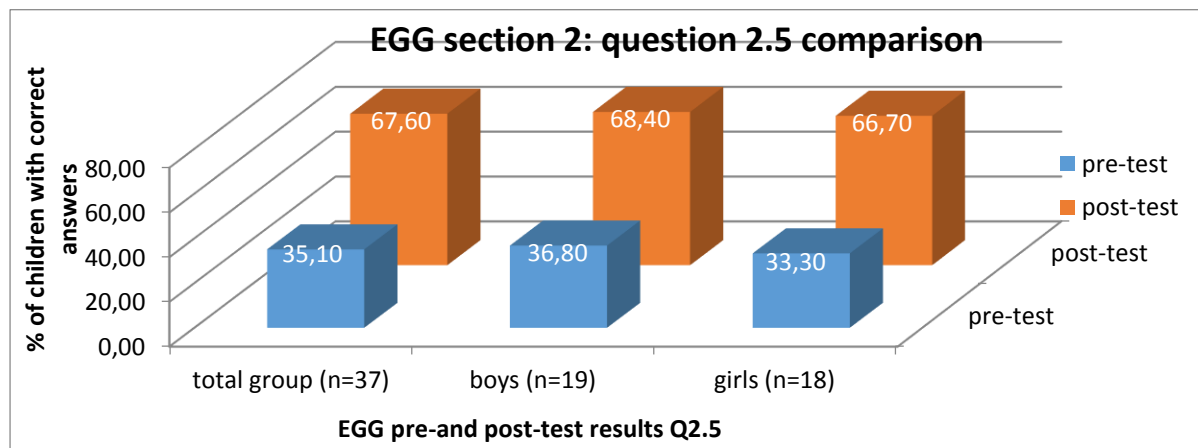


Figure 6.17: Comparison of percentage of children with correct pre-and post-test answers for Section two, Question 2.5 for the experimental government school total group, boys and girls

6.5.1.2 Experimental private school (EPG) results

• EPG whole test results

Figure 6.18 presents the EPG comparison of the percentage of children with correct pre-and post-test answers for the whole test, Section one and two. For the entire test, an improvement in the percentage (16.67 percent) of children with correct answers was observed between the pre- (70.83 percent) and post-test (87.50 percent).

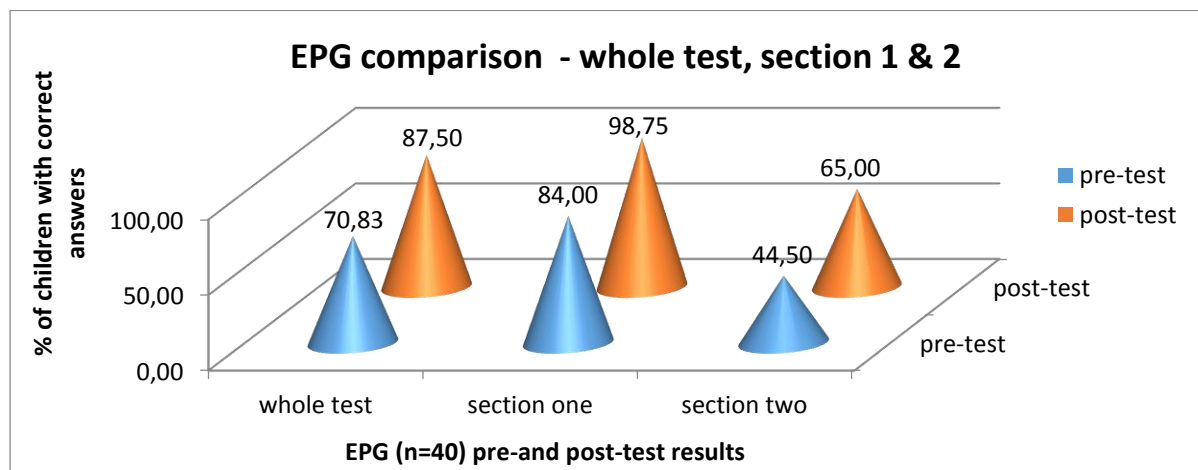


Figure 6.18: Comparison of percentage of children with correct pre-and post-test answers for the experimental private school group for the whole test, Section one and two

- **EPG Section one results**

In Section one (Figure 6.18), although the majority of children in the EPG (84.00 percent) knew the correct answers before the intervention there was a 14.75 percent improvement in the percentage of children with correct answers observed in the post-test (98.75 percent).

The EPG pre-and post-tests results for each question in Section one is presented in Table 6.6. At baseline, Question 1.3 (play outside) and 1.9 (milk, yoghurt, cheese needed for healthy bones and teeth) were the two questions where the group of children had the lowest percentage of correct answers (62.50 percent). After the NEP there was an increase in the percentage of children with correct answers observed in all questions except one (Q1.8: Is it healthy to eat lots of sweets, cakes, biscuits). This question referred to the consumption of sugary foods and drinks and there was no change between pre-and post-test. A substantial improvement in the percentage of children with correct answers was observed in Questions 1.1 (32.50 percent) and 1.3 (37.50 percent), both questions pertaining to being active. In addition, all the children (100.00 percent) knew the answers in the post-test to seven of the questions in Section one (Q1.1, 1.3, 1.4: Eat different types of food), 1.5, 1.6 (wash hands before eating), 1.7 and 1.10 (drink six glasses of water daily).

Table 6.6: Experimental private school group: Section one: percentage of children with correct answers for the pre-and post-test with effect on knowledge

EXPERIMENTAL PRIVATE GROUP (n=40) – SECTION ONE			
Question number	PRE-TEST % (n)	POST-TEST % (n)	Effect on knowledge
1.1 10hrs of sleep	67.50 (27)	100.00 (40)	↑
1.2 Daily 5 Fruit & Vegetables	90.00 (36)	97.50 (39)	↑
1.3 Play outside daily	62.50 (25)	100.00 (40)	↑
1.4 Eat different types of food	95.00 (38)	100.00 (40)	↑
1.5 Wash fruit	90.00 (36)	100.00 (40)	↑
1.6 Wash hands	97.50 (39)	100.00 (40)	↑
1.7 Meat & fish give strong muscles	87.50 (35)	100.00 (40)	↑
1.8 Lots sweet, cakes	95.00 (38)	95.00 (38)	↔
1.9 Milk – healthy bones & teeth	62.50 (25)	95.00 (38)	↑
1.10 Daily six glasses of water	92.50 (37)	100.00 (40)	↑

n=number of participants

- ❖ **Enjoy a variety of food**

Figure 6.19 indicates that in Question 1.4 almost all of the children (95.00 percent) in the pre-test knew that a child must eat different types of foods with 100.00 percent answering correctly in the post-test.

❖ **Be active**

Question 1.3 (Figure 6.19) indicates that the majority (62.50 percent) of the EPG knew the correct answer before the intervention. However, there was a substantial improvement (37.50 percent) post-intervention with all children (100.00 percent) knowing that it is important to play outside very day.

❖ **Eat plenty of fruit and vegetables every day**

For Question 1.2 (Figure 6.19) the majority percentage of children (90.00 percent) answered correctly in the pre-test. There was an improvement (7.50 percent) after the education as 97.50 percent of the children knew that five fruit and vegetables must be eaten daily.

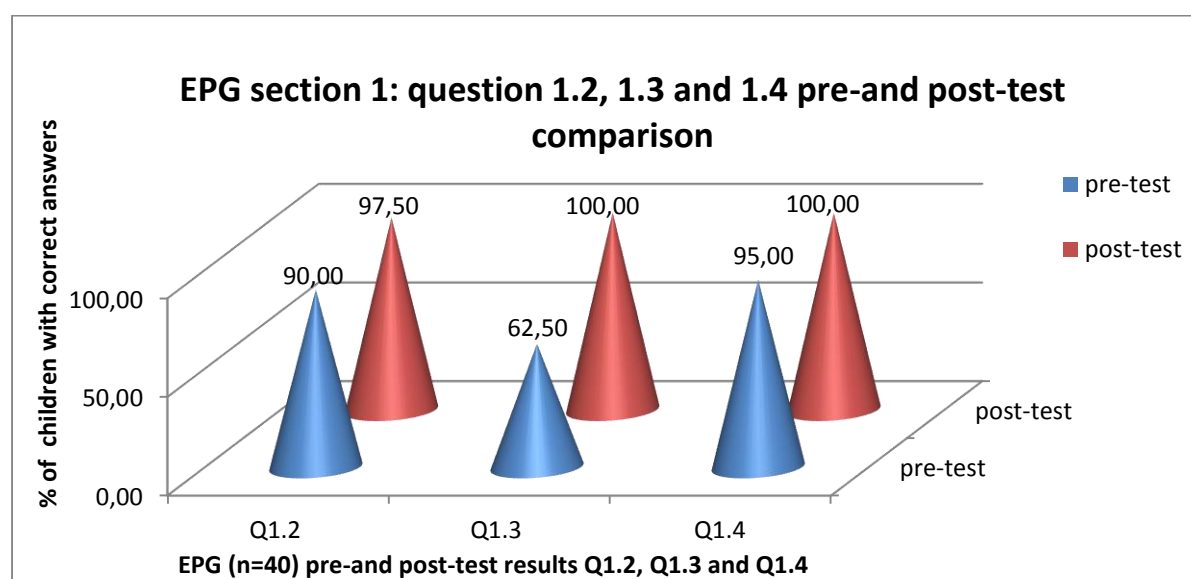


Figure 6.19: Comparison of percentage of children with correct pre-and post-test answers for the experimental private school group for Section one Questions 1.2, 1.3 and 1.4

❖ **Chicken, fish, milk, meat or eggs can be eaten daily**

For Question 1.7 (Figure 6.20), prior to the intervention the majority (87.50 percent) knew that meat and fish will give them strong muscles. There was a 12.50 percent improvement observed with all children (100.00 percent) answering correctly post-test.

In Question 1.9 (Figure 6.20), the majority (62.50 percent) of the children prior to the NEP knew of the relationship between the dairy food group and bone and teeth health with an improvement (32.50 percent) occurring after the intervention with 95.00 percent of children correctly answering this question post-test.

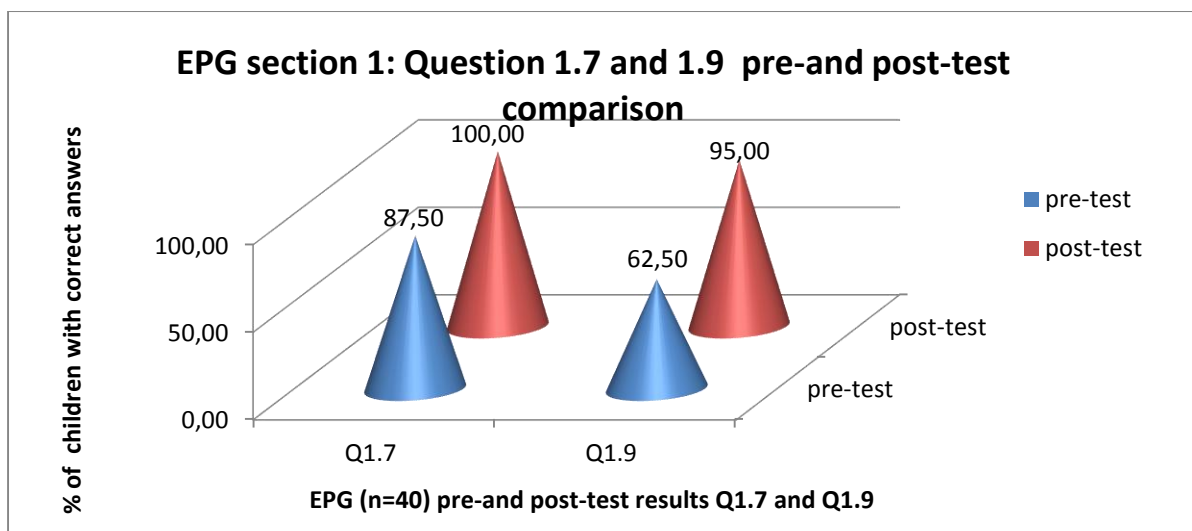


Figure 6.20: Comparison of percentage of children with correct pre-and post-test answers for the experimental private school group for Section one Questions 1.7 and 1.9

❖ **Drink lots of clean safe water**

Question 1.10 post-test results (Figure 6.21) show that after the intervention all children (100.00 percent) knew the number of glasses of water that they should consume daily. As the majority (92.50 percent) of children knew this answer prior to the NEP with a slight improvement in the percentage of children with correct answers (7.5 percent) at post-test.

❖ **Use food and drinks containing sugar sparingly and not between meals**

The results of the pre-test for Question 1.8 (Figure 6.21) indicate that the majority (95.00 percent) of the EPG children knew prior to the NE that it was unhealthy to eat a lot of food that was high in sugar. However, the intervention had no effect on the percentage of children with correct answers related to this question.

❖ **Hygiene is important**

Prior to the intervention, for Question 1.5 (Figure 6.21), the majority (90.00 percent) of children knew that fruit needs to be washed before eating and at post-test this improved to 100.00 percent. Almost every child (97.50 percent) in the pre-test knew to wash ones hands before eating (Question 1.6, Figure 6.21). The effect of the NEP increased the percentage of children knowing this important aspect of hygiene to 100.00 percent.

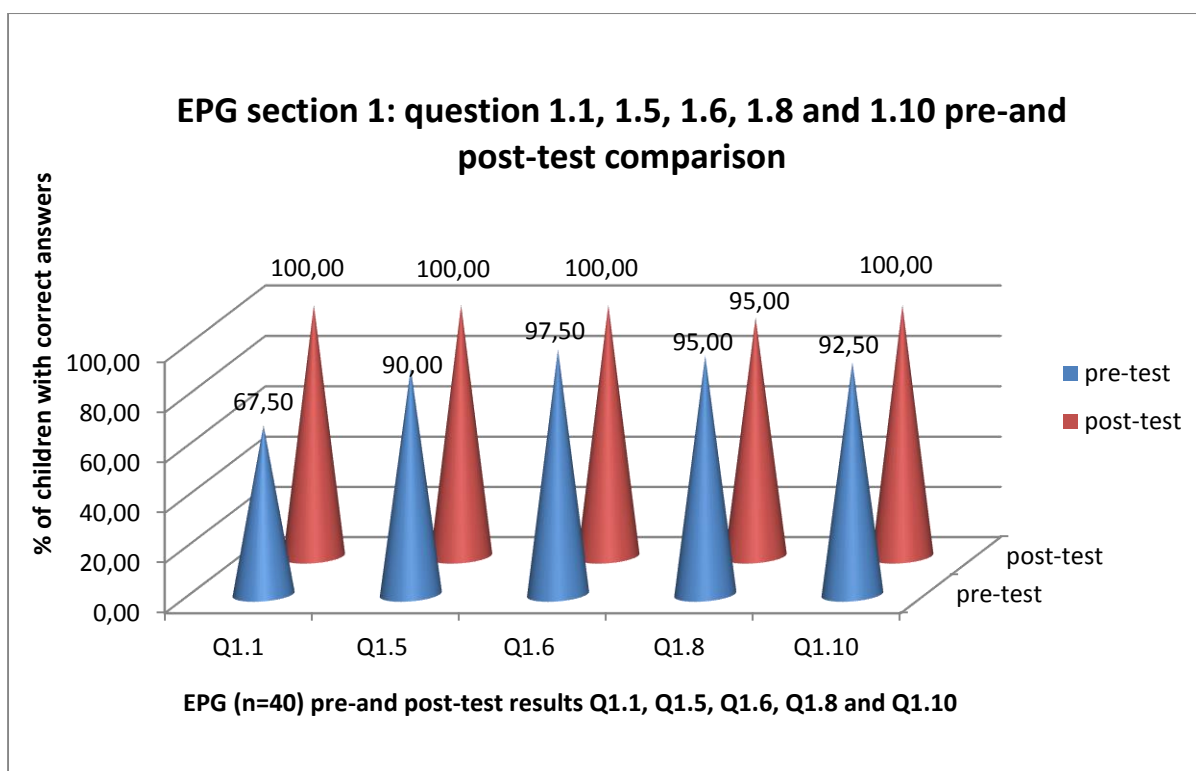


Figure 6.21: Comparison of percentage of children with correct pre-and post-test answers for the experimental private school group for Section one for Questions 1.1, 1.5, 1.6, 1.8 and 1.10

❖ Sufficient sleep required at night

For Question 1.1 (Figure 6.21), the majority of children (67.50 percent) knew the correct answer before the intervention. At post-test all children (100.00 percent) knew that that they needed 10 hours of sleep at night.

• EPG Section two results

For Section two, as illustrated in Figure 6.18, the majority of the EPG did not know the correct answers in the pre-test (44.50 percent). However, post intervention there was a 20.50 percent increase as 65.00 percent of the children provided the correct answers in this section.

EPG individual question results for Section two are presented in Table 6.7. Post intervention there was an increase in the percentage of children with correct answers in four questions (Qs 2.1 (Dairy), 2.3 (Protein), 2.4 (Fat) and 2.5 (CHO)). For one question (2.2, Vegetable and Fruit) there was no difference observed between pre-and post-test percentages of correct answers achieved by the children. An explanation pertaining to each question in Section two follows.

Table 6.7: Experimental private school group: Section two: percentage of children with correct answers for the pre-and post-test with effect on knowledge

EXPERIMENTAL PRIVATE SCHOOL GROUP (n=40) – SECTION TWO			
Question number	PRE-TEST % (n)	POST-TEST % (n)	effect on knowledge
2.1 Dairy	50.00 (20)	72.50 (29)	↑
2.2 Vegetables & Fruit	92.50 (37)	92.50 (37)	↔
2.3 Protein	25.00 (10)	45.00 (18)	↑
2.4 Fat	17.50 (7)	65.00 (26)	↑
2.5 Carbohydrate	37.50 (15)	50.00 (20)	↑

n=number of participants

❖ Dairy food group

Prior to the intervention, half the children (50.00 percent) in the EPG answered Question 2.1 correctly. An increase in the percentage of children (22.50 percent) with correct answers was observed post-test pertaining to the relationship between the dairy food group and bone and teeth health (Figure 6.22).

❖ Vegetable and Fruit food group

The results for Question 2.2 (Figure 6.22) indicate that there was no change in the percentage of children with correct answers after the NEP with the majority of the EPG (92.50 percent) correctly matching this food group with the appropriate picture in both pre-and post-test.

❖ Protein-rich food group

In Question 2.3, the minority (25.00 percent) knew the answer prior to the intervention (Figure 6.22). Although there was an improvement (20.00 percent) observed after the NEP, the majority of children (55.00 percent) post-test did not know the relationship between the protein food group and the foods that provide protein in the diet.

❖ Fat food group

In the pre-test in Section two, the EPG was found to have the lowest percentage of children with correct answers in Question 2.4 where only 17.50 percent of the children identified oil, butter and margarine as representatives of the Fat food group (Figure 6.22). In addition, the greatest increase (47.50 percent) in children with correct answers was observed in Section two in Question 2.4 as 65.00 percent of the EPG provided the correct answer post-test.

❖ Starch/Carbohydrate food group

In Question 2.5, half the children (50.00 percent) answered correctly in the post-test, with an improvement of 12.5 percent from the pre-test results (37.50 percent), (Figure 6.22).

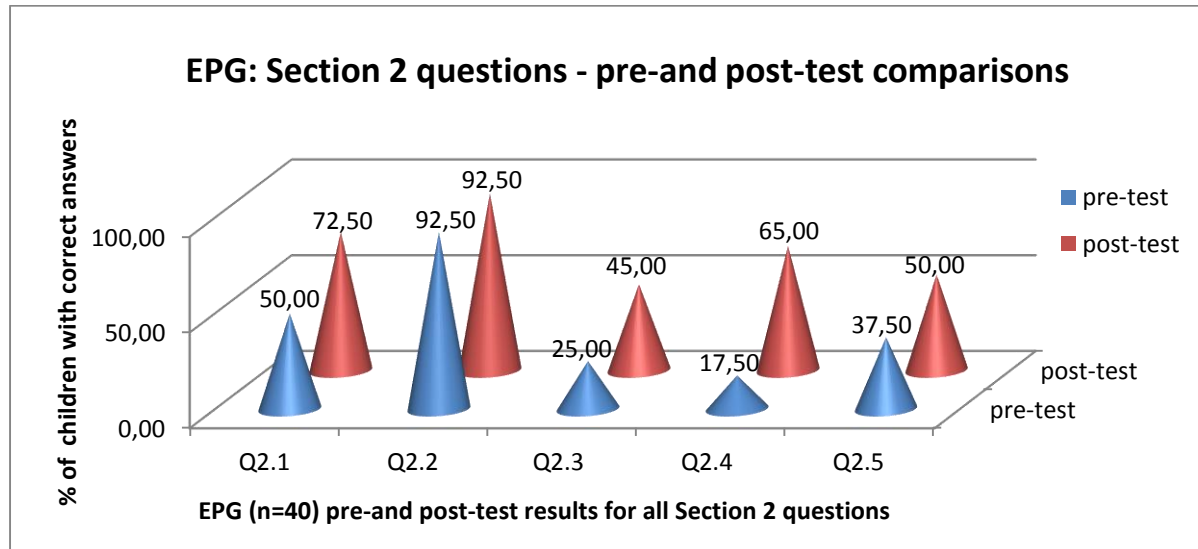


Figure 6.22: Comparison of percentage of children with correct pre-and post-test answers for all questions in Section two for the experimental private school group

6.5.1.3 Control group (CG) results

- CG whole test results

For the whole test, for the entire control group (Figure 6.23) there was a minimal increase in the percentage of children with correct answers (2.32 percent) between the pre-and the post-test results (69.15 and 71.47 percent respectively). The girls, as an individual group, showed no increase (67.33 percent), obtaining an identical number of correct answers in the first and second test. The increase of 4.34 percent for the boys (pre- 70.73 and post-test 75.07 percent) contributed to the overall increase in the percentage of children with correct answers in the CG.

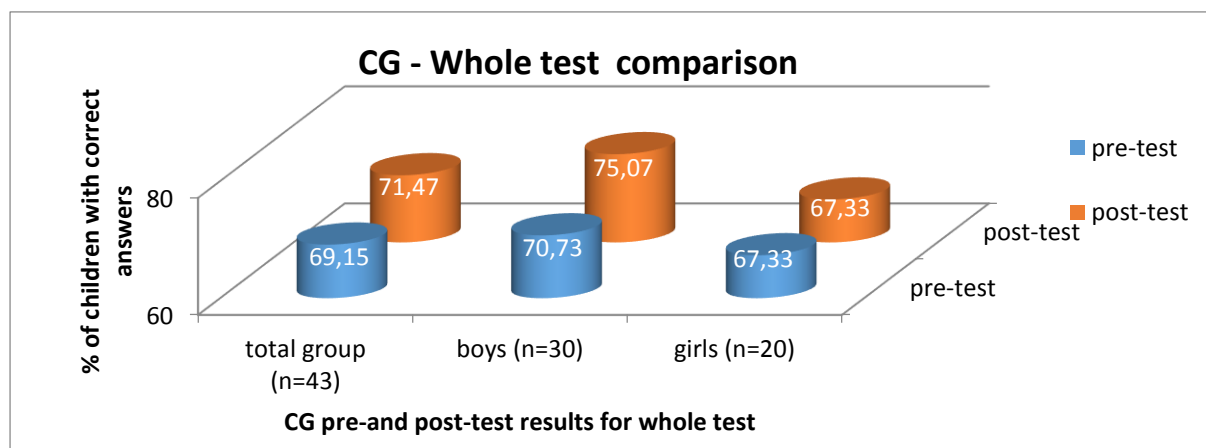


Figure 6.23: Comparison of percentage of children with correct pre-and post-test answers for the whole test for the total control group, boys and girls

- **CG Section one results**

Results for individual questions in Section one (Table 6.8) are reflected for the total group, the boys and the girls, between pre-and post-test correct answers.

For Section one (Figure 6.24), the majority (84.19 percent) of the CG children at pre-test were knowledgeable. There was a similar trend for the boys (85.66 percent) and girls (82.50 percent).

Post-test results showed a slight percentage increase in children with the correct answers for the whole group (1.84 percent) and the boys (4.35 percent). However, the girls had a marginal decrease (1.00 percent) in the percentage of children with correct answers.

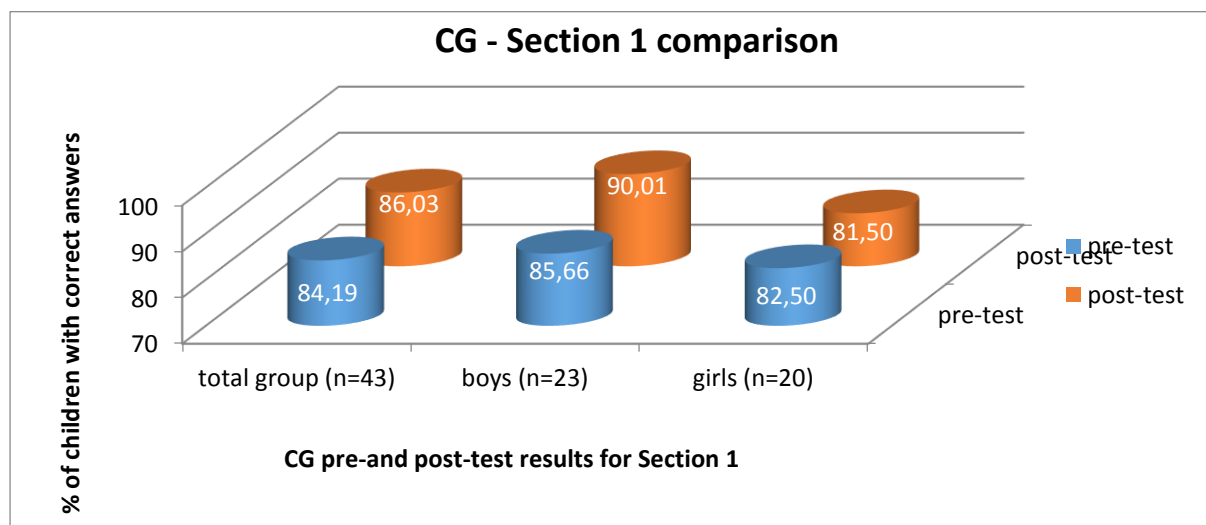


Figure 6.24: Comparison of percentage of children with correct pre-and post-test answers for Section one for the total control group, boys and girls

The post-test results for the entire CG (Table 6.8) indicate that in three of the 10 questions the percentage of children with correct answers increased (Qs 1.1 (10 hours of sleep), 1.2 (5 fruit and vegetables) and 1.8 (healthy to eat lots of sweets, cakes). In four questions (Qs 1.3 (play outside daily), 1.4 (eat different types of foods), 1.7 (meat and fish give strong muscles) and 1.10 (drink six glasses of water daily) decreased and remained identical in three questions (Qs 1.5 (wash fruit before eating), 1.6 (wash hands before eating) and 1.9 (milk and milk products needed for healthy bones and teeth).

Comparing the results of the boys and girls as individual groups, the boys had an increase in the percentage of children with correct answers in five questions (Qs 1.1, 1.2, 1.3, 1.8 (healthy to eat lots of sweets, cakes) and 1.9), compared to the girls where the only increases occurred in two questions (1.1 and 1.2). A similar trend between boys and girls was observed in Questions Q1.5 and 1.6, where no change in pre-and post-test percentages was observed. The percentage of boys who answered correctly decreased in only one question (Q 1.7) compared to the five questions (Qs 1.3, 1.4, 1.7, 1.9 and 1.10) in the group of girls.

Table 6.8: Control group: Section one: percentage of children with correct answers for the pre- and post-test for the total group, boys and girls with effect on knowledge

CONTROL GROUP (n=43) – SECTION ONE									
Question number	TOTAL GROUP OF BOYS AND GIRLS (n=43)			BOYS ONLY (n=23)			GIRLS ONLY (n=20)		
	PRE-TEST % (n)	POST-TEST % (n)	EO K	PRE-TEST % (n)	POST-TEST % (n)	EO K	PRE-TEST % (n)	POST-TEST % (n)	EO K
1.1 10 hrs of sleep	69.80 (30)	86.00 (37)	↑	78.30 (18)	91.30 (21)	↑	60.00 (12)	80.00 (16)	↑
1.2 Daily 5 F & V	62.80 (27)	81.40 (35)	↑	65.20 (15)	82.60 (19)	↑	60.00 (12)	80.00 (16)	↑
1.3 Play outside daily	76.70 (33)	74.40 (32)	↓	82.60 (19)	87.00 (20)	↑	70.00 (14)	60.00 (12)	↓
1.4 Eat different types of food	88.40 (38)	86.00 (37)	↓	91.30 (21)	91.30 (21)	↔	85.00 (17)	80.00 (16)	↓
1.5 Wash fruit	95.30 (41)	95.30 (41)	↔	91.30 (21)	91.30 (21)	↔	100.00 (20)	100.00 (20)	↔
1.6 Wash hands	97.70 (42)	97.70 (42)	↔	100.00 (23)	100.00 (23)	↔	95.00 (19)	95.00 (19)	↔
1.7 Meat & fish - strong muscles	90.70 (39)	83.70 (36)	↓	95.70 (22)	91.30 (21)	↓	85.00 (17)	75.00 (15)	↓
1.8 Lots of sweet, cakes	93.00 (40)	95.30 (41)	↑	91.30 (21)	95.70 (22)	↑	95.00 (19)	95.00 (19)	↔
1.9 Milk – healthy bones & teeth	79.10 (34)	79.10 (34)	↔	69.60 (16)	78.30 (18)	↑	90.00 (18)	80.00 (16)	↓
1.10 Daily six glasses of water	88.40 (38)	81.40 (35)	↓	91.30 (21)	91.30 (21)	↔	85.00 (17)	70.00 (14)	↓

n=number of participants, EOK=effect on knowledge, F & V=Fruit and Vegetables

❖ Eat plenty of fruit and vegetables every day

For Question 1.2 (Figure 6.25), similar pre-test knowledge is evident in the individual group of boys (65.20 percent) and girls (60.00 percent). Post-test results show an increase in knowledge for the girls (20.00 percent) and for the group as a whole (18.60 percent) pertaining to the daily consumption of five fruit and vegetables.

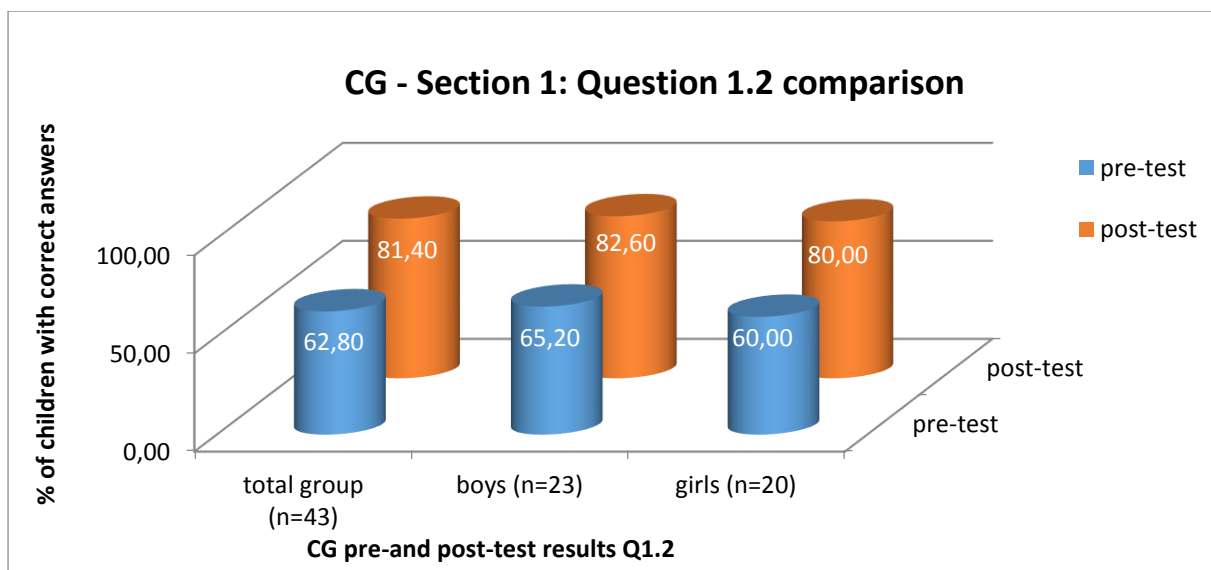


Figure 6.25: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.2 for the total control group, boys and girls

❖ **Sufficient sleep required at night**

The pre-test results for Question 1.1 (Figure 6.26) shows that the majority of boys and girls (78.30 and 60.00 percent respectively) knew that 10 hours of sleep is required for children. The post-test results indicate a 20.00 percent increase in the percentage of girls with correct answers whilst the boys achieved a 13.00 percent increase. For Question 1.1 the whole GC had a 16.20 percent improvement in children obtaining the correct answers.

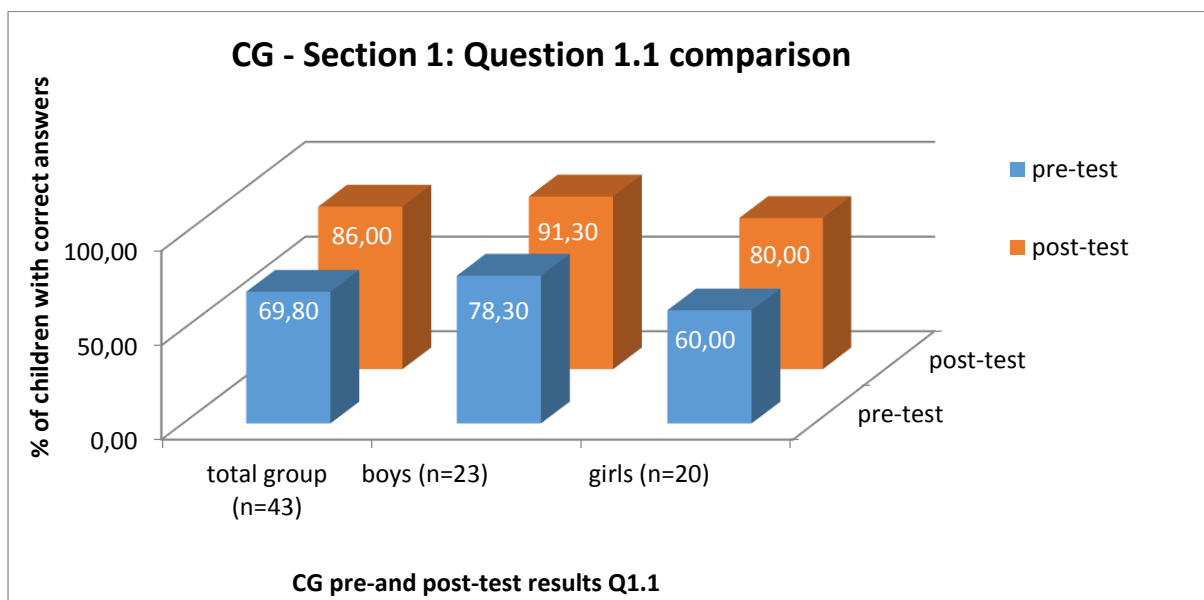


Figure 6.26: Comparison of percentage of children with correct pre-and post-test answers for Section one Question 1.1 for the total control group, boys and girls

- **CG Section two results**

At baseline for Section two (Figure 6.27), only the minority of the CG (39.08 percent) had knowledge relating to these questions with a similar trend being observed in both the group of boys (40.88 percent) and girls (37.00 percent). The post-test results (Figure 4.27) found an increase in the percentage of boys (4.32 percent) with correct answers, with the girls' improvement at 2.00 percent. Overall, the whole group showed a slight percentage increase in food group knowledge (3.26 percent).

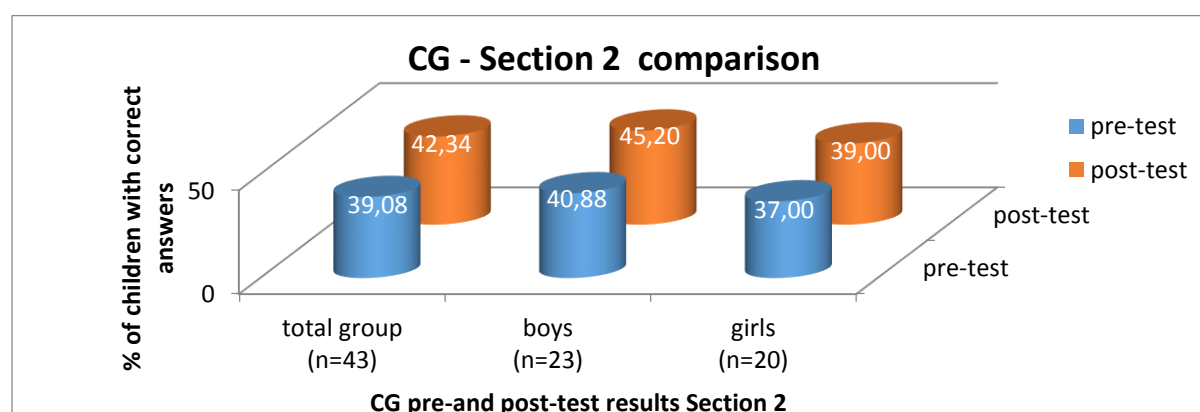


Figure 6.27: Comparison of percentage of children with correct pre-and post-test answers for Section two for the total control group, boys and girls

Results for individual questions in Section two (Table 6.9) are reflected for the total group, the boys and girls in the GC.

Table 6.9: Control group: Section two: percentage of children with correct answers for the pre- and post-test for the total group, boys and girls, with effect on knowledge

CONTROL GROUP (n=43) – SECTION TWO									
Question number	TOTAL GROUP OF BOYS AND GIRLS (n=43)			BOYS ONLY (n=23)			GIRLS ONLY (n=20)		
	PRE-TEST % (n)	POST-TEST % (n)	EOK	PRE-TEST % (n)	POST-TEST % (n)	EOK	PRE-TEST % (n)	POST-TEST % (n)	EOK
2.1 Dairy	32.60 (14)	27.90 (12)	↓	34.80 (8)	39.10 (9)	↑	30.00 (6)	15.00 (3)	↓
2.2 V & F	90.70 (39)	88.40 (38)	↓	87.00 (20)	91.30 (21)	↑	95.00 (19)	85.00 (17)	↓
2.3 Protein	30.20 (13)	32.60 (14)	↑	34.80 (8)	34.80 (8)	↔	25.00 (5)	30.00 (6)	↑

2.4 Fat	9.30 (4)	23.30 (10)	↑	13.00 (3)	21.70 (5)	↑	5.00 (1)	25.00 (5)	↑
2.5 CHO	32.60 (14)	39.50 (17)	↑	34.80 (8)	39.10 (9)	↑	30.00 (6)	40.00 (8)	↑

n=number of participants, EOK=effect on knowledge, V & F=Vegetable and Fruit, CHO=Carbohydrate

For Section two for the whole CG there was a rise in the percentage of children with correct answers in three of the five questions (Q2.3, 2.4 and 2.5) and a decrease in two of them (Q2.1 and 2.2). The CG had the lowest percentage (9.30 percent) of children with correct answers in the question relating to the fat food group (Q2.4) and the highest percentage (90.70 percent) when matching the carrot and orange to the Fruit and Vegetable food group (Q2.2).

Post the NEP, the majority of the CG was unable to match the food pictures to the food group names except for the fruit and vegetable Question 2.2.

The percentage of boys were shown to have an improved number of correct answers in four questions (Q2.1, 2.2, 2.4 and 2.5) in comparison to the girls where this was indicated in the three Questions 2.3, 2.4 and 2.5. The group with the highest percentage of children with correct answers was the girls (Figure 6.28).

Post intervention the boys did not show a decrease in the number of correct answers; however, for the girls a decrease was noted in Question 2.1 and 2.2. In Question 2.3 no percentage change was observed for the boys between the pre-and post-test results.

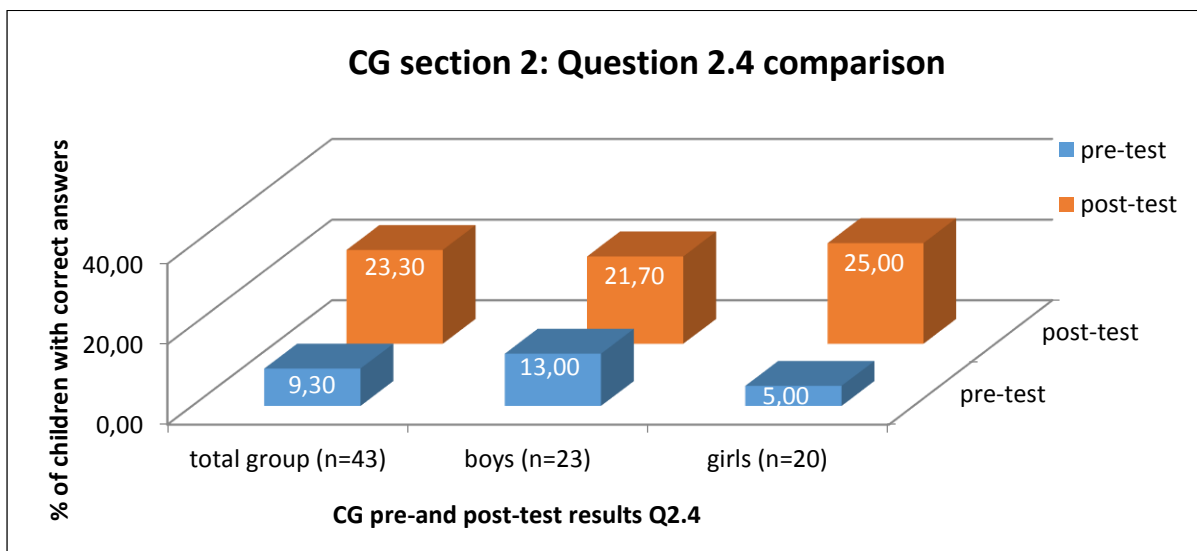


Figure 6.28: Comparison of percentage of children with correct pre-and post-test answers for Section two, Question 2.4 for the total control group, boys and girls

6.5.2 Comparison of the results between the three schools, for the total group, the boys and the girls

6.5.2.1 Comparison of the total group between the three schools

- **Whole test comparison of the total group between the three schools**

One-way ANOVA was used to determine the total group's correct answers between pre-and post-test between the three schools. Presented in Figure 6.29 is a comparison of the EGG, EPG and the CG pre-test and post-test results for the whole test based on the percentage of children with correct answers. The pre-test results revealed that the knowledge of the children in all three schools was very similar and not statistically significant. In the pre-test the EGG obtained the highest (72.43 percent) percentage of children with correct answers whilst the CG had the lowest (69.15 percent) with the difference between them being minimal (3.28 percent).

After the NEP the whole test results showed that the percentage of children with correct answers in the EGG (88.30 percent) was similar but not significantly different to the EPG (87.50 percent). There was, however, a significant ($p=0.035$) difference between the EGG and the CG (71.47 percent).

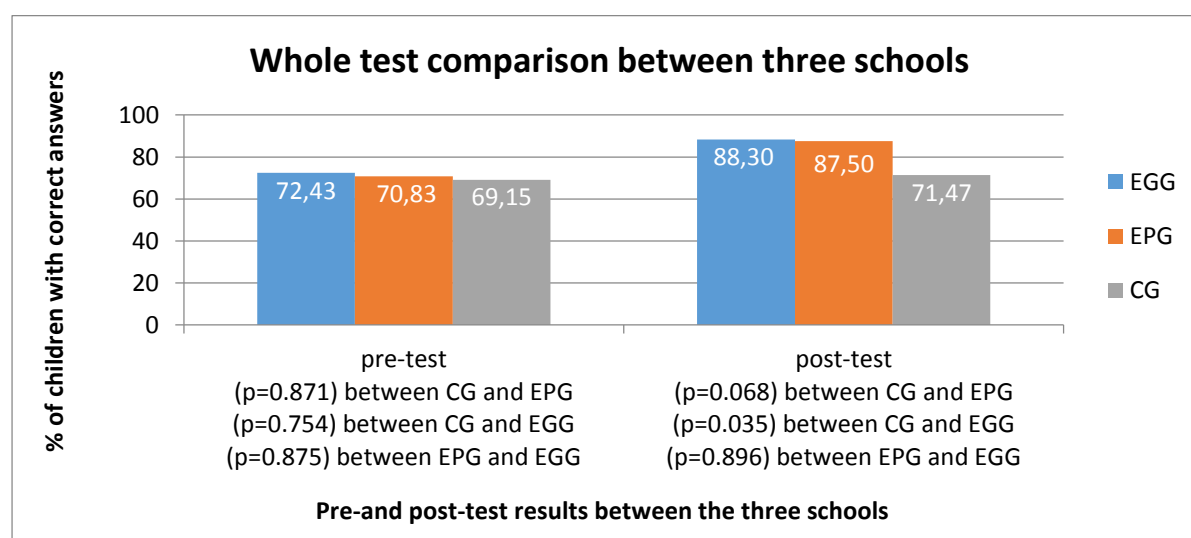


Figure 6.29: The percentage of children with correct answers at pre-and post-test for the whole test between the three schools with statistical significant difference $p<0.05$ (2 tailed t-test)

- **Section one comparison of the total group between the three schools**

The results shown in Figure 6.30 represent the percentage of children with correct answers pre-and post-test between the three schools for the questions in Section one. In the pre-test, the majority of the children in all three schools knew the answers. However, the EGG (87.58 percent) had the highest percentage of children with the correct answers and the EPG (84.00 percent) the least. There was a non-significant difference between any of the groups in the pre-test indicating a similar prior knowledge with a minimal difference of 3.58 percent noted between the EGG and the EPG.

As a result of the NEP in the two EGs there was an increase in the percentage of children with correct answers. However the difference (4.42 percent) noted between them was not significant, with the EPG obtaining the highest percentage of correct answers (98.75 percent). The CG post-test results were the lowest at 86.03 percent and there was a statistically significant difference in the percentage of children with correct answers between the CG and each of the two EGs (EGG, $p=0.022$ and EPG, $p=0.000$).

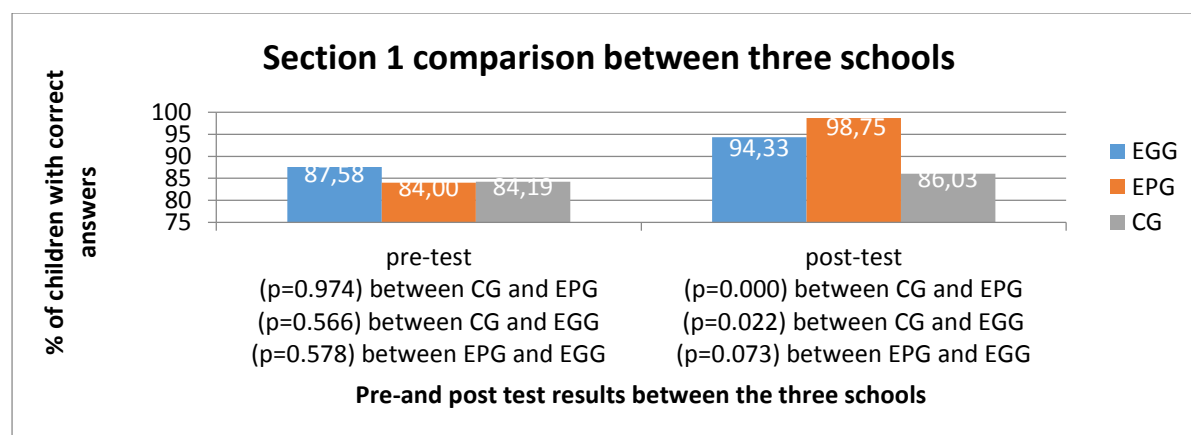


Figure 6.30: The percentage of children with correct answers at pre-and post-test for section one between the three schools with statistical significant difference $p<0.05$ (2 tailed t-test)

The following table (6.10) presents the data obtained for the three schools in the study for each of the questions in section one, both pre-and post-test with statistical significance.

Table 6.10: Comparison of the percentage of children with correct pre-and post-test answers in Section one between the three schools with statistical significance

SECTION ONE - TOTAL GROUP (n=120)						
Question number	PRE-TEST RESULTS			POST-TEST RESULTS		
	EGG (n=37) % (n)	EPG (n=40) % (n)	CG (n=43) % (n)	EGG (n=37) % (n)	EPG (n=40) % (n)	CG (n=43) % (n)
1.1 10hrs of sleep	83.80(31)	67.50(27)	69.80(30)	81.10(30)^a	100.00(40)^a	86.00(37)^a
1.2 Daily 5 F & V	91.90(34)^a	90.00(36)^b	62.80(27)^{ab}	100.00(37)^b	97.50(39)^a	81.40(35)^{ab}
1.3 Play outside daily	51.40(19)	62.50(25)	76.70(33)	86.50(32)	100.00(40)^a	74.40(32)^a
1.4 Eat different types of food	91.90(34)	95.00(38)	88.40(38)	86.50(32)	100.00(40)^a	86.00(37)^a
1.5 Wash fruit	97.30(36)	90.00(36)	95.30(41)	100.00(37)	100.00(40)	95.30(41)
1.6 Wash hands	100.00(37)	97.50(39)	97.70(42)	100.00(37)	100.00(40)	97.70(42)
1.7 Meat & fish give strong muscles	89.20(33)	87.50(35)	90.70(39)	97.30(36)^b	100.00(40)^a	83.70(36)^{ab}
1.8 Lots sweets, cakes	100.00(37)	95.00(38)	93.00(40)	94.60(35)	95.00(38)	95.30(41)
1.9 Milk – healthy bones & teeth	81.10(30)	62.50(25)	79.10(34)	97.30(36)^a	95.00(38)	79.10(34)^a
1.10 Daily drink 6 glasses of water	89.20(33)	92.50(37)	88.40(38)	100.00(37)^b	100.00(40)^a	81.40(35)^{ab}

n=number of participants, upper script ^a and ^b= statistical significance at $p<0.05$ between schools in the same line, EGG=Experimental government group, EPG=Private government group, CG=Control Group, bolded = significant changes, F & V=Fruit and Vegetables

In the pre-test results (Table 6.10) there was a non-significant difference observed between the percentage of children with correct answers in the control school and those in the experimental schools relating to FBDG knowledge except in Question 1.2 (5 fruit and vegetables must be eaten daily). Here it was observed that the children at baseline in the control group (62.80 percent) were significantly less knowledgeable than those in the experimental groups (EGG 91.90 and EPG 90.00 percent).

Significant differences between the schools are evident in the post-test results in seven of the ten questions (Qs 1.1 (10 hours of sleep required), 1.2 (daily 5 fruit and veg), 1.3 (play outside daily), 1.4 (eat different types of foods), 1.7 (meat and fish give strong muscles), 1.9 (milk and milk products needed for healthy bones and teeth) and 1.10 (drink six glasses of water daily). These significances will be elaborated on below.

❖ Enjoy a variety of foods

The pre-test results for Question 1.4 (Figure 6.31) show that the majority of all the children in the study knew that a child must eat different types of food. The EPG (95.00 percent) answered the most questions correctly and the CG (88.40 percent) the least, with a 6.60 percent difference.

Similar post-test knowledge results were observed in the CG (86.00 percent) and EGG (86.50 percent). The only significant ($p=0.037$) difference (14 percent) was found between the EPG (100.00 percent) and the CG.

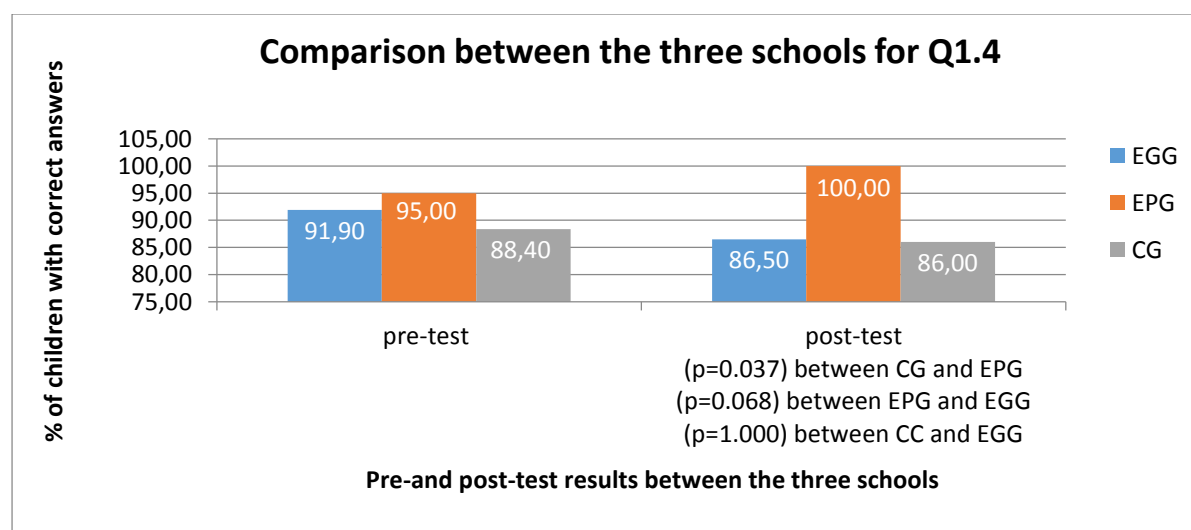


Figure 6.31: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.4

❖ Be active

In all schools in the pre-test the majority of children knew that they must play outside every day (Question 1.3, Figure 6.32). However, the CG was the most knowledgeable (76.60 percent) at baseline and the EGG (51.40 percent) the least knowledgeable.

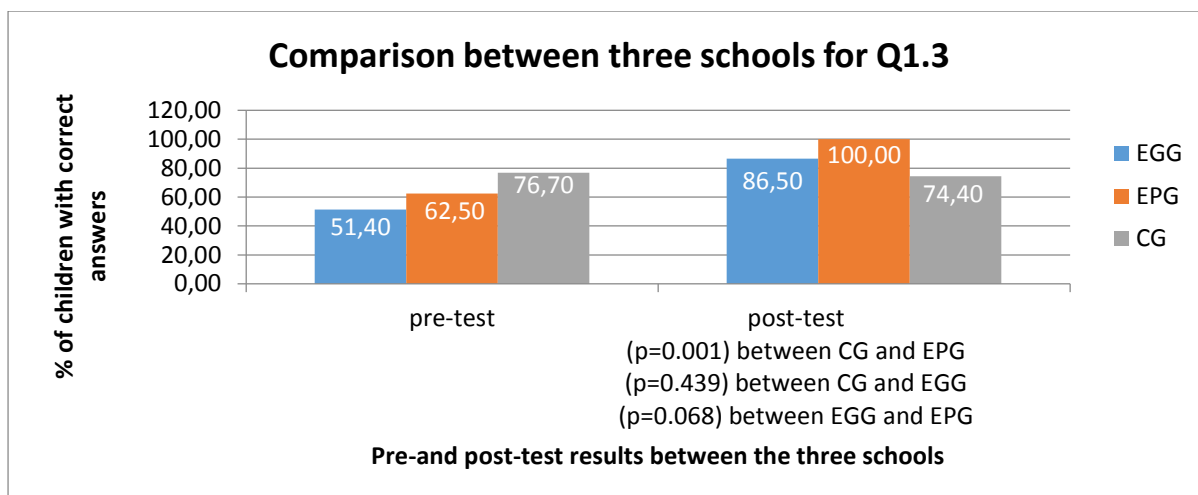


Figure 6.32: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.3

In the post-test, 100.00 percent of the EPG answered correctly for Question 1.3 with a significant ($p=0.001$) difference (25.60 percent) observed between this school and the CG (74.40 percent).

❖ Eat plenty of fruit and vegetables every day

In the pre-test, most of the children knew the answer to Question 1.2 (Figure 6.33). The EGG (91.90 percent) and EPG (90.00 percent) having a similar percentage of children with correct answers which pertained to eating five fruit and vegetables daily. The CG had the lowest percentage of children with correct answers when compared to both EGs. Significant differences were noted between CG and EGG ($p=0.004$) and between CG and EPG ($p=0.009$).

Post-test the EGG obtained the highest percentage of children with correct answers (100.00 percent) and the lowest was indicated in CG (81.40 percent) with a statistically significant difference ($p=0.010$, 18.60 percent) observed between the two groups.

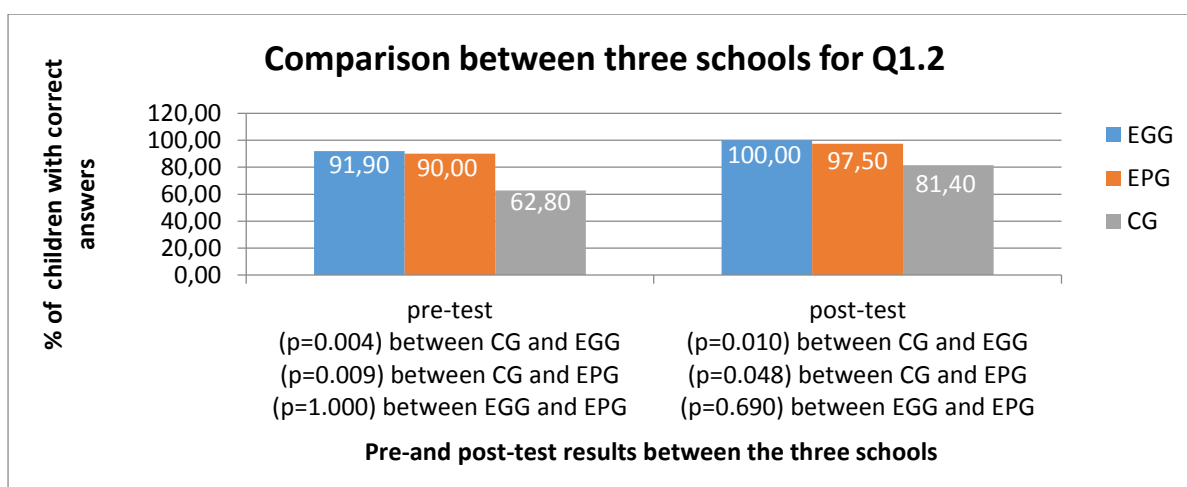


Figure 6.33: The percentage of children with correct pre and post test answers between the three schools for Question 1.2

❖ **Chicken, fish, milk, meat or eggs can be eaten daily**

Very similar percentage of children with correct answers at pre-test was observed in Question 1.7 (Figure 6.34) between the three schools with the majority of children knowing the relationship between meat and fish consumption and strong muscles. The only post-test significant ($p=0.020$) difference (16.30 percent) is noted between the CG (83.70 percent) and the EPG (100.00 percent).

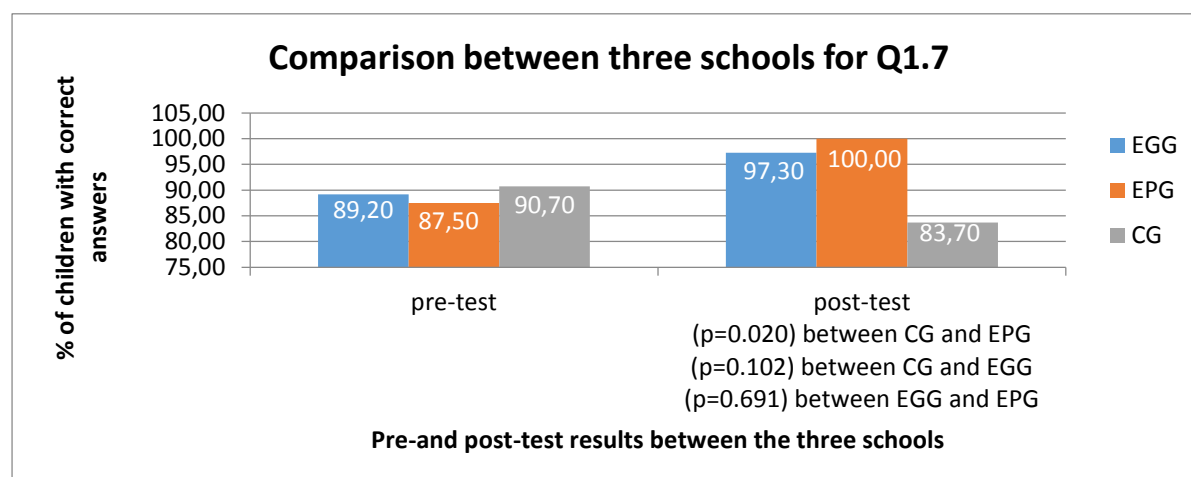


Figure 6.34: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.7

The majority of the children at baseline knew the relationship between the dairy food group and bone and teeth health (Q 1.9, Figure 6.35). Similar percentage of children with correct answers was observed at pre-test between the CG (79.10 percent) and the EGG (81.10 percent) with a non-significant difference between any of the schools.

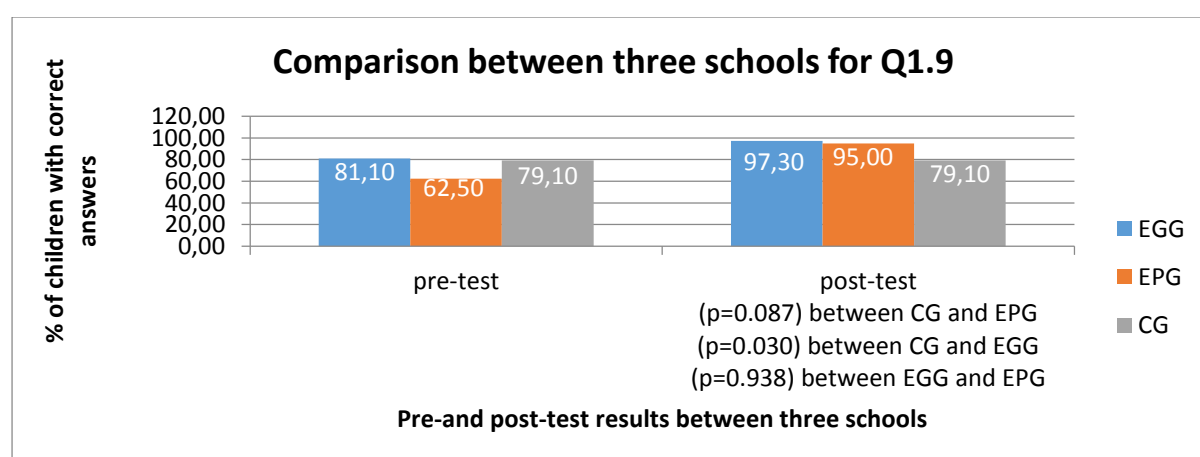


Figure 6.35: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.9

A post-test significant ($p=0.030$) difference (18.2 percent) was observed between the EGG (97.30 percent) and the CG (79.10 percent). For Question 1.9, the EPG children answered fewer questions correctly (2.30 percent) than the children in the EGG.

❖ **Drink lots of clean safe water**

Question 1.10 (Figure 6.36), established that the children in the different schools had very percentage of correct answers at baseline pertaining to the daily consumption of water by a child. The EPG children (92.50 percent) had the highest percentage of correct answers with the lowest percentage obtained by the children in the CG (88.40 percent).

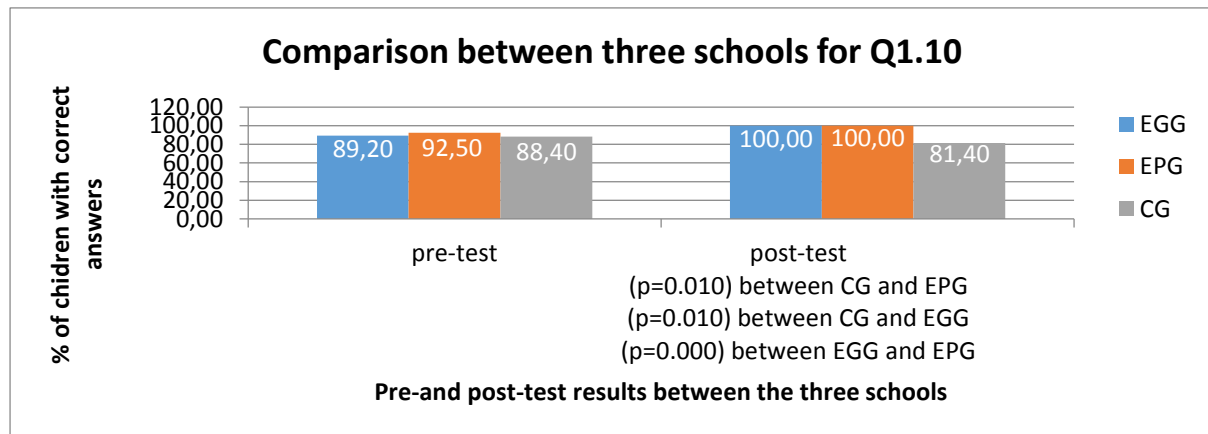


Figure 6.36: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.10

In the post-test, all children (100.00 percent) in both EGs knew the answer to Question 1.10. A significant difference ($p=0.010$) was observed between the CG (81.40 percent) and both EGs due to the 18.60 percent difference.

❖ **Use food and drinks containing sugar sparingly and not between meals**

In the pre-test Question 1.8 (Figure 6.37), the majority of children in all groups were knowledgeable about the health aspect of consuming large amounts of sugary foods, with the entire EGG (100.00 percent) answering this question correctly. The CG with 93.00 percent correct answers was the least knowledge group. In the post-test, there was non-significant difference between the three groups with the majority knowing the answer as in the pre-test. The CG (95.30 percent) obtained the highest percentage correct answer and the EGG the least (94.60 percent); however, there was only a minimal (0.70 percent) difference between them.

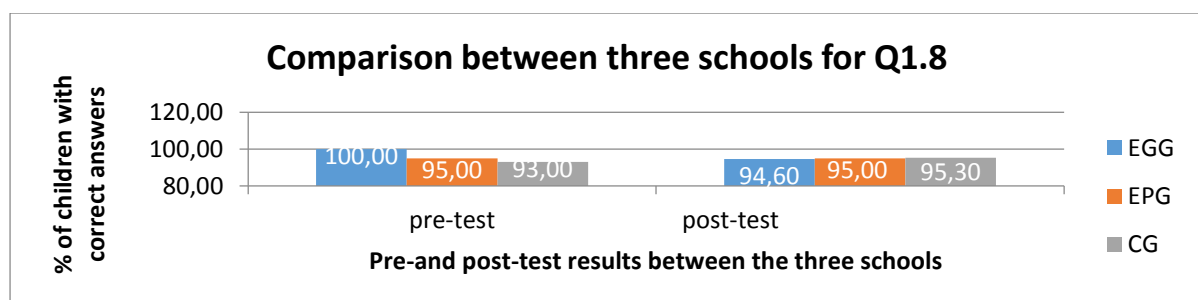


Figure 6.37: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.8

❖ Hygiene is important

The knowledge that fruit must be washed before being eaten (Q 1.5, Figure 6.38) was known by the majority of all children in the study. The most knowledgeable group was the EGG (97.30 percent) and the lowest percentage of correct answers was provided by the EPG (90.00 percent) with only a difference of 7.30 percent between these two groups. After the intervention, all the children (100.00 percent) in the two EGs answered this question correctly.

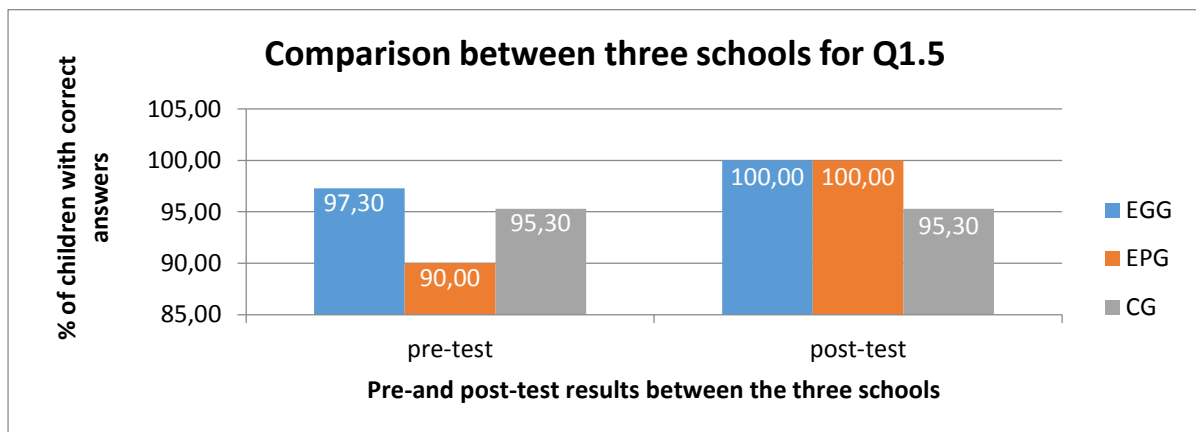


Figure 6.38: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.5

Washing hands before eating (Q 1.6, Figure 6.39) was known 100.00 percent of the children in the EGG as well as the majority of the CG (97.70 percent) and EPG (97.50 percent) with non-significant differences between the groups.

After the NEP, all the children (100.00 percent) in the two EGs answered this question correctly. There was a non-significant difference between the knowledge in the CG and that of the EGs.

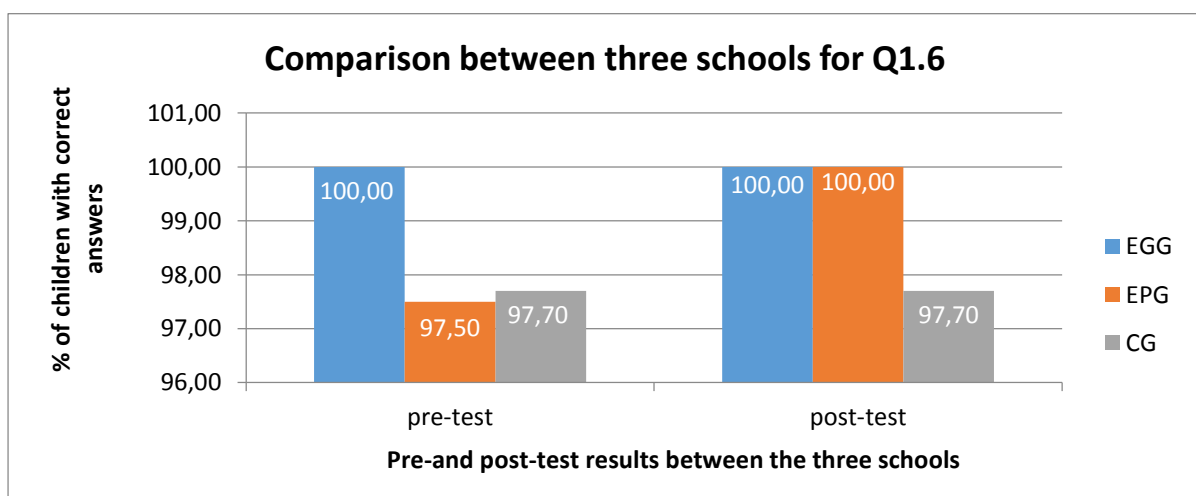


Figure 6.39: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.6

❖ Sufficient sleep required at night

The knowledge relating to a child requiring 10 hours of sleep at night (Q 1.1, Figure 6.40) was observed in the majority of children in the pre-test with the EGG (83.80 percent) being the most well-informed. The remaining two groups had similar percentage of children with correct answers (EPG 67.50 percent and CG 69.80 percent) for this question.

Post-test significant differences were observed between the EPG (100.00 percent) and the other two schools: CG $p=0.037$ with a 14.00 percent difference, and the EGG $p=0.019$ with a difference of 18.90 percent.

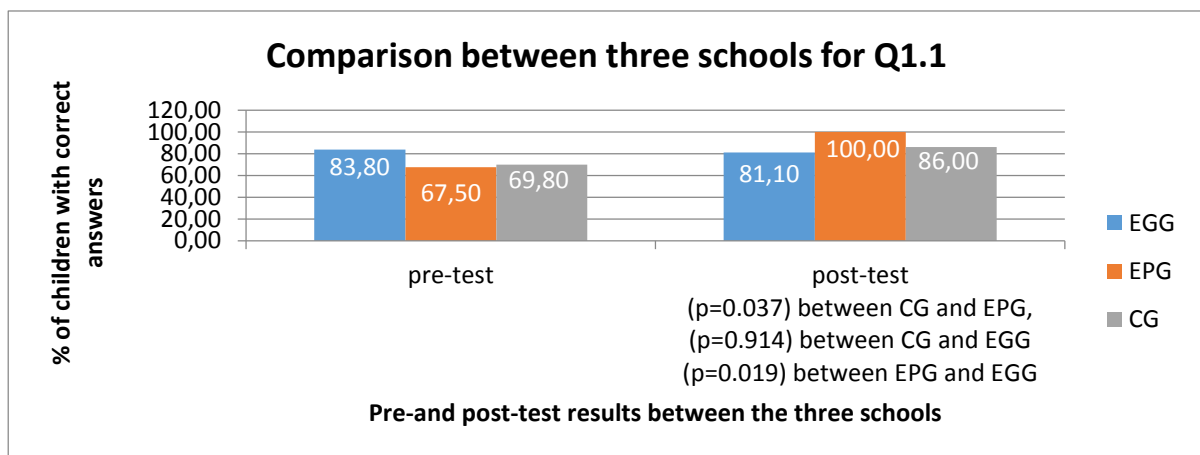


Figure 6.40: The percentage of children with correct pre-and post-test answers between the three schools for Question 1.1

• Section two comparison of the total group between the three schools

For the pre-test in Section two (Figure 6.41) the majority of the children in all three groups did not answer correctly. The CG had the least knowledge (39.08 percent) with the EPG obtaining the highest (44.50 percent) percentage of correct answers, with non-significant differences in knowledge between the three schools at pre-test.

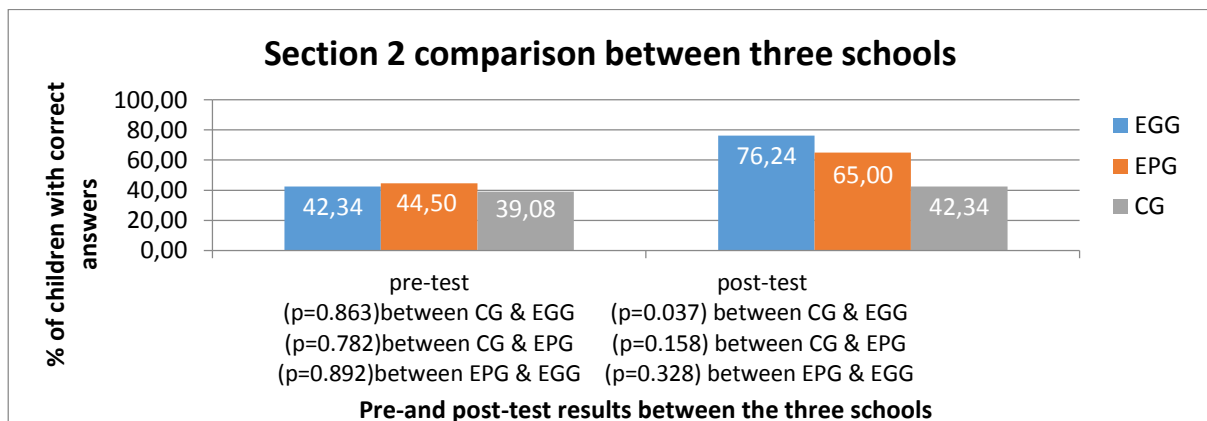


Figure 6.41: The percentage of children with correct pre-and post-test answers between the three schools for Section two

The NEP had an impact on the food group knowledge of the children in both the EGs. However, the difference (11.24 percent) in the percentage of children with correct answers between the two experimental schools (EGG 76.24 and EPG 65.00 percent) was not significant. The control group post-test (42.34 percent) knowledge was significantly lower ($p=0.037$, 33.90 percent) than that of the EGG. Section two results (Table 6.11) indicate the percentage of children with correct answers pre-and post-test and the significance in each question for the three schools.

Table 6.11: Comparison of percentage of children with correct pre-and post-test answers in Section two between the three schools. with statistical significance

SECTION TWO - TOTAL GROUP (n=120)						
Question number	PRE-TEST RESULTS			POST-TEST RESULTS		
	EGG (n=37) % (n)	EPG (n=40) % (n)	CG (n =43) % (n)	EGG (n=37) % (n)	EPG (n=40) % (n)	CG (n=43) % (n)
2.1 Dairy	29.70(11)	50.00(20)	32.60(14)	70.30(26)^a	72.50(29)^a	27.90(12)^a
2.2 V & F	83.80(31)	92.50(37)	90.70(39)	100.00(37)^a	92.50(37)	88.40(38)^a
2.3 Protein	32.40(12)	25.00(10)	30.20(13)	62.20(23)^a	45.00(18)	32.60(14)^a
2.4 Fat	29.70(11)	17.50(7)	9.30(4)	81.10(30)^a	65.00(26)^a	23.30(10)^a
2.5 CHO	35.10(13)	37.50(15)	32.60(14)	67.60(25)^a	50.00(20)	39.50(17)^a

n=number of participants, upper script ^a= statistical significance at $p<0.05$ between schools in the same line, EGG=Experimental government group, EPG=Private government group, CG=Control group, bolded = significant changes, V & F= Vegetable and Fruit, CHO=Carbohydrate

❖ Dairy food group

At baseline (Q 2.1) the experimental private school had the greatest percentage of children with correct answers (Figure 6.42); however only half of the children (50.00 percent) could match the picture of cheese and milk to the dairy food group. The school with the lowest percentage (29.70 percent) of children with correct answers at pre-test was the EGG.

The intervention resulted in the two experimental schools achieving similar post-test results (EGG 70.30 and EPG 72.50 percent) whilst the percentage of correct answers in the CG was significantly ($p=0.000$) lower (27.90 percent) than in both the EGs.

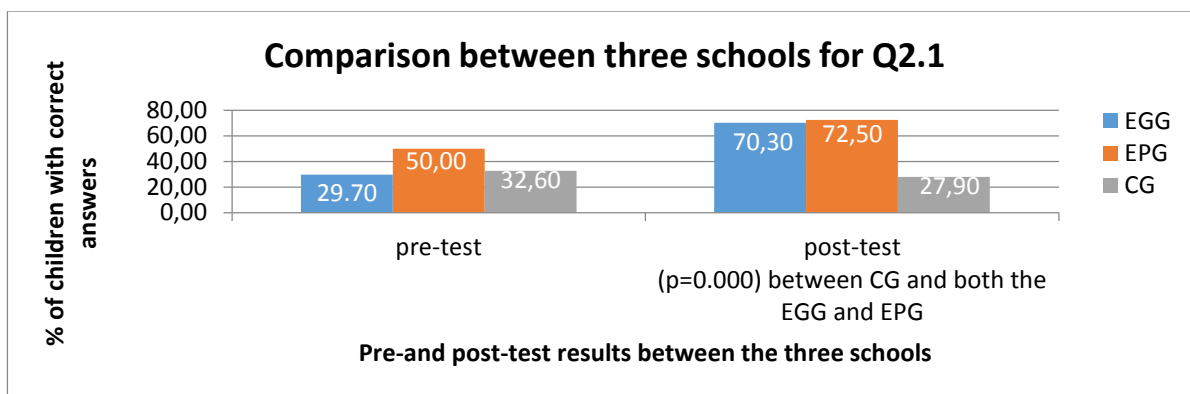


Figure 6.42: The percentage of children with correct pre-and post-test answers between the three schools for Question 2.1

❖ Vegetable and Fruit food group

Question 2.2 (Figure 6.43) pre-test observations found that the majority of children in the study had a similar results when asked to match the correct food items to the Vegetable and Fruit food group. The EPG had the highest percentage (92.50 percent) of children with correct answers, followed by the CG (90.70 percent) and the EGG (83.80 percent).

There was a non-significant difference between the groups in the post-test with all children (100.00 percent) in the experimental government school matching the correct food items to the Vegetable and Fruit food group. The lowest percentage of children with correct answers were found in the CG (88.40 percent).

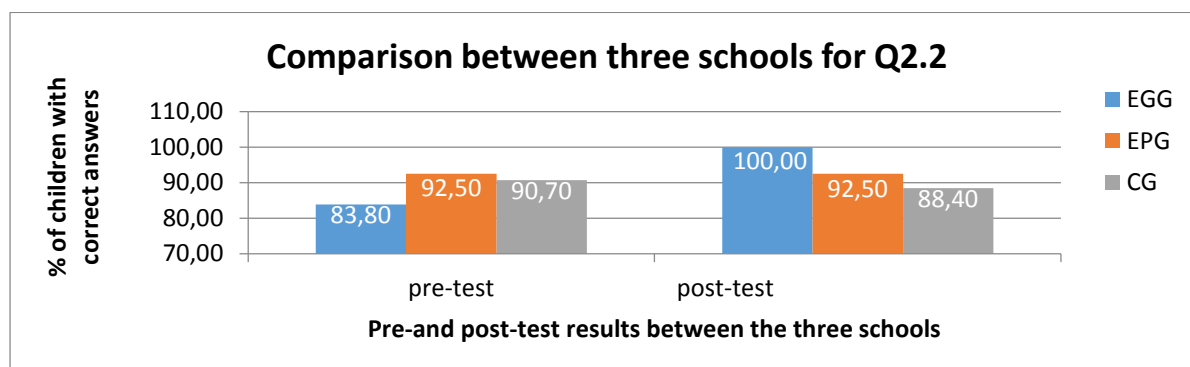


Figure 6.43: The percentage of children with correct pre-and post-test answers between the three schools for Question 2.2

❖ Protein-rich food group

Similar poor nutrition knowledge was evident in all groups in the pre-test results for Question 2.3 (Figure 6.44).

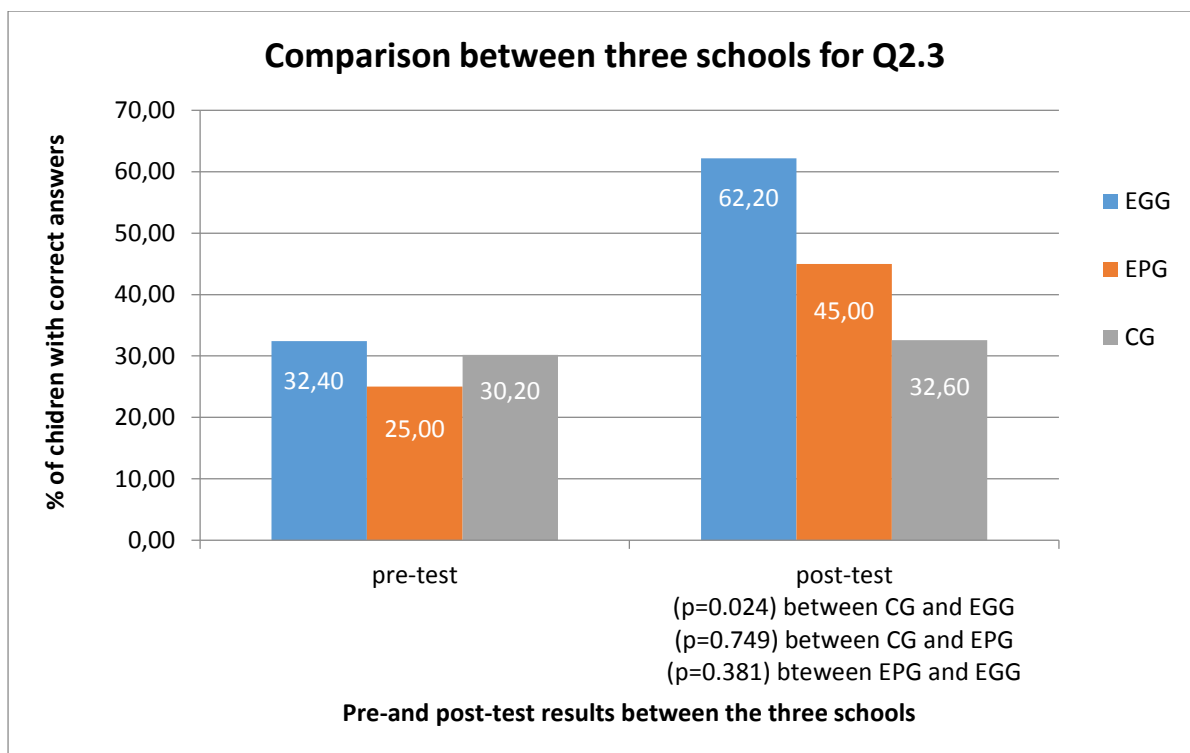


Figure 6.44: The percentage of children with correct pre-and post-test answers between the three schools for Question 2.3

However, the post-test results illustrate a significant difference ($p=0.24$) between the percentage of children with correct answers in the experimental government school (62.20 percent) and the CG (29.60 percent). Post- intervention more than half of the children in the experimental private school (55.00 percent) did not know that chicken and meat were protein-rich foods.

❖ **Fat food group**

The pre-test results (Figure 6.45) indicate that the majority of children in all the schools did not know that oil, butter and margarine were from the fat food group.

The NEP resulted in an increase of the percentage of children with correct answers in both the experimental schools when compared to the CG, with an identical significance of $p=0.000$. The EGG had the greatest percentage of children with correct answers post-test (81.10 percent) being 16.10 percent higher than the EPG (65.00 percent).

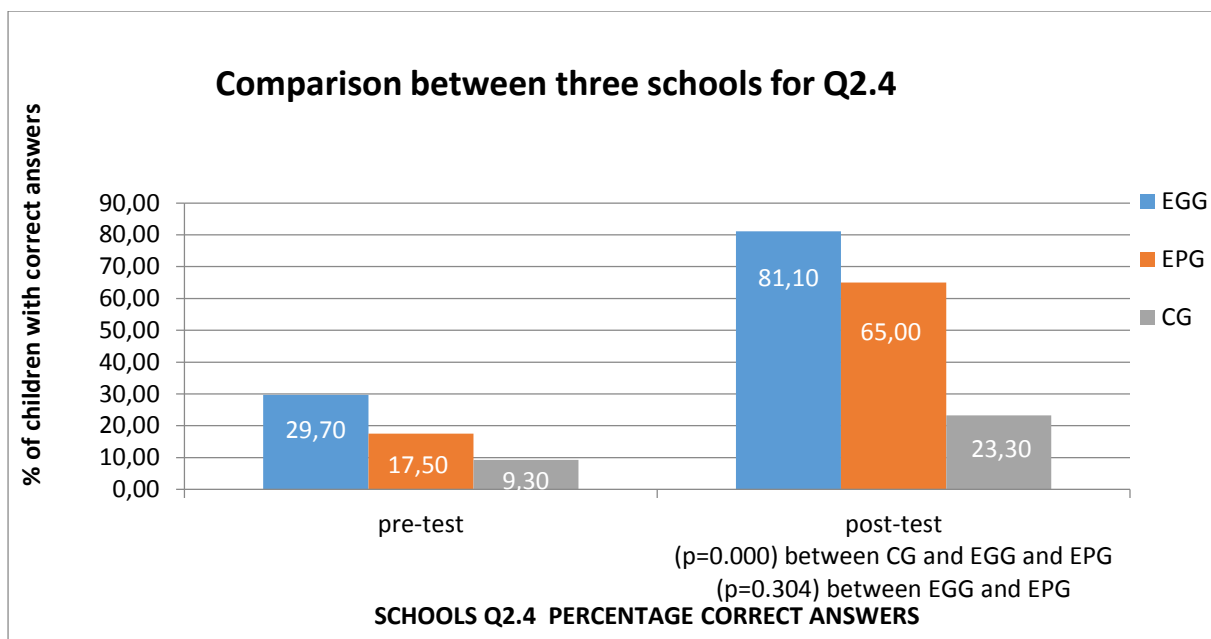


Figure 6.45: The percentage of children with correct pre-and post-test answers between the three schools for Question 2.4

❖ Starch/Carbohydrate food group

Pre-test (Figure 6.46) knowledge of the starch food group (Q 2.5) was poor and very similar between all the schools.

Post-intervention the EGG was the most knowledgeable group (67.60 percent) with a significant ($p=0.037$) difference (28.10 percent) in the percentage of children with correct answers when compared to the CG (39.50 percent). Whilst 17.60 percent fewer children provided the correct answers about starchy foods in the EPG, than those in the EGG.

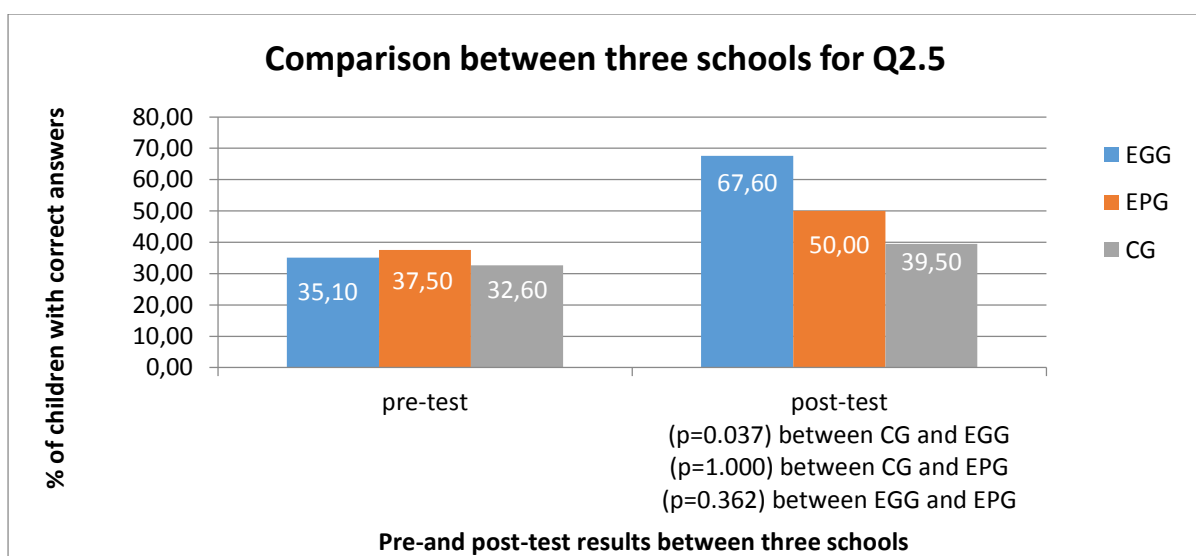


Figure 6.46: The percentage of children with correct pre-and post-test answers between the three schools for Question 2.5

6.5.2.2 Comparison of the boys between the two schools (CG and EGG)

- **Whole test comparison of the boys between the CG and EGG**

The independent *t*-test was used to determine the boys' correct answers between the two schools for both the pre-and the post-test. At baseline with regards to the whole test (Figure 6.47) the majority of the boys (CG and EGG) answered correctly and a similar percentage of boys in the EGG (73.32 percent) and CG (70.73 percent) obtained correct answers. The intervention resulted in a greater difference (11.93 percent) between the experimental government school (87.00 percent) and the CG (75.07) but non- significant.

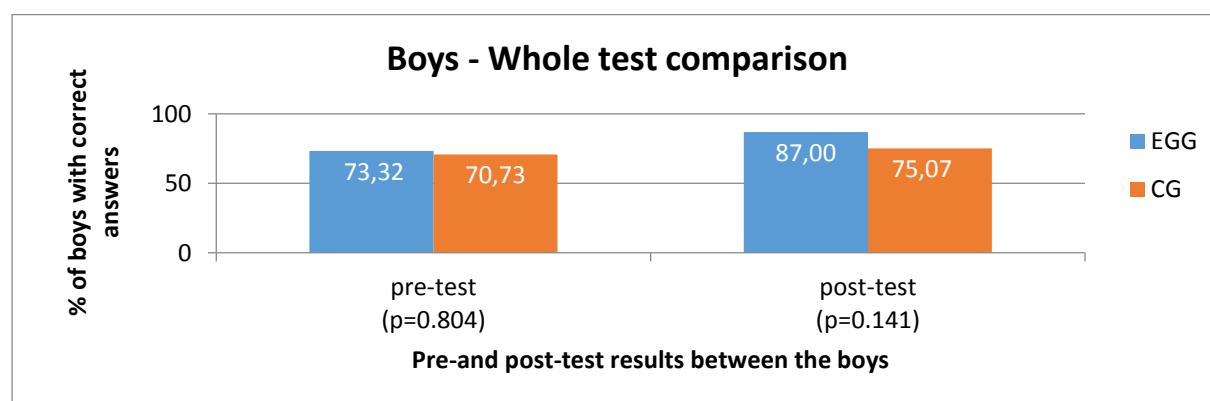


Figure 6.47: The percentage of boys (EGG and CG) with correct answers at pre-and post-test for the whole test

- **Section one comparison of the boys between the CG and EGG**

For Section one, as illustrated in Figure 6.48, the majority of boys (EGG 88.94 and CG 85.66 percent) knew the answers in the pre-test with no significant difference (3.28 percent) in knowledge. The difference (3.66 percent) between the boys in the two schools in the post-test results was found to be similar to the pre-test difference. The NEP resulted in the EGG (93.67 percent) boys obtaining a higher percentage with correct answers than the CG (90.01 percent) boys but a non-significant difference.

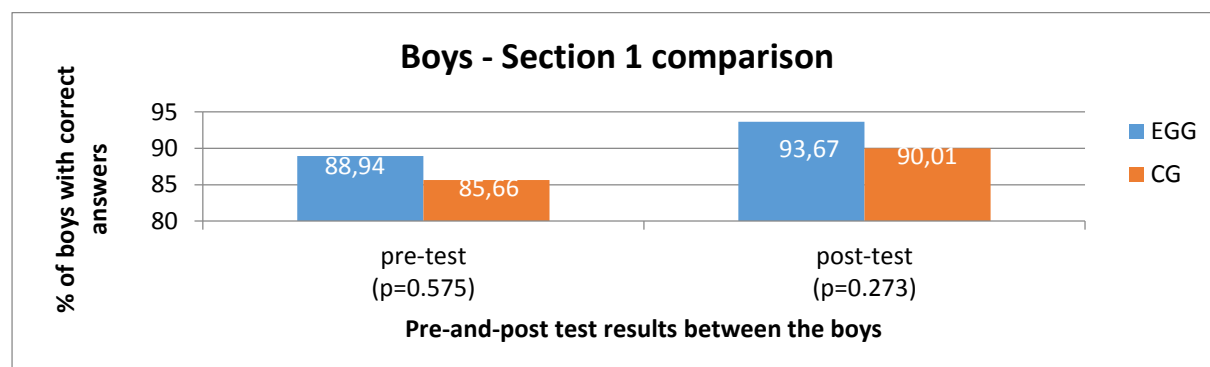


Figure 6.48: The percentage of boys with correct answers at pre-and post-test for Section one

Presented in Table 6.12 is the comparison of the boy's correct answers for each question in section one. The majority of boys in each of the schools were knowledgeable about the FBDGs.

In the pre-test, the only significant difference in knowledge between the boys in the two schools was in Question 1.3 pertaining to a child playing outside every day. Post-test significance was noted in two of the ten questions namely 1.2 and 1.9. The former question pertains to the amount of fruit and vegetables to be eaten daily and the latter to the relationship between the dairy food group and bone and teeth health.

The boys in both schools achieved 100.00 percent in both the pre-and post-test for Question 1.6 relating to hands being washed before eating. The control school boys did not achieve 100.00 percent for any other question in either the pre-or post-test. However, the experimental government school post-test results for Questions 1.2 (5 fruit and vegetables to be eaten daily), 1.5 (wash fruit before eating), 1.9 (milk and milk products needed for healthy bones and teeth) and 1.10 (drink six glasses of water daily) indicate that all the boys (100.00 percent) knew the answer to these FBDG questions.

Table 6.12: Comparison of the percentage of boys with correct answers in the pre-and post-test in Section one in the control group and experimental government school group with statistical significance

BOYS (n=42) – SECTION ONE						
Question number	PRE-TEST			POST-TEST		
	EGG (n=19) % (n)	CG (n=23) % (n)	Statistical significance $p < 0.05$	EGG (n=19) % (n)	CG (n=23) % (n)	Statistical significance $p < 0.050$
1.1 10hrs of sleep	84.20(16)	78.30(18)	0.635	78.90(15)	91.30(21)	0.266
1.2 Daily 5 F & V	89.50(17)	65.20(15)	0.059	100.00(19)	82.60(19)	0.043*
1.3 Play outside daily	52.60(10)	82.60(19)	0.043*	84.20(16)	87.00(20)	0.806
1.4 Eat different types of food	100.00(19)	91.30(21)	0.197	84.20(16)	91.30(21)	0.492
1.5 Wash fruit	94.70(18)	91.30(21)	0.676	100.00(19)	91.30(21)	0.197
1.6 Wash hands	100.00(19)	100.00(23)	1.000	100.00(19)	100.00(23)	1.000
1.7 Meat & fish give strong muscles	94.70(18)	95.70(22)	0.893	94.70(18)	91.30(21)	0.676
1.8 Lots sweet, cakes	100.00(19)	91.30(21)	0.197	94.70(18)	95.70(22)	0.893
1.9 Milk – healthy bones & teeth	84.20(16)	69.60(16)	0.279	100.00(19)	78.30(18)	0.022*
1.10 Daily six glasses of water	89.50(17)	91.30(21)	0.845	100.00(19)	91.30(21)	0.197

n= number of participants, * = statistical significance at $p < 0.05$ between the schools in the same line, EGG=Experimental government group, CG=Control group, bolded = significant changes, F & V=Fruit and Vegetables

❖ Be active

In Figure 6.49, the baseline results for Question 1.3 show that the boys in the control school (82.60 percent) obtained significantly ($p=0.043$) more correct answers than those in the Experimental government school (52.60 percent). Post-test knowledge of the two groups of boys was similar however the CG (87.00 percent) obtained more correct answers than the EGG (84.20 percent) but the difference was non-significant.

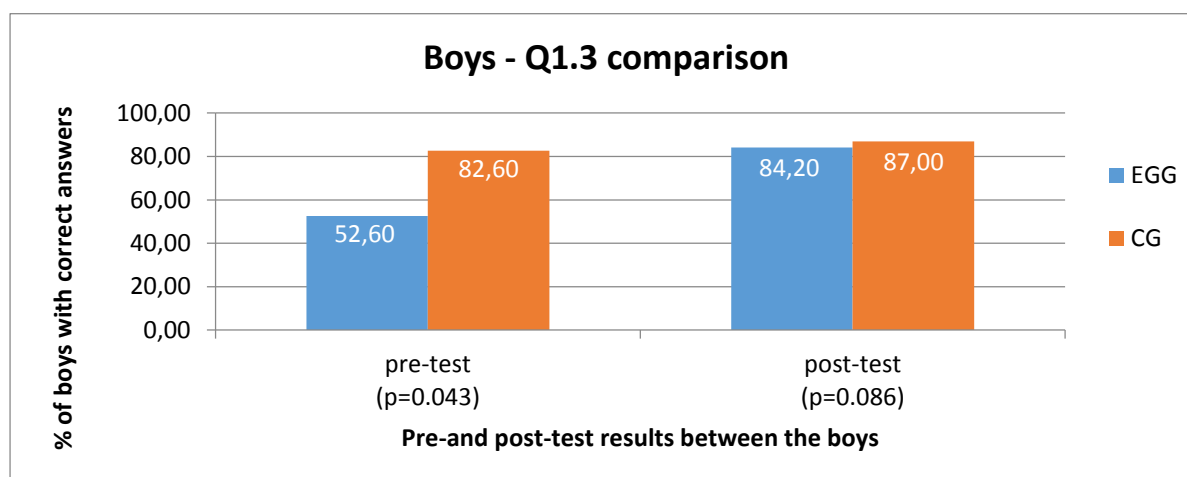


Figure 6.49: The percentage of boys with correct answers at pre-and post-test for Question 1.3

❖ Eat plenty of fruit and vegetables daily

The boys at baseline for Question 1.2 (Figure 6.50) in the experimental government school (89.50 percent) answered more questions correctly (24.30 percent) than those in the CG (65.20 percent) but non-significant. The post-test results indicate a significant ($p=0.043$) difference (17.40 percent) between the two groups of boys (EGG 100.00 and CG 82.60 percent).

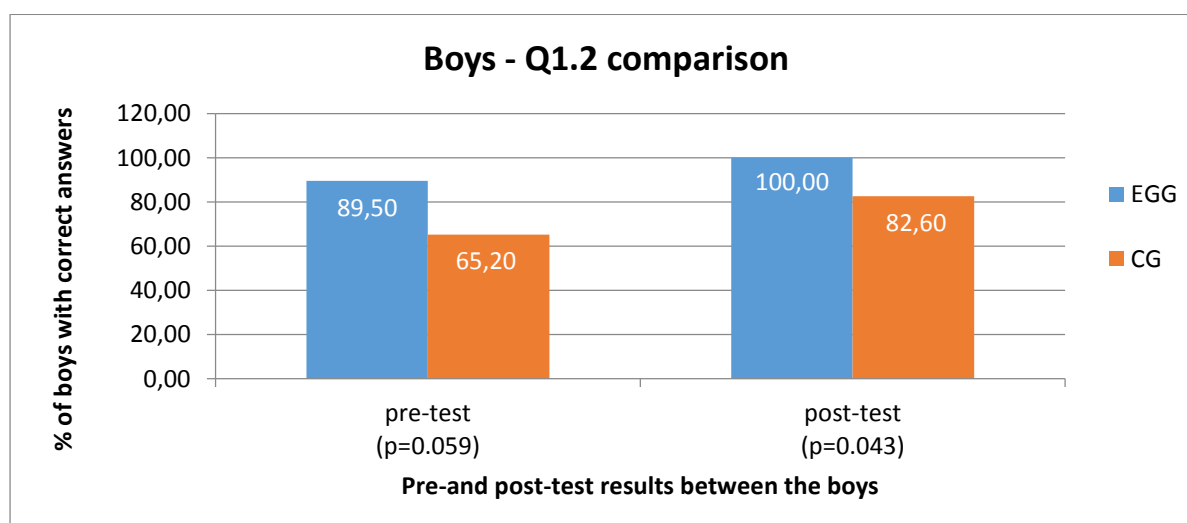


Figure 6.50: The percentage of boys with correct answers at pre-and post-test for Question 1.2

❖ **Chicken, fish, milk, meat or eggs can be eaten daily**

At baseline (Figure 6.51) for Question 1.9, there was no statistically significant difference between the percentages of boys with correct answers (14.60 percent) between the two schools. The percentage of correct answers in the experimental government school boys (84.20 percent) was higher than in the CG (69.60 percent). The EGG boys achieved 100.00 percent post-intervention, which resulted in a significant ($p=0.022$) difference (21.70 percent), when compared to the CG boys (78.30 percent) post-test results.

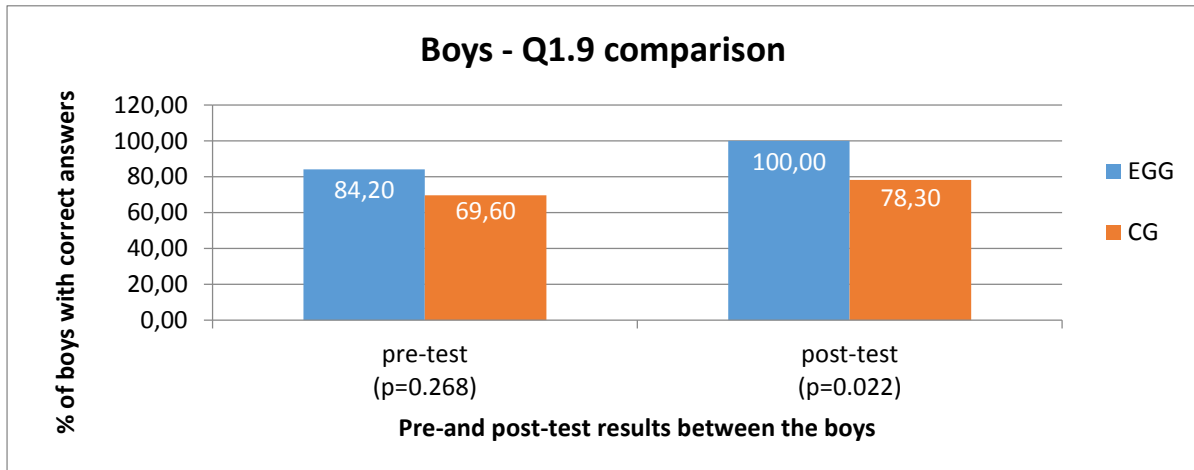


Figure 6.51: The percentage of boys with correct answers at pre-and post-test for Question 1.9

- **Section two comparison of the boys between the CG and EGG**

The Section two pre-test results for the boys in the two different schools (Figure 6.52) were very similar with only the minority of the boys in both groups (EGG 42.08, CG 40.88 percent) providing the correct answers on food groups. The NEP resulted in the EGG boys (73.66 percent) answering more questions correctly than the CG (45.20 percent) in Section two. Post-test the difference between the boys in the two schools was 28.46 percent but not significant.

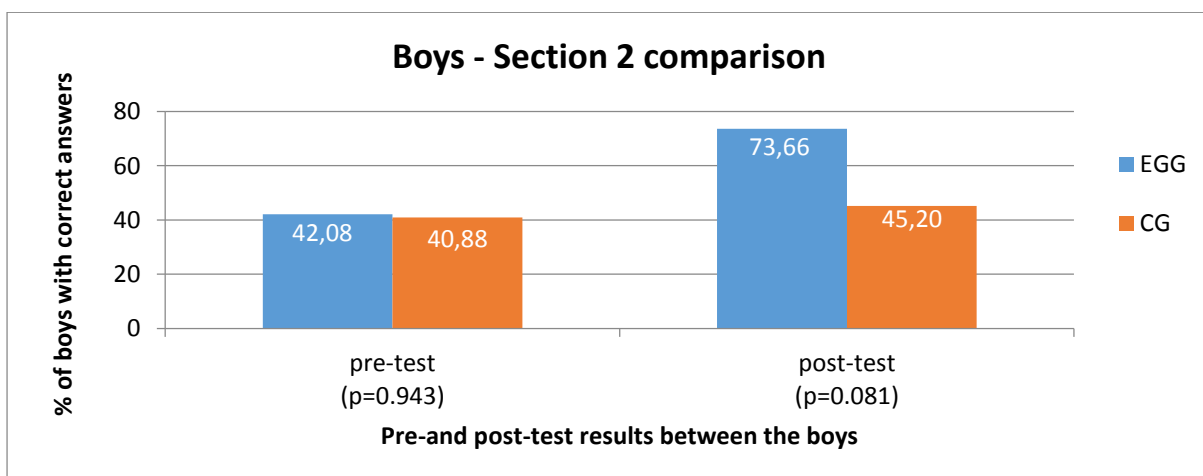


Figure 6.52: The percentage of boys with correct answers at pre-and post-test for Section two

The Section two pre-test results for both schools presented in Table 6.13 indicate that in four of the five questions the knowledge was poor as the majority of boys could not match pictures of food to the appropriate food groups. Question 2.2 (Vegetable and Fruit food group) was the exception and here the majority of boys (EGG 84.20 and CG 87.00 percent) knew how to match the picture of the orange and carrot to this food group.

Table 6.13: Comparison of the percentage of boys in the control group and experimental government school group with the correct answers in the pre-and post-test in Section two with statistical significance

BOYS (n=42) – SECTION TWO						
Question number	PRE-TEST			POST-TEST		
	EGG (n=19) % (n)	CG (n=23) % (n)	Statistical significance $p < 0.050$	EGG (n=19) % (n)	CG (n=23) % (n)	Statistical significance $p < 0.050$
2.1 Dairy	26.30(5)	34.80(8)	0.566	68.40(13)	39.10(9)	0.061
2.2 V & F	84.20(16)	87.00(20)	0.806	100.00(19)	91.30(21)	0.197
2.3 Protein	36.80(7)	34.80(8)	0.893	52.60(10)	34.80(8)	0.255
2.4 Fat	26.30(5)	13.00(3)	0.287	78.90(15)	21.70(5)	0.000*
2.5 CHO	36.80(7)	34.80(8)	0.893	68.40(13)	39.10(9)	0.061

n=number of participants, * = statistical significance at $p < 0.05$ between the schools in the same line, EGG=Experimental government group, CG=Control group, bolded = significant changes, V & F=Vegetable and Fruit, CHO=Carbohydrate

As a result of the intervention, in each of the post-test section two questions it was observed that the experimental government school answered more questions correctly than the CG with the entire EGG boys (100.00 percent) correctly answering Question 2.2. However, there was only one question (2.4) which pertained to the fat food group, where the difference (57.20 percent) between the boys in each school was observed to be significant ($p=0.000$), illustrated in Figure 6.53.

❖ Fat food group

At baseline the majority of boys for Question 2.4 (Figure 6.53) had poor results when answering which food items belonged to the fat food group. The difference (13.30 percent) in the percentage of children that answered correctly between the two schools (EGG 26.30 and CG 13.00 percent) was not significant. The NEP resulted in a significant ($p=0.000$) increase (57.20 percent) between the EGG (78.9 percent) and the CC (21.70 percent).

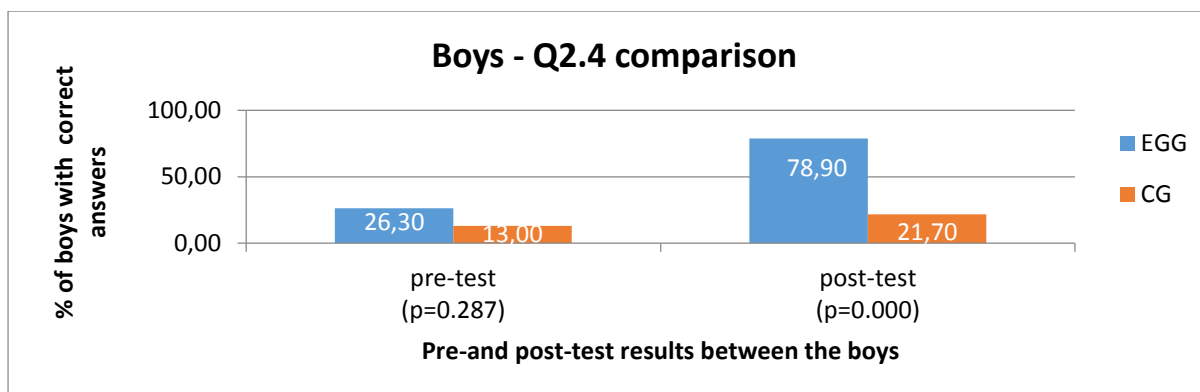


Figure 6.53: The percentage of boys with correct answers at pre-and post-test for Question 2.4

6.5.2.3 Comparison of the girls between the three schools (CG, EGG and EPG)

- Whole test comparison of the girls between the CG, EGG and EPG

One-way ANOVA was used to determine the percentage of correct answers between three schools for pre-and post-test. Figure 6.54 indicates that for the whole test at pre-test, there was a similar percentage of girls who answered correctly in the three groups with the majority knowing the correct answers (EGG 71.47, EPG 70.83 and CG 67.33 percent). There was a minimal difference (4.14 percent) observed between the most and the least knowledgeable group and non-significant differences were found between the groups.

The intervention resulted in an increase in percentage of girls with correct answers for the whole test in both of the EGs (EGG 89.62 and EPG 87.50 percent) with a minimal 2.12 percentage difference between them. The CG had the least percentage (67.33 percent) of children with the correct answers in the post-test resulting in a significant difference between the Control school and each of the Experimental schools (EGG $p=0.007$ and EPG $p=0.027$).

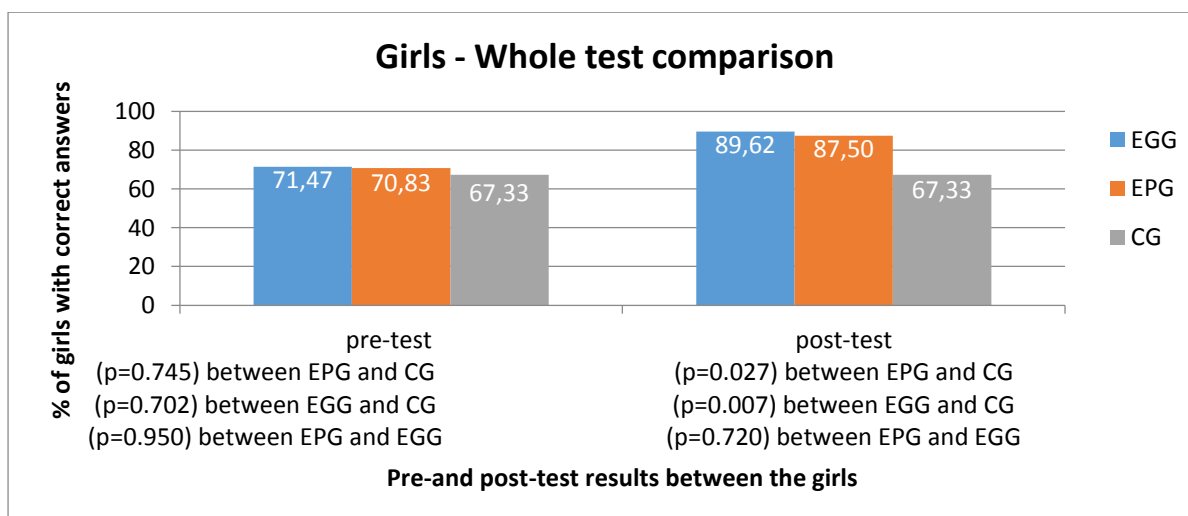


Figure 6.54: The percentage of girls with correct answers at pre-and post-test between the three schools for whole test

- **Section one comparison of the girls between the CG, EGG and EPG**

At baseline for Section one, a large proportion of the girls in each of the three schools (EGG 86.10, EPG 84.00 and CG 82.50 percent) obtained the correct answers as presented in Figure 6.55. There was a marginal difference (3.60 percent) between the group with the highest (EGG) and lowest (CG) percentage of correct answers.

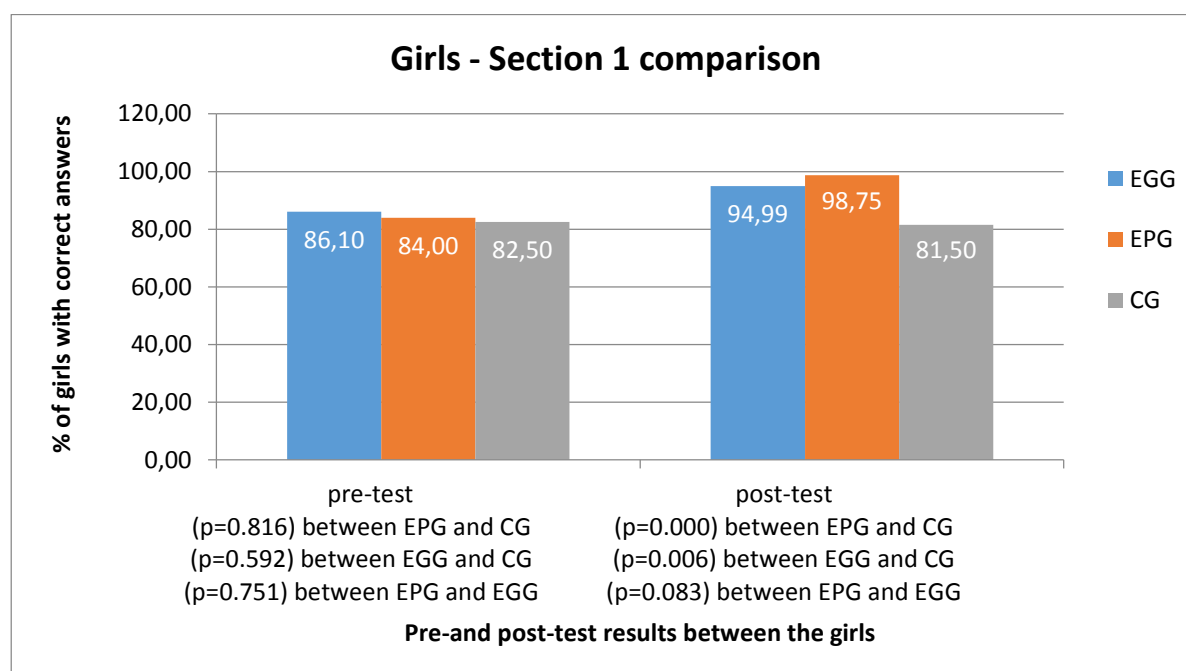


Figure 6.55: The percentage of girls with correct answers at pre-and post-test Section one

The post-test results for the girls in the two experimental schools, indicate an increase in the percentage of with correct answers after the NEP, with almost all the girls in the EPG (98.75 percent) answering the questions in this section correctly. Slightly fewer girls in the EGG (94.99 percent) answered correctly than those in the EPG, but non-significant. However, there was a significant difference observed between the girls in the Control school and those in the Experimental schools. The greatest significant ($p=0.002$) difference (17.25 percent) occurred between the CG and EPG (81.50 and 98.75 percent respectively) and between the CG and the EGG the difference (13.49 percent) was marginally less but significant ($p=0.008$).

Table 6.14 presents the entire girl's results for the questions in Section one. At baseline the girls in the EGG obtained 100.00 correct answers for three questions (Q 1.5 (wash fruit before eating), 1.6 (wash hands before eating) and 1.8 (eating lots of sweets and cakes) whilst in the CG all the girls (100.00 percent) obtained the correct answer for only Question 1.5. In the pre-test similar percentages were observed across all three schools for the questions in this section with the exception of Questions 1.2 (eat 5 fruit and vegetables daily) and 1.9 (milk, yoghurt, cheese needed for healthy bones and teeth). Here significant differences were found and illustrated in Figures 6.58 and 6.60 respectively.

Table 6.14: Comparison of the percentage of girls with the correct answers in the pre-and post-test in Section one between the three schools. with statistical significance

GIRLS (n=78) – SECTION ONE						
Question number	PRE-TEST			POST-TEST		
	EGG (n=18) % (n)	EPG (n=40) % (n)	CG (n=20) % (n)	EGG (n=18) % (n)	EPG (n=40) % (n)	CG (n=20) % (n)
1.1 10hrs of sleep	83.30(15)	67.50(27)	60.00(12)	83.30(15)	100.00(40)^a	80.00(16)^a
1.2 Daily 5 F & V	94.40(17)^a	90.00(36)	60.00(12)^a	100.00(18)^a	97.50(39)^a	80.00(16)^a
1.3 Play outside daily	50.00(9)	62.50(25)	70.00(14)	88.90(16)^a	100.00(40)^a	60.00(12)^a
1.4 Eat different types of food	83.30(15)	95.00(38)	85.00(17)	88.90(16)	100.00(40)^a	80.00(16)^a
1.5 Wash fruit	100.00(18)	90.00(36)	100.00(20)	100.00(18)	100.00(40)	100.00(20)
1.6 Wash hands	100.00(18)	97.50(39)	95.00(19)	100.00(18)	100.00(40)	95.00(19)
1.7 Meat & fish give strong muscles	83.30(15)	87.50(35)	85.00(17)	100.00(18)^a	100.00(40)^a	75.00(15)^a
1.8 Lots sweet, cakes	100.00(18)	95.00(38)	95.00(19)	94.40(17)	95.00(38)	95.00(19)
1.9 Milk – healthy bones & teeth	77.80(14)	62.50(25)^a	90.00(18)^a	94.40(17)	95.00(38)	80.00(16)
1.10 Daily six glasses of water	88.90(16)	92.50(37)	85.00(17)	100.00(18)^a	100.00(40)^a	70.00(14)^a

n=number of participants, upper script ^a = statistical significance at $p<0.05$ between schools in the same line, EGG=Experimental Government group, EPG=Experimental Private group, CG=Control group, bolded = significant changes

The intervention resulted in the girls in the experimental schools obtaining 100.00 percent correct answers in a number of questions in the section one post-test. The EPG girls obtained 100.00 correct answers in six questions (Q1.3 (play outside everyday), 1.4 (eat different types of food), 1.5 (wash fruit before eating), 1.6 (wash hands before eating), 1.7 (meat and fish give strong muscles) and 1.10 (drink 6 glasses of water daily)) in comparison to the EGG girls who all correctly answered five questions (Q1.2, 1.5, 1.6, 1.7 and 1.10). In the control school only one question (1.5) was answered correctly by all the girls in the post-test. Post-test there were a number of significant differences in knowledge between the schools which are elaborated on here.

❖ Enjoy a variety of foods

Figure 6.56 shows similar percentages obtained by the girls in the three school's pre-test results for Question 1.4. Post the NEP the two EGs indicated similar percentages with a minimal difference of 11.10 percent. All (100.00 percent) of the girls in the EPG knew that a child must eat different types of food to be healthy. The only significant ($p=0.018$) difference (20.00 percent) was observed in the post-test between the EPG (100.00 percent) and the CG (80.00 percent).

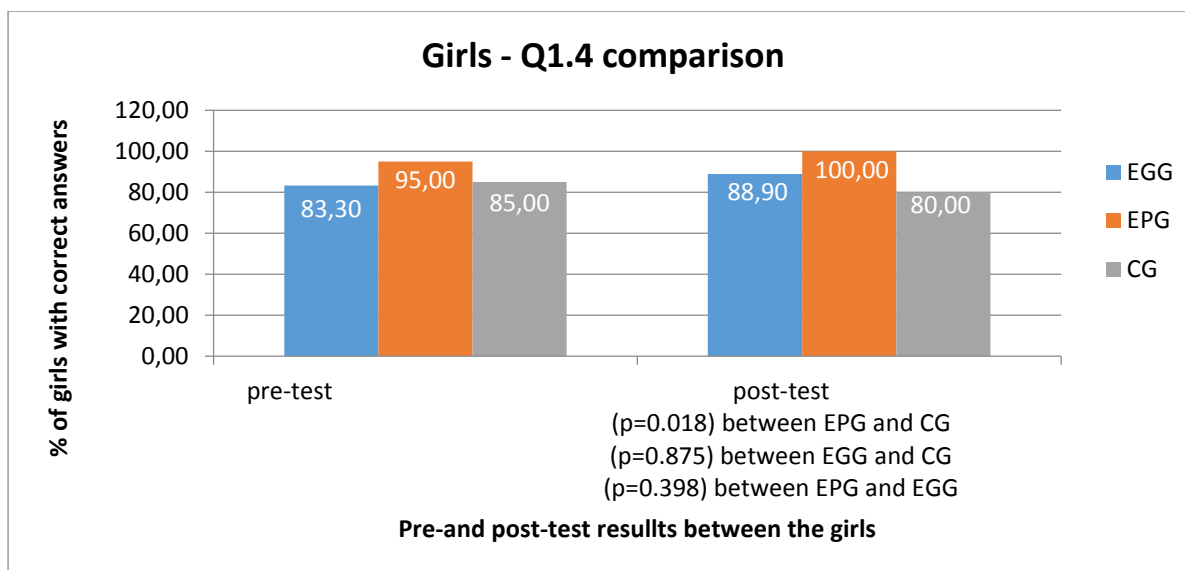


Figure 6.56: The percentage of girls with correct answers at pre-and post-test for Question 1.4

❖ **Be active**

In Question 1.3 knowing that a child should play outside every day (Figure 6.57) in the pre-test, the control school girls had the highest percentage of correct answers (70.00 percent). In comparison the lowest score was from the EGG (50.00 percent), with a non-significant difference between the two schools. However, after the NEP, all the EPG girls (100.00 percent) obtained the correct answer. Slightly fewer children (11.10 percent) obtained correct answers in the EGG (88.90 percent), with a non-significant difference between these two groups. A significant ($p=0.000$) difference (40.00 percent) was observed between the girls in the CG (60.00 percent) and those in the EPG (100.00 percent).

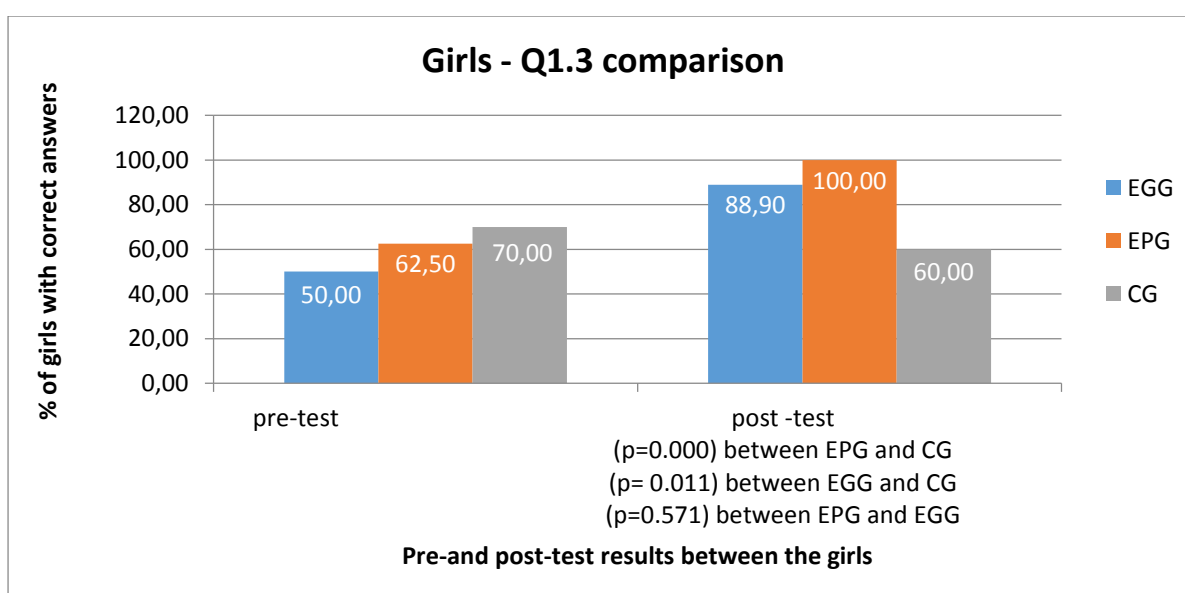


Figure 6.57: The percentage of girls with correct answers at pre-and post-test for Question 1.3

❖ Eat plenty of fruit and vegetables every day

At baseline (Figure 6.58) in Question 1.2, the greatest difference (34.40 percent) was observed between the EGG (94.40 percent) and the CG (60.00 percent), with significance ($p=0.031$). The EPG group had a similar number (90.00 percent) of correct answers to the EGG (94.40 percent) however; the difference between these schools was of no significance.

After the NE significant differences were observed between the control school and both the experimental schools. All girls in the EGG (100.00 percent) knew the answer to this question resulting in a 20.00 percent significant ($p=0.033$) difference when compared to the CG girls (80.00 percent). There was also a significant ($p=0.025$) difference (17.50 percent) between the girls in the CG and those in the EPG (97.50 percent). There was, however, only a marginal difference (2.5 percent) between the girls in the two Experimental schools.

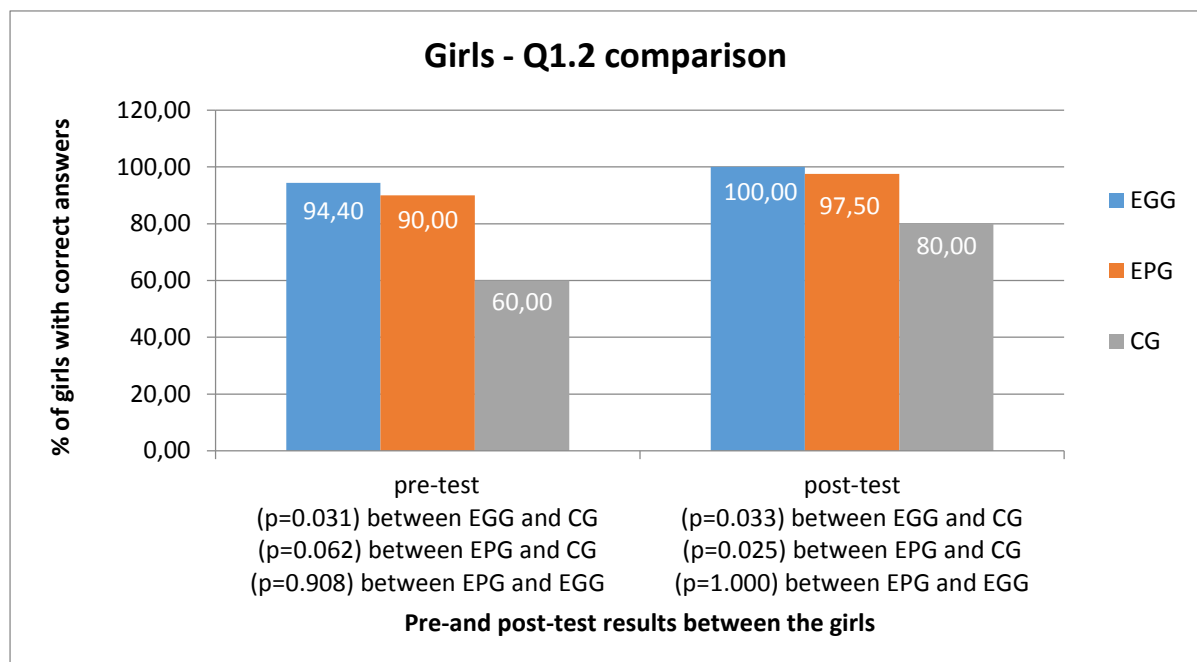


Figure 6.58: The percentage of girls with correct answers at pre-and post-test for Question 1.2

❖ Chicken, fish, milk, meat or eggs can be eaten daily

At baseline, similar knowledge pertaining to meat and fish giving strong muscles was observed in all three schools (Question 1.7) as presented in Figure 6.59. After the NEP all (100.00 percent) the girls in both of the Experimental schools knew the correct answer resulting in a 25.00 percent knowledge difference between the CG and both Experimental schools.

The greatest significant ($p=0.000$) difference was observed between the girls in the EPG and CG whilst a $p=0.003$ significant difference occurred between the CG and the EGG girls.

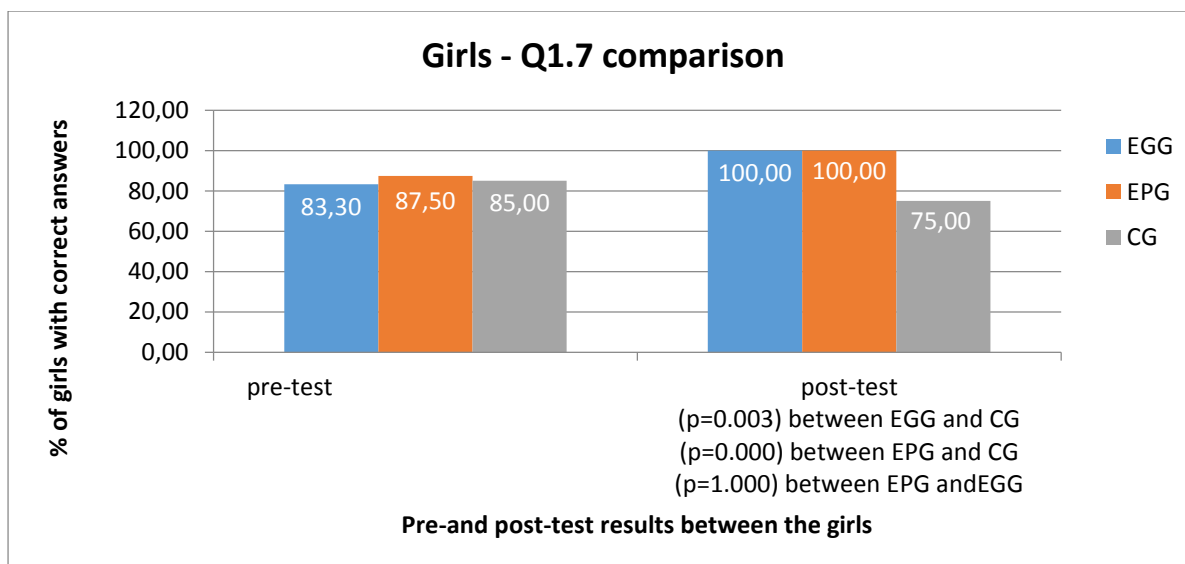


Figure 6.59: The percentage of girls with correct answers at pre-and post-test for Question 1.7

For Question 1.9 (Figure 6.60) for the girls, the only significant ($p=0.031$) difference (27.50 percent) was observed at baseline between the EPG (62.50 percent) and the Control school (90.00 percent). The majority of the girls in the EGG (77.80 percent) knew of the relationship between the dairy food group and bone and teeth health. Post-intervention the knowledge of the girls in both experimental groups (EGG 94.40 and EPG 95.00 percent) were almost identical, the CG (80.00 percent) slightly less knowledgeable in the post-test.

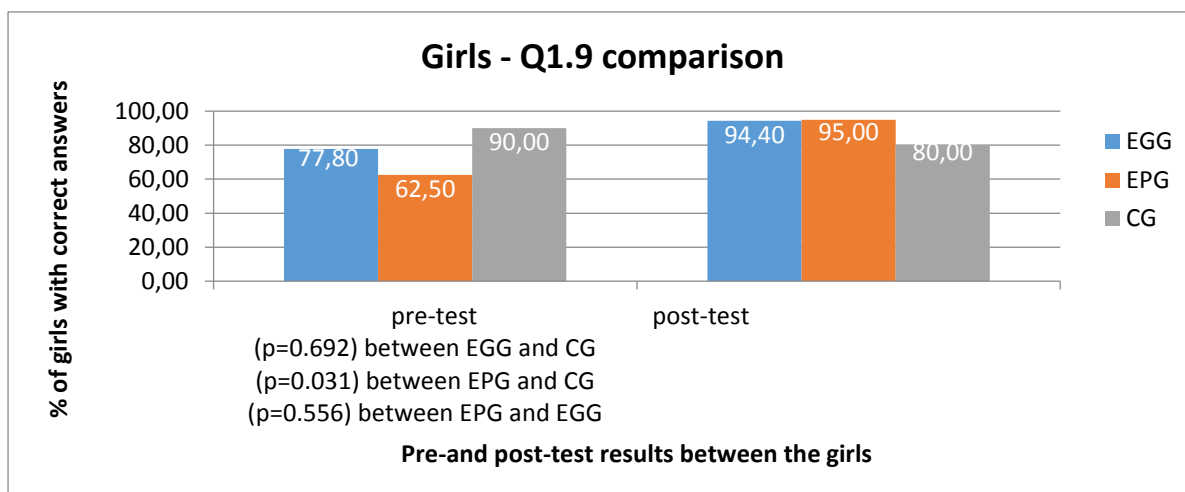


Figure 6.60: The percentage of girls with correct answers at pre-and post-test for Question 1.9

❖ Drink lots of clean safe water

In the pre-test in Question 1.10, (Figure 6.61) very similar results were evident amongst the girls in the three schools (EPG 92.50, EGG 88.90 and CG 85.00 percent) with the EPG obtaining the greatest number of correct answers. After the NEP, all girls (100.00 percent) in the two Experimental schools knew a child must drink six glasses of water daily. A 30.00 percent difference was observed for this question post-test between the EGs (100.00 percent) and the Control school (70.00 percent) with

$p=0.000$ significance indicated between the EPG and the CG, and a $p=0.001$ significant difference observed between the EGG and CG.

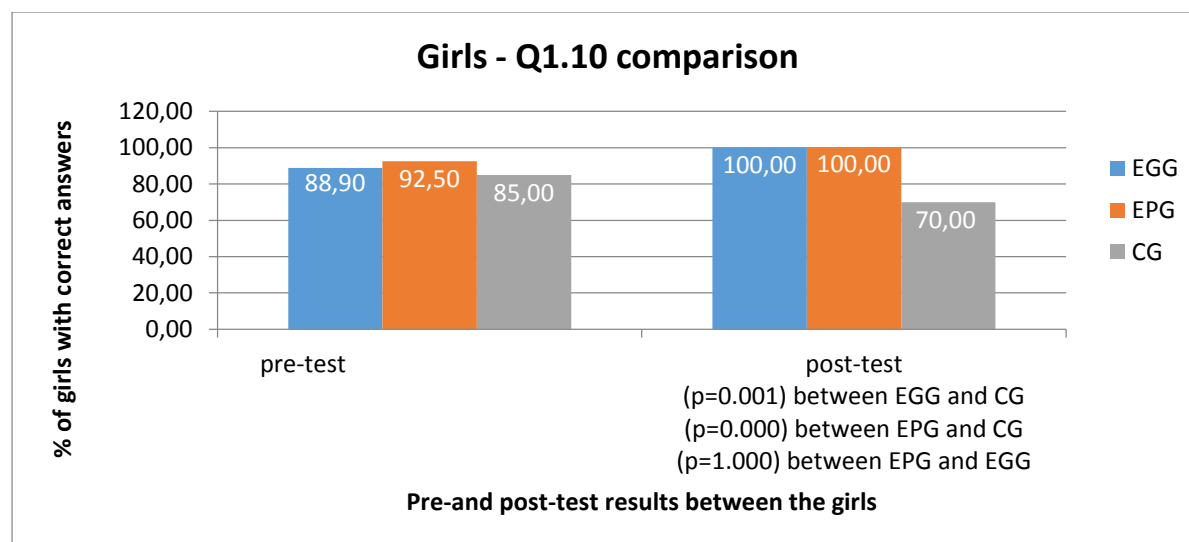


Figure 6.61: The percentage of girls with correct answers at pre-and post-test for Question 1.10

❖ Sufficient sleep required at night

In Figure 6.62, Question 1.1 for the pre-test, the greatest number of girls with correct answers were the EGG (83.30 percent) and the least from the Control school (60.00 percent) with non-significance noted. The intervention resulted in all (100.00 percent) the Experimental private school girls knowing that 10 hours of sleep is required at night and they has significantly ($p=0.030$) more correct answers than the CG girls (80.00 percent). Very similar post-test results were observed between the girls in the EGG (83.30 percent) and CG (80.00 percent, $p=1.000$).

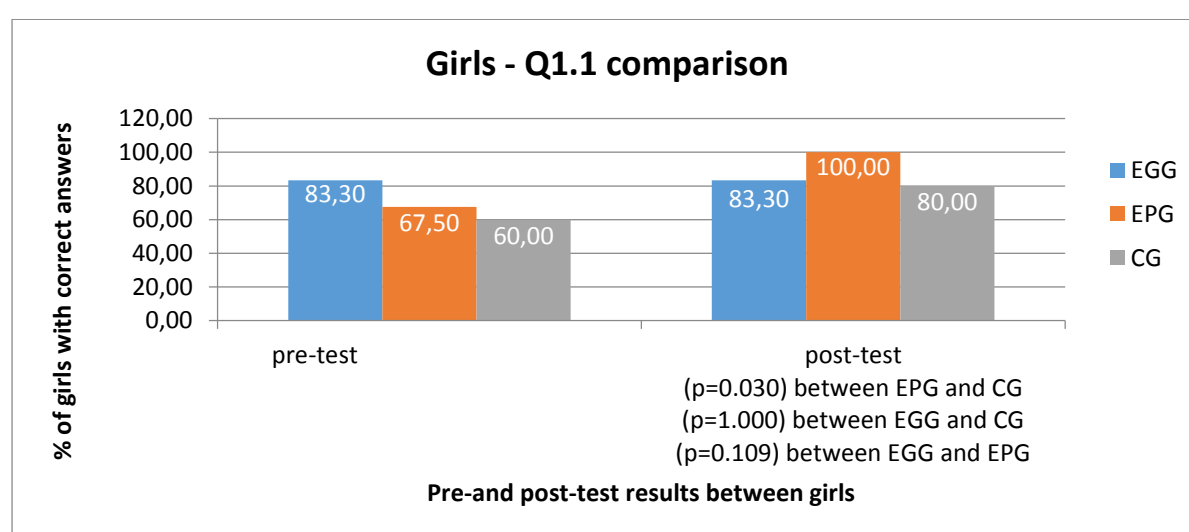


Figure 6.62: The percentage of girls with correct answers at pre-and post-test for Question 1.1

- **Section two comparison of the girls between the CG, EGG and EPG**

Figure 6.63 illustrates, that the majority of the girls in the Section two pre-test were unable to match the pictures of the food items to the appropriate food group. There was a minimal difference in the number of children with correct answers between the three groups. The control school girls (37.00 percent) with the lowest percentage of correct answers whilst the EPG (44.50 percent) had the highest percentage of correct answers.

Section two post-test results show a considerable improvement in number of girls answering correctly in the two Experimental schools with the EGG girls (78.88 percent) having the highest score in comparison to the EPG (65.00 percent) and the CG (39.00 percent). A significant ($p=0.019$) difference (13.88 percent) was observed between the EGG and Control school.

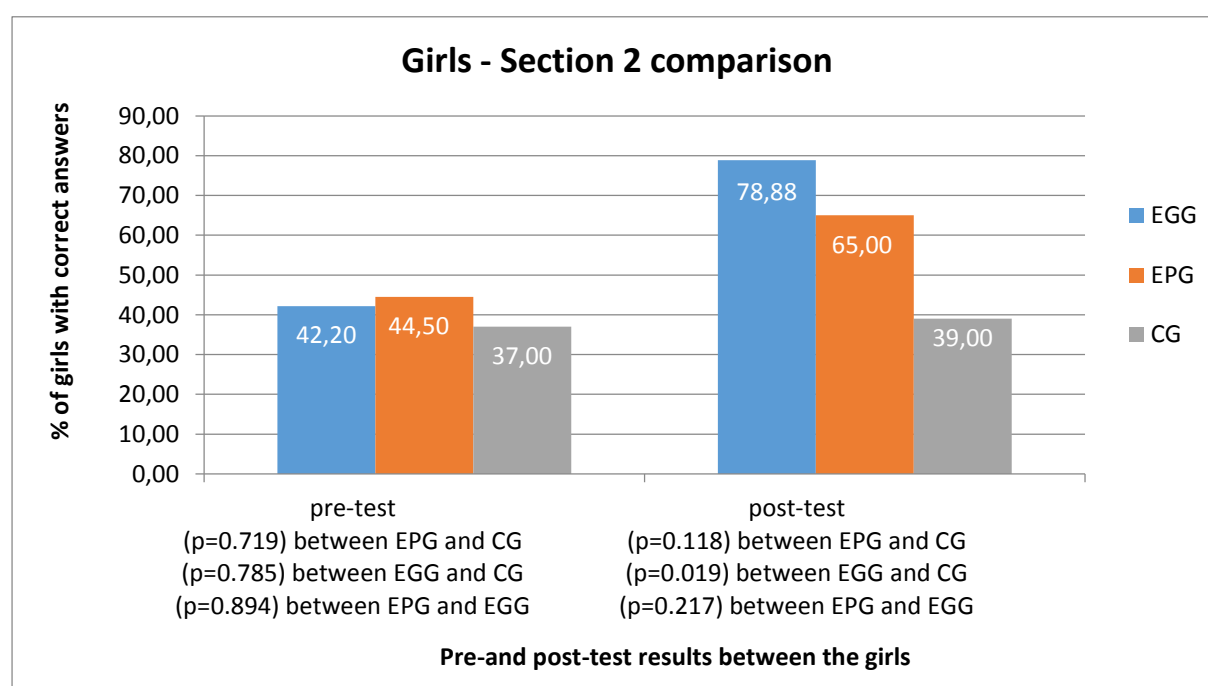


Figure 6.63: The percentage of girls with correct answers at pre-and post-test for Section two

For Section two the results for the individual questions for the pre-and post-test is reported in Table 6.15. The percentage of correct answers to the pre-test questions by the girls in the different schools was very similar. Poor knowledge was evident in all questions except in Question 2.2 which related to the Vegetable and Fruit food group. Post-test results with statistical significance are indicated in three of the food group questions (Qs 2.1(Dairy), 2.3 (Protein) and 2.4 (Fat)) and are further elaborated on.

Table 6.15: Comparison of the percentage of girls with the correct answers in the pre-and post-test in Section two between the three schools. with statistical significance

GIRLS (n=78) – SECTION TWO						
Question number	PRE-TEST			POST-TEST		
	EGG (n=18) % (n)	EPG (n=40) % (n)	CG (n=20) % (n)	EGG (n=18) % (n)	EPG (n=40) % (n)	CG (n=20) % (n)
2.1 Dairy	33.30(6)	50.00(20)	30.00(6)	72.20(13)^a	72.50(29)^a	15.00(3)^a
2.2 V & F	83.30(15)	92.50(37)	95.00(19)	100.00(18)	92.50(37)	85.00(17)
2.3 Protein	27.80(5)	25.00(10)	25.00(5)	72.20(13)^a	45.00(18)	30.00 (6)^a
2.4 Fat	33.30(6)	17.50(7)	5.00(1)	83.30(15)^a	65.00(26)^a	25.00(5)^a
2.5 CHO	33.30(6)	37.50(15)	30.00(6)	66.70(12)	50.00(20)	40.00(8)

n=number of participants, EGG=Experimental Government group, EPG=Experimental Private group, CG=Control Group, bolded=significant changes, V & F=Vegetable and Fruit, CHO=Carbohydrate

❖ Dairy food group

At baseline in Question 2.1 (Figure 6.64), the EPG had the highest percentage of girls providing the correct answers when matching food items to the Dairy food group however only half (50.00 percent) of the EPG girls knew the answer. Similar percentages were observed in the EGG (33.30 percent) and CG (30.00 percent).

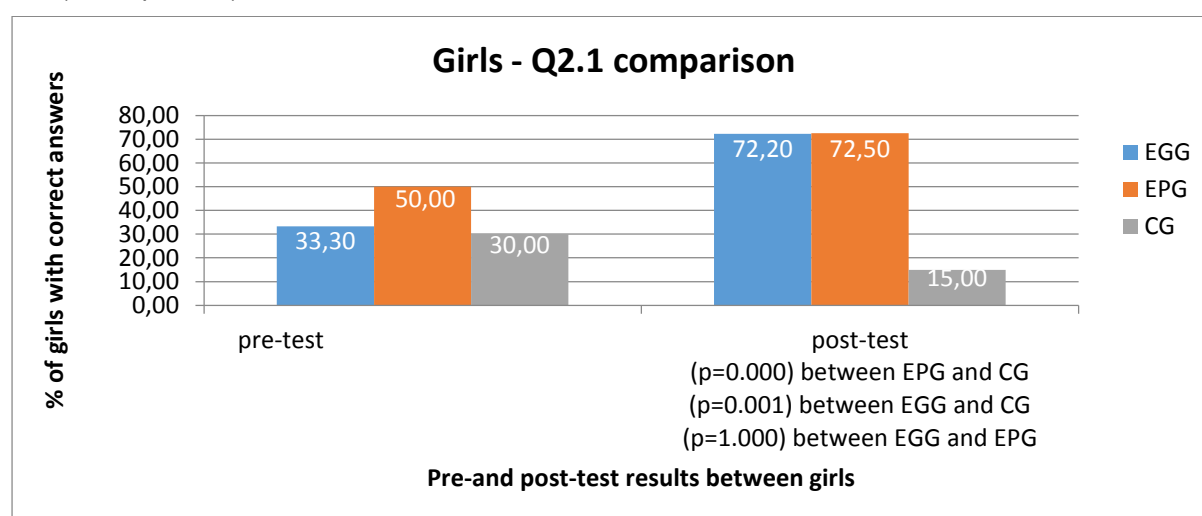


Figure 6.64: The percentage of girls with correct answers at pre-and post-test for Question 2.1

The NE led to an improvement of girls providing the correct answer in both of EGs with almost the identical percentage (EGG 72.20 and EPG 72.50 percent) of correct answers being obtained. Poor results of the girls in the control school (15.00 percent) led to a significant difference in knowledge being observed between the CG and both of the EGs ($p=0.000$ between CG and EPG, $p=0.001$ between the CG and the EGG).

❖ Protein-rich food group

Prior to the intervention in Question 2.3 as illustrated in Figure 6.65, the girls in all three groups had very poor and similar (EGG 27.80, EPG 25.00 and CG 25.00 percent) percentages of correct answers relating to food items belonging to the protein-rich food group. Post the intervention the EGG girls (72.20 percent) obtained the highest percentage results followed by the EPG girls (45.00 percent). However, a significant ($p=0.025$) difference (42.20 percent) was observed between the girls in the control school (30.00 percent) and those in the Experimental government school.

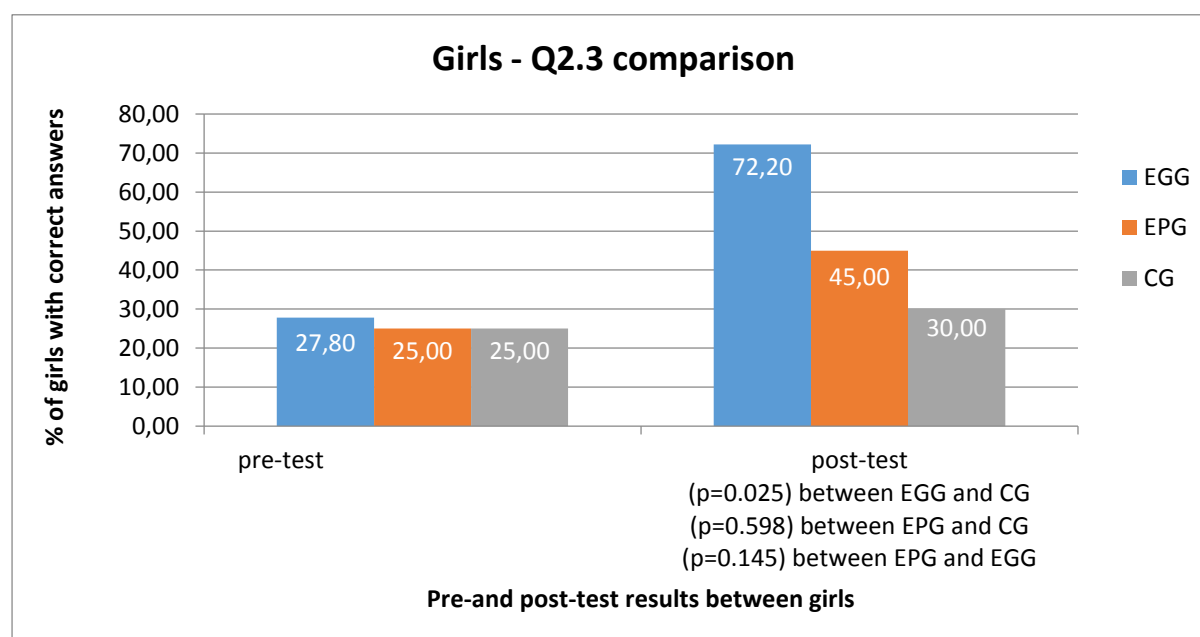


Figure 6.65: The percentage of girls with correct answers at pre-and post-test for Question 2.3

❖ Fat food group

Figure 6.66 (Question 2.4) indicates that at baseline low percentages were obtained for the girls in each of the schools especially those in the control school (5.00 percent). Although the girls in the EGs (EGG 33.00 and EPG 17.50 percent) achieved slightly more correct answers than those in the CG, the majority of them did not know which of the foods belonged to the fat food group. The girl's NE knowledge improved in both of the experimental schools with the EGG (83.30 percent) obtaining more correct answers when compared to the EPG (65.00 percent). Due to poor post-test results (25.00 percent) by the girls in the control school, the differences reported between the control and the two experimental schools (EGG 58.30 percent, $p=0.000$, and EPG, 40.00 percent, $p=0.006$) is significant.

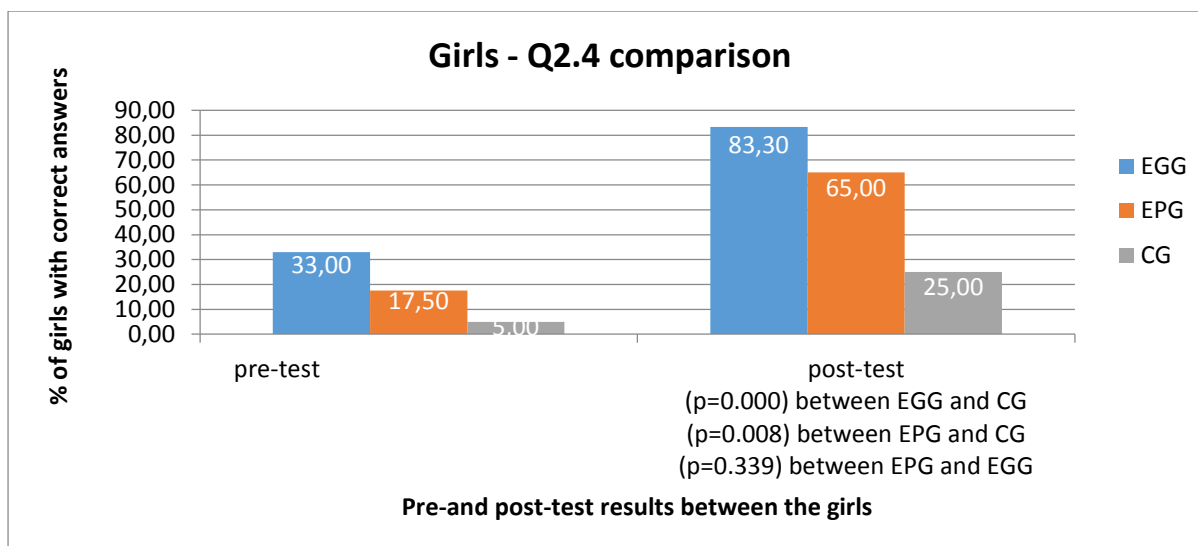


Figure 6.66: The percentage of girls with correct answers at pre-and post-test for Question 2.4

6.6 DISCUSSION OF RESULTS

The aim of implementing a classroom based NEP was to improve the nutrition knowledge of Grade R learners in Durban, KwaZulu-Natal (KZN). The outcome to improve nutrition knowledge was closely matched to the nutrition content and didactic approach of the programme, an important educational strategy cited by Contento et al. (1995: 360). A similarity exists between this South African study and one conducted in the United States (US) by Murphy et al. (1995: 219) where the Dietary Guidelines of the country were used as a basis for the intervention and assessment of knowledge of Grade R children.

In the present study, knowledge relating to the SA FBDGs (Vorster, 2001: S3) was established in Section one of the NKQ. In Section two, the classification of a variety of foods into their appropriate food groups was assessed. Classification is a skill appropriate for preschool children according to Murphy et al. (1995: 223), however this can be difficult for children in this age group depending on the type of classification required. It is easier for children to categorize food according to the sugar, fat or salt content rather than into nutrient-based food groups as was also noticed in this study in the pre-test.

Globally, a number of classroom based NE intervention programmes for children of a similar age to the current study, have been implemented successfully by significantly increasing nutrition knowledge (Wagner et al., 2005: 105; Blom-Hoffman et al., 2004: 56; Shariff et al., 2008: 123; Shah et al., 2010: 433; Shi-Chang et al., 2004, and Cason, 2001: 163). Other NEPs have increased healthy dietary behaviours (Hu et al., 2009: 259; Matvienko, 2007: 284, and Cason, 2001: 163).

There is a paucity of South African NE studies conducted in pre-primary and primary schools. A Grade R study which used the same nutrition education tools (NETs) as this study was completed in the Vaal region by Oldewage-Theron and Egal (2009: 46). Similar NE studies were conducted in primary schools in Boipatong by Oosthuizen (2010: 22), in QwaQwa by Oldewage-Theron and Egal (2010: 149) and in

Potchefstroom by Phometsi, Kruger and van't Riet (2006: 530). The children in all of these studies were from less privileged low socio-economic backgrounds than the children in the current study.

No NE intervention according to the researcher's knowledge has been implemented in Grade R in a suburban setting in Durban. The present study will therefore contribute to the body of literature relating to NE.

Contento et al. (1995: 355) emphasised that research has established the importance of NE in pre-school children as a key aspect in the development of healthful dietary practices as and when they are given greater opportunities to make decisions regarding food choices. In agreement is Shariff et al. (2008: 123) as these researchers confirm that nutrition knowledge is fundamental in the attainment of a healthier dietary attitude and behaviour. Similarly, in a US school study of six and seven year olds, the "NutriActive Healthy Experience Program" by Matvienko (2007: 284), a combination of nutrition and food education significantly empowered these children to make healthier food selections over at least a four-month period. Van Cauwenberghe et al. (2010: 794) reviewed published European literature between 1990 and 2007 and concluded that a NEP can be successful in motivating healthier food choices by children.

6.6.1 Pre-intervention knowledge of the whole group for the whole test, Sections one and two

The pre-intervention nutrition knowledge of the Grade R children in the three schools participating in this study, for the whole test, was good and similar (EGG 72.42, EPG 70.83 and CG 69.15 percent) with the EGG children having the highest percentage of correct answers and the CG having the lowest percentage of correct answers at pre-test. A Grade R study in the Vaal (Oldewage-Theron and Egal, 2009: 48) also ascertained that the children had some nutrition knowledge prior to the nutrition intervention. This was in spite of the fact that in SA, there is a dearth of nutrition media campaigns aimed at children to increase the knowledge of the SA FBDGs (Vorster, 2001: S3) and the food groups. Contento et al. (1995: 360) is of the opinion that nutrition messages via the media will increase a child's awareness and motivation to bring about change if repeated over a long period of time.

For Section one, the FBDG baseline knowledge of the preschool children in this study was good (EGG 87.58, EPG 84.00 and CG 84.19 percent) with the EGG children obtaining the highest percentage of correct answers.

In Question 1.1, the majority of preschool children in this study (EGG 83.50, EPG 67.50 and CG 69.80 percent) knew prior to the intervention that a child requires 10 hours of sleep at night. Research data on sleep patterns of preschool children gathered by Healy (1972: 174-176), established that between boys and girls, there is non-significant difference in the hours of sleep required. However, the amount of sleep needed varies from child to child in a particular age group and decreases as the child grows older. A consistent bedtime should be observed which will benefit a child's health and alertness.

The pre-test results of Q1.2 revealed that the majority of Grade R children (EGG 91.90, EPG 90.00 and CG 62.80 percent) were aware of the daily requirement of five fruit and vegetables, an important FBDG

enhancing academic performance (Florence, Asbridge and Veugelers, 2008: 213). A similar finding (74.60 percent) was confirmed by Oldewage-Theron and Egal (2010: 151) in the QwaQwa study. Furthermore, only half (50.00 percent) of the children in the Grade R study in the Vaal Region knew of the required fruit and vegetable intake (Oldewage-Theron and Egal, 2009: 48) whilst Oosthuizen (2010: 124) reported a severe lack of this knowledge in primary school children in Boipatong (EG 13.50 and CG 23.80 percent). Internationally, a number of school-based NEPs reported a significant increase of fruit and/or vegetable intake in the short term and in some instances the long term. This outcome was achieved in a school-based NEP in Melbourne with primary school children in the “Fresh Kids” study by Laurence, Peterken and Burns (2007: 223) and in North Carolina the “Colour Me Healthy” (CMH) study for preschoolers by Witt and Dunn (2012: 110-111) whilst a modest increase in the consumption of fruit was observed in five to seven year olds in Oxford, United Kingdom (UK) as observed by Warren et al. (2003: 295).

Research established that a similar percentage of QwaQwa (51.00 percent) and Vaal children (47.70 percent) knew that being active every day (Q1.3) was important for good health (Oldewage-Theron and Egal, 2010: 151 and 2009: 48 respectively). In comparison, the children in the current study, especially in the CG, were more aware that being active was a health benefit (EGG 51.40, EPG 62.50 and CG 76.70 percent). The 2007 HealthKick Programme in the Western Cape has placed great emphasis on increased participation in physical activity in school which has been lacking especially in underprivileged schools (De Villiers et al., 2012).

Murphy et al. (1995: 221) reports that many Grade Rs experience difficulty in understanding nutrition-related terms e.g. a variety of foods. What is important is for the children to know the concept not the definition as was the case in Q1.4: Does a child need to eat different types of food to be healthy? Excellent pre-intervention knowledge for this question was observed in this study in all three schools (EGG 91.90, EPG 95.00 and CG 88.40 percent). The Durban children were more knowledgeable than those in two similar studies: where the majority (76.10 percent) of Grade Rs in a Vaal Study (Oldewage-Theron and Egal, 2009: 48) and Boipatong primary school children (EG 55.60 and CG 68.20 percent) (Oosthuizen, 2010: 124) knew the importance of eating a varied diet before the intervention.

At baseline nearly all the children in this study (EGG 97.30, EPG 90.00 and CG 95.30 percent) knew that fruit must be washed before eating (Q1.5). In comparison, Oldewage-Theron and Egal (2010: 151, 153) reported that just over half (53.60 percent) of the primary school children in the QwaQwa study and 61.40 percent of Grade Rs in the Vaal study (Oldewage-Theron and Egal, 2009: 48) knew of this healthy practice required to prevent the consumption of unsafe food and resultant illness.

In the current study prior to the NEP, knowing that hands must be washed before eating (Q1.6) was well known amongst all children. All of the EGG children (100.00 percent) obtained the correct answer and similar percentages were obtained in the EPG (97.50 percent) and CG (97.70 percent). Similarly, Phometsi, Kruger and Van't Riet (2006: 533) reported that children at farm schools in the North West

Province were most knowledgeable about washing hands before eating; however the research established that this was not actually practiced. Oldewage-Theron and Egal (2010: 151) established that only a minority (48.90 percent) of QwaQwa primary school children and Grade Rs (47.70 percent) in the Vaal study (Oldewage-Theron and Egal, 2009: 48) knew of this hygiene practice.

The baseline knowledge of eating meat and fish to give strong muscles (Q1.7) was similar between the children in the three schools (EGG 89.20, EPG 87.50 and CG 90.70 percent). These children were considerably more knowledgeable about the function of protein than those studied in QwaQwa and in the Vaal region by Oldewage-Theron and Egal (2010: 151 and 2009: 48, respectively). In both of these studies the identical percentage (33.30 percent) of children knew of the importance of eating protein. However, in the Vaal study, the finding of the multiple choice question (33.30 percent) was inconsistent with the same question in the 'true/ false' section where 51.70 percent knew the correct answer.

Eating of sugary foods should be limited as it is unhealthy (Q1.8). This was well known amongst the children (EGG 100.00, EPG 95.00 and CG 93.00 percent) in this study prior to the intervention as well as in a US study by Murphy et al. (1995: 221) and similarly in a study by Oosthuizen (2010: 124) (EG 92.70 and CG 86.40 percent). Sugary foods should be restricted in the diet was known by a minority (47.90 percent) of children in the QwaQwa study (Oldewage-Theron and Egal, 2010: 151).

In Question 1.9, the children in this present study were considerably more knowledgeable regarding the function of dairy products (EGG 81.10, EPG 62.50 and CG 79.10 percent) than those children in comparative studies in a rural setting. The consumption of dairy products for the building of strong bones and teeth was known by only 26.70 percent of the primary school children in QwaQwa (Oldewage-Theron and Egal, 2010: 151). In the Vaal Grade R study, in the multiple choice section of the questionnaire, a similar finding (27.40 percent) was observed. However, a discrepancy in knowledge was found in the true and false sections of this questionnaire where 67.80 percent of the Grade Rs were aware of the function of dairy products (Oldewage-Theron and Egal, 2009: 48).

Fairly similar good knowledge was observed at baseline between the three schools (EGG 89.20, EPG 92.50 and CG 88.40 percent) in relation to a child knowing the required daily intake of water (Q1.10). In comparison, at pre-test the children in the Boipatong study (Oosthuizen, 2010: 124) were considerably less knowledgeable (EG 52.70 and CG 45.50 percent), and even less so were the children from QwaQwa (19.00 percent) and the Vaal region (3.10 percent), ascertained in studies by Oldewage-Theron and Egal, (2010: 151 and 2009: 48 respectively). However, in the Vaal region, there was an inconsistency in knowledge as 44.00 percent of the children in the 'true/ false' section knew that six glasses of water is required daily. One aspect of the Australian 'Fresh Kids' programme was to increase water intake as sweetened drinks have increased in popularity over the years and children are not knowledgeable regarding the importance of water (Laurence, Peterken and Burns, 2007: 223).

In all three Durban schools, in Section two at pre-test, when matching food items to the different food groups, limited knowledge was exhibited by the Grade R children (EGG 42.34, EPG 44.50 and CG

39.08 percent). Similarly, research conducted by Oldewage-Theron and Egal (2009: 48) ascertained that only a few (13.40 percent) of the Vaal Grade R children knew of the five different food groups.

Prior to the NEP, identification of foods belonging to the Dairy food group (Q2.1) was not well executed (EGG 29.70, EPG 50.00, and CG 32.60 percent). Matheson, Spranger and Saxe (2002: 86) observed that preschool children experienced difficulty when trying to classify dairy products due to the observation that colour was used most often by children to classify food rather than the nutrients. This trend was similar in two studies by Oldewage-Theron and Egal for 32.00 percent of the children in Grade R in the Vaal region and 37.30 percent in QwaQwa (Oldewage-Theron and Egal, 2009: 48 and 2010: 151 respectively). In addition, the Boipatong study (Oosthuizen, 2010: 124) confirmed the difficulty children had in recognising dairy foods (EG 46.30 and CG 40.90 percent) which was also acknowledged by Wagner et al. (2005:106).

The majority of children in this study (EGG 83.80, EPG 92.50 and CG 90.70 percent) knew prior to the intervention which food items belonged to the Vegetable and Fruit food group (Q2.2). In Wagner's et al. (2005: 106) study children could easily identify a picture of food items belonging to the vegetable food group. Less knowledgeable were the primary school children (76.1 percent) in rural QwaQwa (Oldewage-Theron and Egal, 2010: 151). In comparison, the Oosthuizen study (2010: 124) established that fewer Boipatong primary school children (EG 66.00 and CG 63.60 percent) had knowledge of the Vegetable and Fruit food group. The Grade Rs (43.20 percent) in the Vaal were the least knowledgeable regarding the Vegetable and Fruit group (Oldewage-Theron and Egal, 2009: 48).

Prior to the intervention, knowledge of food items belonging to the Protein-rich food group (Q2.3) was very limited in the present study (EGG 32.40, EPG 25.00 and CG 30.20 percent) with similar findings (EG 16.70 and CG 31.80 percent) noted in the Boipatong study (Oosthuizen, 2010: 124), the QwaQwa study (23.40 percent) and Vaal Grade R study (20.60 percent) by Oldewage-Theron and Egal (2010: 151 and 2009: 48 respectively).

In the present study, the children (EGG 29.70, EPG 17.50 and CG 9.30 percent) had difficulty identifying food items that belonged to the Fat food group in Question 2.4. Similarly, children in Germany were challenged when matching a card illustrating butter and margarine, to the oil and fat food group (Wagner et al., 2005: 106). This lack of knowledge could affect dietary fat intake, impacting on academic performance and future health (Florence, Asbridge and Veugelers, 2008: 213- 214).

Preceding the NE, the identification of carbohydrate foods (Q2.5) by the Grade Rs in this study (EGG 35.10, EPG 37.50 and CG 32.60 percent) was poor but comparable to findings from two questions in the QwaQwa pre-test (36.60 percent and 40.80 percent) and, the Vaal study (23.70 percent) by Oldewage-Theron and Egal (2010: 151 and 2009: 48 respectively). Oosthuizen (2010:124) verified that only a limited number of primary school children in Boipatong could identify carbohydrate foods (EG

13.00 and CG 14.30 percent). In contrast, children easily managed to assign the bread roll to the cereal and cereal products food group in the study conducted by Wagner et al. (2005: 106).

6.6.2 Post-intervention knowledge of the whole group for the whole test, Sections one and two

For the whole test after the NEP, the CG showed a minimal 2.32 percent increase in knowledge in comparison to the EGs (EGG 15.87 and EPG 16.67 percent respectively). A significant difference ($p=0.035$) in knowledge was observed only between the EGG and CG. The increase in knowledge of the EGG and EPG reported in this study is consistent with findings of other similar SA studies. Oldewage-Theron and Egal (2009: 49) confirmed an 18.20 percent overall significant improvement of knowledge for Grade Rs in the Vaal region. In the current study, the post-test was conducted a week after the completion of the intervention. Similarly, this occurred in the Grade R study by Oldewage-Theron and Egal (2009: 49) although the duration of that NEP was for eight months compared to the eight week programme of the current study. In both of these studies, the increase in nutrition knowledge was slightly higher than the 13.40 percent improvement in knowledge in the study by Oosthuizen (2010: 124). Internationally, five to seven year olds in England in the Be Smart Study, in the Eat Smart and Eat/Play Smart programmes, conducted by Warren et al. (2003:292) improved nutrition knowledge significantly ($p<0.001$) during a classroom-based nutrition programme. A Chinese preschool classroom-based nutrition education intervention by Hu et al. (2009:259) reported a positive impact which resulted in an improvement of healthy lifestyle behaviours.

During the present study no parental involvement took place. However, the role of family support and involvement for young school children in a classroom based NEP is documented by Contento et al. (1995: 357) as an effective means to increase the impact of an education programme.

The whole test results of this study indicate that the NEP programme significantly (EGG $p=0.004$ and EPG $p=0.001$) improved the knowledge of the children in both of the EGs.

The similarity in the increase of the percentage of children that answered correctly in both the experimental schools in this study could be attributed to the fact that a qualified foundation phase educator delivered the NEP to both schools. A qualified educator is advocated by Sharma (2011: 214S) as being the logical person for implementing a NEP in a school. However, it is advised by Contento et al. (1995: 359) that the educator should, as occurred in the current study, undergo in-service preparation with regard to the nutrition content and delivery of the programme. The educator should also be a positive social adult role model (Contento et al., 1995: 295). There was also active participation by the learners in this programme as each child worked independently in an activity book and played with the educational tools in a nonthreatening environment, an educational approach Contento et al. (1995: 357,361) advocates as important. Pre-schoolers in particular, need to be involved in making decisions as occurred in this study when using the food plate puzzle educational tool to create food group combinations for breakfast, lunch and dinner. This NEP was of relevance to the age group and the

child's developmental stage, both valuable aspects contributing to the success of a programme as advised by Contento et al. (1995: 357).

For Section one, the CG pre-and-post-test results indicated there were only two items (Q1.1 and Q1.2) showing significant differences. After the intervention period 86.00 percent knew that 10 hours of sleep is required at night (Q1.1) in comparison to 69.80 percent at pre-test. Eating fruit and vegetables daily (Q1.2) was agreed by 81.40 percent at post-test and answered correctly by 62.80 percent at pre-test. There is no known reason for this significant increase in knowledge but it is evident from this study that prior to the NE the Grade R children had fairly good nutrition knowledge relating to the FBDGs in Section one. Post the intervention, the FBDG knowledge of the EGs had significantly improved in six of the 10 questions, pertaining to needing sleep for a healthy body (Q1.1); playing outside daily (Q1.3); washing fruit before eating it (Q1.5); eating meat and fish for strong muscles (Q1.7); eating dairy products for healthy bones and teeth (Q1.9), and drinking 6 glasses of water daily (Q1.10). It is evident that the NEP was successful in respect of increasing FBDG knowledge when comparing the percentage of children with correct answers post-intervention in the CG (1.84 percent) and the EGs (EGG 6.75 and EPG 14.75 percent respectively). In addition, both EGs were significantly (EGG $p=0.022$ and EPG $p=0.000$) more knowledgeable than the CG at post-test for Section one. In seven (Q1.1, 1.2, 1.3, 1.4, 1.7, 1.9 and 1.10) of the ten questions it was established that there was a significant difference in the percentage of children with correct responses between the control and EGs. In Q1.1, 1.2, 1.7 and 1.10 there was a significant improvement in the percentage of children with correct answers in both experimental schools when compared to the CG. It was found that in Q1.3 (play outside daily) and Q1.4 (eat different types of food to be healthy) the significant difference was only between the EPG and the CG. On the other hand, in Q1.9 (eat dairy products) the significant difference was between the EGG and the CG. The Grade Rs in the study by Oldewage-Theron and Egal (2009: 48) similarly showed a significant improvement in knowledge in three questions related to the current study (Q1.7, 1.9 and 1.10). Oosthuizen (2010: 124) reported that post-intervention, the knowledge of Boipatong primary school children increased significantly regarding daily water consumption (Q1.10).

The NEP had an impact on the food group knowledge (Section two) of the children in both EGs (EGG 33.90 and EPG 20.50 percent respectively). A significant ($p=0.037$) difference was noted at post-test between the percentage of children with correct answers in the EGG and CG (3.26 percent). In this section, a significant improvement in the percentage of children with correct answers was observed in each of the five questions between the CG and the EGs. In relation to the dairy (Q2.1) and fat (Q2.4) food group knowledge, both EGs obtained significantly higher percentages of children with correct answers than the CG at post-test. For the remaining food group questions, Q2.2 (vegetable and fruit), Q2.3 (protein-rich) and Q2.5 (starch/carbohydrate) it was the EGG that achieved a significantly higher percentage of children with correct responses than the CG. With regards to matching food items to the food groups, the post-test findings of this Grade R study is consistent with the results released by Oldewage-Theron and Egal (2009: 48). These researchers established that the Grade R children in the experimental groups had a significant improvement in knowledge in related questions by correctly

identifying Vegetables and Fruit (as in Q2.2); Dairy products (as in Q2.1); Starch/ Carbohydrate (as in Q2.5), and Protein-rich foods (as in Q2.3) to the correct food groups. However, the Boipatong primary school children gained a significant increase in knowledge in only two related questions (Q2.3 and Q2.5) when matching foods to the Protein-rich and Starchy/ Carbohydrate food group (Oosthuizen, 2010: 124). The Cason (2001: 163) study established that preschool children could learn the names of various fruit and vegetables and identify the food group to which they belonged. All children in the present study (100.00 percent) as well as those in the Oldewage-Theron and Egal (2009: 48) and Oosthuizen study (2010: 124) easily identified food items belonging to the vegetable and fruit food group. The kindergarten study by Murphy et al. (1995: 222) revealed that the children knew what to eat for a healthy lifestyle but the food choices were in many cases contradictory to the knowledge of the Dietary Guidelines.

After the NEP, in the EGs, it was observed that there were no questions where the majority (>50 percent) answered incorrectly. In addition, there were no findings indicative of a significant ($p < 0.05$) decrease in the percentage of children who answered correctly nor did this occur in nutrition interventions conducted by Oosthuizen (2010: 124) and Oldewage-Theron and Egal (2009: 48).

6.6.3 Comparison of the Government and Private school intervention results

For the whole test, the Grade R private school children obtained a marginally higher percentage of correct answers (0.80 percent) as a result of the intervention (pre- 70.83 and 87.50 post-test percents, 16.67 percent difference) when compared to the children in the government school (pre- 72.43 and 88.30 post-test percent, 15.87 percent difference). However, the EGG at post-test had the highest percentage of children with correct answers.

The government school was situated in a middle class suburb whilst the private school was in a more affluent middle to upper class suburb. It is acknowledged that the potential effect of a NEP could be greater in schools situated in more deprived areas where children could have limited nutrition knowledge prior to an intervention (Lakshman, 2010). However, in the Durban Grade R study at baseline, the children in the government school achieved 1.60 percent more correct answers than those in the private school.

Research by Florence, Asbridge and Veugelers, (2008: 214) and Shah et al. (2010: 434) established that children in families of higher educational and socioeconomic standing will perform better than those from less wealthier backgrounds. Florence, Asbridge and Veugelers (2008: 214) and Zarnowiecki et al. (2011:1289) affirm that children from more affluent families are at an advantage with regard to the understanding of nutrition concepts as well as access and consumption of a healthful diet. The Durban study reinforced this fact, as the private school children had the highest percentage increase (17.17 percent) in correct answers although it did not differ vastly from the percentage increase (15.87 percent) in correct answers obtained by the children in the government school.

Regarding the FBDGs (Section one), post the intervention, the private school children (98.75 percent) had a higher percentage of children with correct answers (4.42 percent) than the government school children (94.33 percent). The opposite was noted in Section two where the EGG obtained 76.27 percent correct answers compared to 65.00 percent obtained by the EPG, a non-significant difference of 11.27 percent.

For the FBDGs (Section one), for the EGG, the most significant ($p=0.001$) increase in percentage of children with correct answers (35.10 percent) was in Q1.3 (playing outside everyday). In comparison, the children in the EPG had the most significant ($p=0.000$) increase in percentage of children with correct responses in Q1.3 (37.50 percent) as well as in Q1.1 (10 hours of sleep required at night) (32.50 percent). The EPG learners were also observed to have a significant ($p=0.05$) increase in percentage of children with correct answers in three additional questions: Q1.5 (must fruit be washed before eating) (10.00 percent), Q1.7 (will meat and fish give strong muscles) (12.50 percent) and Q1.9 (is milk, yoghurt, cheese needed for healthy bones and teeth) (32.50 percent). For the latter question, the children in the EGG also exhibited a significant ($p=0.05$) increase in percentage of children with correct answers (16.60 percent). In addition, in the EGG a significant ($p=0.05$) percentage increase (10.80 percent) of correct answers was observed for Q1.10 (must a child drink six glasses of water daily). Therefore, post the intervention in Section one relating to the FBDGs, the EPG had five questions where there was a significant increase in the percentage of children with correct answers in comparison to three questions in the EGG. This resulted in the EPG having the greatest number of correct responses (4.42 percent) when compared to the EGG in respect of the FBDGs.

The impact of the NEP on food group knowledge (Section two) was most evident in the EGG with a significant ($p=0.05$) increase in the percentage of children with correct answers in Section. However, it was in Q2.4 (Fat food group) that the most significant ($p=0.00$) increase in the percentage of children with correct answers was displayed for both the government and private school. Two questions in the EPG indicated a significant ($p=0.05$) increase in percentage of children with correct answers, namely, Q2.1 (Dairy food group) and Q2.3 (Protein-rich food group). In the EPG there was no change in the percentage of children with correct answers relating to the Vegetable and Fruit group (Q2.2). The majority (55.00 percent) of the EPG, after the intervention, still did not know which foods belonged to the Protein-rich food group (Q2.3) however there had been a significant ($p<0.05$) improvement in the percentage of children with correct answers (20.00 percent) since pre-test. A similar result occurred in the Oosthuizen study (2010: 124) for foods belonging to the Starchy food group.

6.6.4 Questions where there was no change in knowledge

In the present study, identical pre-and post-whole test results were identified in Q1.6, Q1.8 and Q2.2 indicating that there had been no increase or decrease in percentage of children with correct answers after the NEP. Moreover, the Grade R children had the highest percentage of correct answers with regard to these questions: washing hands before eating (Q1.6) (EGG 100.00 percent), consuming lots of sweets, cakes and biscuits is unhealthy (Q1.8) (EPG 95.00 percent) and identifying food items

belonging to the Vegetable and Fruit group (Q2.2) (EPG 92.50 percent). Oosthuizen (2010: 135) reported that sweets were identified by 86.40 percent of children in both the pre-and post-test as being a cause of tooth decay and should therefore be avoided. Contento et al. (1995: 357) acknowledged that information about what foods to avoid for a healthier diet is more relevant to people than what food items should be included in the diet.

6.6.5 Nutrition knowledge of the boys and the girls

Florence, Asbridge and Veugelers, (2008: 214) strongly believe that a child's gender impacts on academic performance and girls are more likely to perform better than boys. This is not convincing in this study as the performance of the girls and boys were very similar when comparing pre-and post-test results as in the case of a pilot study in the UK by Warren et al. (2003: 292). As there were no boys in the experimental private school group no comparisons could be drawn for the post-education knowledge of the boys in a private and government school.

At baseline, for the whole pre-test, the EGG boys had the highest percentage of correct answers (EGG 73.32) when compared to their female counterparts (EGG 71.47, EPG 70.83 and CG 67.33 percent). Similarly, in urban India boys were more knowledgeable than girls at baseline in a nutrition knowledge study by Shah et al. (2010: 430). However, post the NEP the results of the whole test established that the girl's nutrition knowledge increase in the two EGs (EGG 89.62 and EPG 87.50 percent) was marginally better than the group of boys (EGG 87.00 percent) confirming the findings of Florence, Asbridge and Veugelers (2008: 214). As a result of the intervention, in Section one on the FBDGs, marginally more girls gained a higher percentage of correct answers in the EGs (EGG 94.99 and EPG 98.75) than the boys (EGG 93.67). Regarding Section two, food group post-test knowledge, the EGG girls (78.88 percent) obtained a higher percentage of correct answers than the boys (73.66 percent) and the girls in the EPG (65.00 percent).

As detailed above, at pre-test all the girls in the study had very similar percentage of correct answers. However, the EGG girls achieved a slightly higher percentage correct answer than the girls in the other two groups (EPG and CG). After the NE, the whole test results established that the girls in the EGG obtained a marginally higher percent (2.12 percent) of correct answers than those in the EPG. Nevertheless, in Section one, post the intervention the EPG girls (98.75 percent) answered slightly more (3.76 percent) questions correctly than the EGG girls (94.99 percent). The contrary occurred in Section two where 78.88 percent of the EGG girls answered the questions correctly in comparison to 65.00 percent of the EPG girls, an insignificant difference of 13.88 percent.

6.6.6 The Control group

For the CG there was no NEP or interaction with the nutrition educator or researcher during the intervention period. The majority of children for the whole test answered a similar number of questions correctly in both the first and the second test with a minimal (2.32 percent) difference in the number of correct answers in the pre-and post-test (69.15 and 71.47 percent respectively). This difference is

similar to the CG results (1.30 percent) of the Boipatong study, reported by Oosthuizen (2010: 124). In addition, minimal difference between the CG pre-and-post tests also occurred in a pilot study conducted by Shariff et al. (2008).

6.7 CONCLUSION

The implementation of a preschool NEP, significantly increased immediate nutrition knowledge of children in a government and private school, situated in a suburban setting in Durban. There was minimal difference in the percentage of children in the EGG and EPG with correct answers and likewise a marginal difference between the boys and the girls with correct answers in the study. The children understood the information relating to the SA FBDGs (Vorster, 2001: S3) but some of the children had difficulty, post-intervention, understanding the classification of food groups. However, as a result of the NE the children did improve in the classification of foods according to nutrient-based food groups.

Young children do not have the inborn ability to make healthful food choices and therefore need to learn this skill through NE and understand the link between health and food habits. De Bourdeaudhuij (2010: 214) indicates that knowledge alone will not result in significant changes in the healthy behaviour of children with regard to choosing healthy food options. However, Contento et al. (1995: 291, 364) is of the opinion that successful NE is a continuous process of change where the individual is first made aware, and then needs to be motivated and given guidance to enable the change and maintain it, through a multifaceted approach. Therefore inclusion in the intervention of parental involvement, physical activity and the provision of healthy food choices at school can contribute to and increase the success of a programme.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

This chapter presents a summary of the baseline and intervention study: the objectives, limitations, and the main findings based on the analysis of the data, the conclusion and recommendations for future research.

There are multiple influences on a child's food choices and dietary behaviour. Five-to six-year old children are at an ideal age to learn what constitutes an optimal diet for a healthy lifestyle. At this early age food attitudes and habits are developed and are likely to form the basis of lifelong patterns. These become more difficult to change as the child grows older. Therefore, nutrition education (NE) is required as there is a relationship between nutrition knowledge, nutrition attitude and positive dietary behaviour. Ample research confirms that the school environment is the ideal setting for nutrition interventions.

7.2 OBJECTIVES

The purpose of the baseline study, conducted with Grade R educators in 20 urban schools in built-up areas of Durban, both government and private, was to determine the need for NE in Grade R and identify suitable age-appropriate nutrition education tools (NETs). The results identified the need for NE for this age group and the educational tools suggested by the Grade R educators were comparable to those developed by Oldewage-Theron and Napier (2011: 285) for use in pre-primary schools.

The intervention study that followed was to ascertain the impact of a NEP on the nutrition knowledge of Grade R learners in Durban in order to suggest to the Department of Basic Education (DBE) that the nutrition education programme (NEP) should be included in the pre-primary school education curriculum.

7.3 LIMITATIONS OF THE STUDY

A limitation of the study was that 10 participants did not complete both pre-and post-test. This resulted in the children being excluded from the study. The sample size (n=120) was therefore not as originally planned (n=130) and the findings can thus not be generalised to the wider population.

One aspect of the study was to compare the differences and similarities of nutrition knowledge of the boys and girls. In Durban, private schools are in the minority and not all are co-educational. The private school randomly selected as the experimental school comprised only girls. This could be viewed as a limitation although the girls (n=78) and the boys (n=42) in the study had similar knowledge pre-and post-test. The two co-educational schools (EGG and CG) in the study were evenly matched in respect of the number of boys to girls and the CG was a private school.

NO KZN DoE approval for the teachers' participation in the self-administered survey was sought. No parental/caregiver consent or child assent was requested as it was considered by the school to be part of the Grade R curriculum. The government school approved the nutrition education programme as part of the Life Orientation lessons for the Grade R's for 2010 which took place during the normal school lesson time. In addition, no invasive procedures were administered, nor were anthropometric, biochemical or blood measurements collected. Besides obtaining the age and gender of the participating children from the teacher for statistical purposes no other private information was obtained. No KZN DoE approval was sought for the government school participation in the study.

7.4 MAIN FINDINGS

7.4.1 Literature

In Chapter 2, the literature emphasised the importance of NE which can contribute to the improvement of dietary behaviour to prevent malnutrition, especially if NE commences at an early age. The Food and Agricultural Organisation (FAO) emphasises the need for effective NE to be firmly established in education and other government policies. Research has advocated 50 hours of NE per year for school-age children to effect positive dietary behavioural changes. Worldwide there is concern that too little time is dedicated to NE in school curricula as NE is often integrated into existing subjects as it is not a core subject. To increase the effectiveness of NE it is crucial that the educator has a basic comprehension of the nutritional aspects of food, human nutrition as well as the concepts of behaviour change. However, this knowledge is often lacking. Numerous NE studies have been conducted in schools, an ideal environment for the promotion of healthful dietary change especially when part of a multi-component intervention. The present study was a single component intervention of classroom education, with no other component included in the scope of this particular nutrition education study.

For young children in particular, family involvement in the NEP is beneficial. The literature iterates that a supportive environment needs to be created to enable a behavioural change to be maintained. To assist in dietary life-style changes a variety of learning experiences are advocated with interactive learning using quality educational tools recommended for NE. The knowledge and skills gained as a result of a NEP enable a child to make informed decisions. Furthermore, motivation is required to enhance health and the complexities of the near environment will impact on the decision making.

The literature reviewed in Chapter 3 posits that under-and overnutrition affects many children living in both urban and rural areas of South Africa (SA). There are many influences including individual, family, peer, community, societal and economic factors that have an impact on the eating behaviour of children and any one of these could be a reason for unhealthy dietary habits. The poor nutritional status of many children living in SA has been recognized by the Department of Health (DoH) and the DBE as an area of concern. Therefore various strategies have been identified to alleviate the problems of over- and undernutrition, with NE being one of them.

7.4.2 Baseline study

The results from the baseline study, discussed in Chapter 4, reflect that Grade R educators considered NE to be important for Grade R children in suburban areas of Durban. Nevertheless in both government and private schools there was a significant difference in the amount of time spent on this subject. The majority of educators devoted 30 minutes per week to NE and only one school spent two hours per week. The other extreme was also noted where a school covered nutrition only when it was linked to a weekly or monthly theme. Only two educators tried to instil good food habits at an early age and checked lunch-boxes daily to reinforce healthy eating which is commendable.

For NE to be beneficial age appropriate NETs must be used in the classroom. The Grade R educators in the baseline study identified role-playing, puzzles and activity books to be the three most effective NETs. Various studies found that activity-based learning experiences helped children understand food and nutrition concepts more easily. The Durban Grade R educators were of the opinion that nutrition games will enhance nutrition learning as activity-based NETs stimulate growth due to the application of the Multiple Intelligences theory. For education material to be attractive and stimulating for children the baseline study revealed that bright colours must be used and food items should be illustrated photographically. Research has revealed that NE materials need to be language and culturally appropriate for different communities. This was reiterated in the baseline study where the majority of educators advocated that materials should be in the home language of the child although the use of English together with the home language was also appropriate.

7.4.3 Existing nutrition knowledge assessed

Children in Grade R will have varying abilities and nutrition knowledge as a result of their age, ethnicity, socio-economic standing and child care.

The existing nutrition knowledge of the Grade R learners in a suburban government and private school was established through the use of a specifically developed nutrition knowledge questionnaire (NKQ). As a child's reading ability is limited in Grade R they might not have been able to recognize the names of food items and food groups. Each item and group was therefore verbally identified for the children. The illustrations of the food items in Section two of the NKQ were in black and white nevertheless Illustrations in colour may have aided the children in identifying the different foods more easily.

Generally, children from upper to middle class socioeconomic status (SES) attend private schools and middle to lower socioeconomic status children attend government schools. Generally children in the lower SES are found to make poor dietary decisions and therefore require nutrition education. However, the Grade R NKQ verified that prior to the nutrition education intervention the children from the private and government schools had very similar and fairly good nutrition knowledge with the experimental government group (EGG) being marginally more knowledgeable at baseline.

7.4.4 Intervention study

The literature discussed in Chapter 2 relating to NE interventions established that certain criteria need to be met when implementing a NEP. Neither a change in dietary behaviour or physical activity was in the scope of this study, only an increase in knowledge in Grade R in a private and government school. The Grade R nutrition intervention developed for the suburban schools in Durban aimed to increase knowledge of the SA FBDGs (Vorster, 2001: S3) and the food groups. In addition, the study relates to the Integrated Nutrition Programme (INP) 'to improve the nutritional status of the population, to prevent nutrition related diseases, and to improve the quality of life of people'.

An important aspect noted by various researchers and implemented in this study, was that the educator, who plays a crucial role, must be qualified to teach the age group and adequately trained for the NEP thereby contributing to the required confidence needed for implementing a NE intervention.

The literature expounds that classroom-based NE is significantly more successful than home-based learning. Therefore, using a school-based intervention coincides with other successful NE studies in different parts of the world. The Durban study was structured as an eight-week, eight-hour teacher-led, classroom-based nutrition intervention. Weekly one hour was set aside for NE in a non-threatening environment. Approximately 15 minutes was spent on the theory, 15 minutes on the related fun activities in the workbook, and the remainder of the time dedicated to the child's involvement with the nutrition educational games.

For information to be effectively imparted, research established that consideration must be given to the target audience as suitable educational resources for interactive learning are integral to the success of the programme. The NE used in the study was appropriate for the child's developmental stage and the method of delivery which was activity based. The baseline study results confirmed that the NE tools used for this intervention were suited to the Grade R children in suburban schools in Durban. The identical NE tools were used in a Grade R study in the Vaal region and in a primary school Boipatong study with the findings of the Durban study consistent with many of the findings reported from these studies.

7.4.5 Post-intervention results between the schools

The same NKQ used in the pre-test was used post-intervention to determine the impact of the NEP. In this study, the primary aim of formal NE was met as the statistically significant difference between the control group (CG) and experimental group (EG) post-test results was evident in the majority of Section one questions and in all questions in Section two. Each Grade R EGs showed an increase in knowledge for the whole test immediately after the intervention with the CG, achieving similar post-to pre-test results.

When comparing nutrition knowledge gained in the whole test by Grade R learners in the government and private experimental schools it was found to be very similar. This may be attributed to the NEP

being delivered to both groups by the same educator which eliminated any variations in delivery and style of teaching used during the implementation of the NEP. For the whole test, it was the EGG that achieved a marginally higher percentage of correct answers post-test than the experimental private group (EPG) with a significant post-test difference between CG and EGG. However, the private school children most probably benefited more from this intervention as they exhibited the greatest difference in the percentage of correct answers in pre-and post-test.

For the FBDG knowledge, assessed in Section one of the test, it was established that the EPG learners obtained the highest percent of correct answers. In contrast, the EGG obtained the highest percentage of correct post-test answers for food group knowledge (Section two),

There was a minimal difference in the percentage of correct answers for the pre-and post-test CG children's results due to these children not receiving any NE.

7.4.6 Gender-based results

Researchers propound that gender differences impact on academic performance. Girls generally do better academically and are found to be better listeners than boys. Relatively few studies have determined the differences between the sexes with regards to nutrition knowledge and the impact of a NEP in pre-primary school. In this Grade R study, gender-based nutrition knowledge differences were determined. Slightly more boys than girls answered the questions correctly in relation to the whole post-test. In Section two, relating to food group knowledge, somewhat more girls than boys answered the questions correctly although both genders lacked knowledge in relation to which foods belonged to a particular food group.

With regard to all the boys in the study, for the whole test, the pre-test percentage of correct answers for the two groups of boys (EGG and CG) was similar with evidence of greater knowledge in relation to the FBDGs than food group knowledge. Post the intervention, the boys in the EGG had a significant increase in food group knowledge. The whole-test percentage of correct answers for the CG boys remained similar at pre-and post-test.

When comparing the whole post-test percentage of correct answers for the girls only, the greatest improvement was observed in the EGG. However, there was an insignificant difference between the girls in the two EGs with regard to the percentage of correct answers achieved after the intervention. For FBDG knowledge, the girls in the EPG answered nearly all of the questions correctly with those in the EGG to a lesser extent in this regard. In contrast, with regard to food group knowledge, the percentage of girls in the EGG that answered correctly was greater than those in the EPG. The control group (CG) girls obtained the identical percentage of correct answers in both pre-and post-test.

7.5 CONCLUSION

The baseline study was effective in determining the need for a NEP in Grade R. The educators advocated NE at this age and endorsed the use of a variety of age appropriate NETs to create curiosity and eagerness amongst the Grade R learners.

Urban schools in built-up areas were used for the Durban baseline study and NEP which precludes the intervention results from being generalised to rural schools, where children come from dissimilar socioeconomic backgrounds.

This study showed that Grade Rs in a private and government school participating in an eight hour NEP with of a variety of fun NE activities had a statistically significant (EGG $p=0.004$ and EGG $p=0.001$) improvement in nutrition knowledge.

The literature emphasises that knowledge is the primary motivator of change in dietary practices. If there was sequential NE from Grade R through to Grade 12, children would derive even greater health benefits. In the long term, NE could contribute towards achieving nutritional healthy behaviour in adulthood through informed decisions.

NE is a necessity and numerous NE strategies are advocated by researchers as there are multiple influences affecting dietary behavioural change. Nevertheless, NE is a challenge as the educator assists in the enrichment of knowledge to increase awareness as the motivation to change comes from within only when the person wishes to improve their well-being.

7.6 RECOMMENDATIONS

As a result of this study, the following proposed recommendations are suggested for future school-based nutrition interventions.

7.6.1 Community/ schools

- Nutrition interventions starting in pre-primary school, especially in rural areas, are recommended to break the cycle of intergenerational malnutrition. It is recommended that a NEP programme of similar eight week or longer duration be conducted in the first half rather than the second half of the year to enable post-testing to occur in the latter part of the year to ascertain the retention of this knowledge over a longer period of time. However, programmes of a longer duration could have a greater impact on behavioural outcomes. Nevertheless, any benefit from a NEP, irrespective of its duration, will be limited if psychological and socioeconomic issues exist in a population and are not addressed in a holistic manner.

- Depending on the school resources, the inclusion of multimedia tools in a NEP is recommended to enhance the learning experience whilst allowing the children to have fun. Other strategies in a NEP can be implemented to improve food security such as school vegetable gardens.
- Incorporating a larger audience in a school NEP is highly recommended. An increase in parental and/or caregiver nutrition knowledge and a change in attitudes towards a healthier lifestyle can be of benefit to the entire community and not only the child.
- Lunch-box checks in the early Grades, especially in Grade R, should be part of a NEP. In addition, it is recommended that schools should have a food policy and have lunchbox rules to effect meaningful change in the lunchbox contents. Moreover, those schools involved in the School Feeding Programme (SFP) should monitor the quality and effectiveness of such programmes in promoting the child's wellbeing. A NEP combined with these initiatives may improve food security and enhance dietary behaviour.
- If a NEP is to compare the knowledge retention between boys and girls, it is recommended to select schools where there is a fairly equitable gender representation.
- The inclusion of a government school in the control could add value to the study
- The inclusion of a socio-economic questionnaire could provide information relating to the socio-economic differences between the children attending the private and government schools.

7.6.2 Policy makers

- It is proposed that the current school curriculum be reassessed by the DBE to give NE the necessary importance it requires in the curriculum, starting as early as Grade R. It is therefore recommended that NE is a separate subject and not a minor section of the Life Orientation (LO) curriculum. Nutrition-related activities should also be incorporated into other areas of learning. National government should instruct schools to spend a certain amount of time per week on NE to prevent the current variation observed in time allocated to nutrition. The literature recommends that incorporating NE into the school schedule rather than having it as an extra activity is recommended for greater success as the concentration levels of the children could be low at the end of a school day.
- The training of educators in NE and empowering them to be successful role models for the children is essential as children spend most of the day at school and need encouragement to make positive changes to dietary lifestyles.
- Policy makers should also consider funding appropriate NETs for schools as these are vital for teaching nutrition. It is recommended that school clusters share best practice in teaching nutrition to promote healthy eating to prevent malnutrition.
- Multi-component nutrition interventions are recommended as these could have a positive impact on nutrition programme outcomes. Therefore, the inclusion of one or more components should be considered: physical activity; family participation; community involvement and healthful food provision at school.
- Creating a healthy school environment can have an impact on the effectiveness of a NEP.

7.6.3 Further research

- As this intervention study was conducted in a suburban area, the results are not applicable to the rural setting in the KwaZulu-Natal (KZN) region. It is therefore recommended that a similar baseline survey is completed with educators in rural schools to ascertain the needs in this setting and whether a similar NEP could be used.
- Secondly, it is recommended that the acceptability, usefulness and effectiveness of each of the educational tools used in this study be tested separately to ascertain which one has the greatest impact on NE learning.
- There is minimal literature and nutrition education research on differences between preschool boys and girls. Therefore, gender differences in nutrition knowledge as well as attitude and behaviour could be explored further.

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ANNEXURE A

From: Susan Inge Vermeer
Sent: Wednesday, July 29, 2009 11:55 AM
To: svps@polka.co.za
Subject: Nutrition education questionnaire for Grade R
Attachments: Final__letter_to_schools_10 may_2009[1][1].doc;
_Preprimary_school_questionnaire_nutrition_education[1].doc

Dear Mrs Martin

Please could the attached questionnaire and letter be given to Mrs King for completion as I am assessing the nutrition tools used for Grade R pupils so that we can see what the need is and then in the future develop suitable materials.

Her assistance in this would be greatly appreciated. Please could it be faxed back to me on 031 373 2795 by early next week or emailed back whichever is easier.

Many thanks for your help.

Kind regards

Sue

Head of Department: Food and Nutrition Consumer Sciences
Faculty of Applied Sciences
Durban University of Technology
P.O. Box 1334, Durban, 4000
Tel: (031) 373 2323, Fax: 0866 741 366, suev@dut.ac.za

Annexure B



Nutrition educational material study questionnaire

Dear Grade R teacher

We are currently starting a research project as part of a Masters qualification and the aim of the study is to establish the need for nutritional educational materials for Grade R learners and to identify which educational tools would be the most effective in teaching nutrition education in order to develop materials for this age group. Similar research has been conducted in other provinces of South Africa which has resulted in the development of relevant tools.

Your name and contact details have been supplied to me by your school to enable me to gather information that ultimately will be of benefit to the Grade Rs.

Please could you assist me by completing the attached questionnaire which will take about 5 - 10 minutes of your time and return to me either via email or fax 031 – 373 2795 whichever is most convenient for you? The identity of the participating schools will be protected and neither your name nor that of the school will be divulged. The results will be presented to you and the participating schools at the end of this study.

I do appreciate your participation in this study which will benefit future learners.

Kind regards

Sue Vermeer



Tel. (031) 373-2326, Fax (031) 373-2795

Educators' questionnaire on nutrition education tools

10 May 2009

School name: _____

Which grade do you teach? _____

Please tick ✓ the answer you think is the correct one.

1.1 Do any of the preprimary school syllabi cover nutrition education?

Yes ☐

No ☐

1.2 If yes, which grades?

1.3 If yes, What tool/s do you use for nutrition education at the moment?

1.3 If no, has it ever been done in the past?

2. How much time is allocated for nutrition education in the grade that you teach?

Nothing ☐

30 minutes / week ☐

1 hour per week / week ☐

2 hours and more per week ☐

3.1 Do you think there is a need for nutrition education?

Yes ☐

No ☐

3.2 If yes, why do you think it is necessary for:

Pre-school children?

Primary school children?

4. What tool/s do you think would be effective in teaching nutrition education to the children in your class? (Tick all applicable options)

Card Games ☐

Board games ☐

Role playing ☐

Activity/colouring books ☐

Videos ☐

- Lectures ☐
- Pamphlets ☐
- Puzzles ☐
- Cross word puzzles/word searches ☐
- Other, specify.....

5. Which of the following do you think the children will enjoy the most when learning about nutrition?
(Tick all applicable options)

- Card Games ☐
- Board games ☐
- Role playing ☐
- Activity/colouring books ☐
- Videos ☐
- Lectures ☐
- Pamphlets ☐
- Puzzles ☐
- Cross word puzzles/word searches ☐
- Other, specify.....

6. Which of the following colours do you think the children would find more entertaining for nutrition education tools? (Tick all applicable options)

- Black and white ☐
- Bright colours ☐
- Pastel colours ☐

7. In your opinion, what do you think the children would find more understandable when showed food items?

- Photos ☐

Colour drawings ☐

Cartoons ☐

8. Should the nutrition education material be in the child's

Home language ☐

English ☐

Both ☐

9. Do you think that making use of nutrition games will enhance nutrition learning?

Yes ☐

No ☐

10. Is there any nutrition education tools/games that you know do not work for children?

Yes ☐

No ☐

If yes, could you please give more information?

Thank you very much for your help.

Sue Vermeer



Department of Food and Nutrition,
Tel. (031) 373-2326, Fax (031) 373-2795

Dear Principal

I am planning to do a nutrition education programme with Grade R children and am seeking permission for participation in this for one hour a week 8 week programme in the 3rd and 4th term, at a time to suit your school. Participation is voluntary.

A nutrition knowledge questionnaire will need to be answered by the learners prior to the start of the programme and on completion in order to assess the impact of the nutrition education programme.

The learning outcomes of this nutrition education programme are based on the SA Food-based Dietary Guidelines for the population older than 7 years. The outcomes are as follows:

1. Identify the 5 different food groups
2. Identify the 5 different colour vegetable and fruit groups
3. Know the importance of regular meals
4. Know to drink sufficient water each day
5. Understand why exercise is important for a healthy body
6. Understand the dangers of too many sweet foods
7. Understand the importance of good hygiene practices

Each learner will receive a 'Healthy Eating Activity Book' which the qualified foundation phase teacher, Sarah Vermeer, will work through with the children. The children will need crayons/roll ups for the lessons. During the lesson group activities will also take place. The learners will play card games, a board game and a food plate puzzle so that learning can take place while having fun. The games will become the property of the school on completion of the programme.

The nutrition education tools were developed and tested as a result of research conducted in Gauteng by nutrition educationalists. We wish to test these nutrition education materials in Durban in order to inform the Department of Education.

I do hope your school will be able to participate in this nutrition education programme for Grade R learners.

Kind regards

Sue Vermeer

Head of Department: Food and Nutrition Consumer Sciences
Faculty of Applied Science, Durban University of Technology

Annexure E

From: Tree Tops [treetops@dbn.stormnet.co.za]
Sent: Wednesday, September 22, 2010 12:21 PM
To: Susan Inge Vermeer
Subject: Re: Possible dates for Nutrition knowledge questionnaire for Grade Rs

Dear Sue,

These dates are fine!

Perhaps you should start administering The Questionnaire at about 8.15am on each day (to allow for 'stragglers').

Look forward to seeing you.

Regards,

Tree Tops School
Tel: 031 2017305
Fax: 031 2023272
Address: PO Box 50155
Musgrave
4062

----- Original Message -----

From: [Susan Inge Vermeer](#)

To: [Tree Tops](#)

Sent: Monday, September 20, 2010 10:50 PM

Subject: Possible dates for Nutrition knowledge questionnaire for Grade Rs

Hi Carolyn

It will be great to come back and see Tree tops again. Which campus would we come to?

If I am correct you have 3 grade R classes but we only need to do the testing with about 42 - 45 children max. We would need to work with half the children and then do it with the other half, one after the other. It takes less than half an hour per group. The children just need a pencil and an eraser per table. Please could no special nutrition education be given to the children because of us coming. They might have already had some nutrition education this year which is fine and it will be interesting to see what they have remembered. I will obviously share the results with you.

Please could we do the first testing if at all possible, on 8 October, Friday , usually 8am is a good time for the children as they are fresh. Then, the second testing, please could we do this on Friday, 12th November also starting at 8am or a little later if necessary.

At the second testing I will bring a variety of fruit for their snack time as a thank you. They might like to make a fruit salad.

Please let me know if these dates are suitable. Hope you all have a wonderful holiday.

Many thanks

Kind regards

Sue

Head of Department :Food and Nutrition Consumer Sciences
Faculty of Applied Sciences
Durban University of Technology
P.O. Box 1334, Durban, 4000
Tel: (031) 373 2323, Fax: 0866 741 366, suev@dut.ac.za

From: Tree Tops [treetops@dbn.stormnet.co.za]

Sent: Wednesday, September 01, 2010 1:45 PM

To: Susan Inge Vermeer

Subject: Re: Date change - Nutrition knowledge questionnaire for Grade Rs

Hi Sue,

Fine..... please contact me with a few dates that would be okay for you next term, (we return to school on the 4th October), and I will chat to the teacher and come back to you.

Regards,

Tree Tops School
Tel: 031 2017305
Fax: 031 2023272
Address: PO Box 50155
Musgrave
4062

----- Original Message -----

From: [Susan Inge Vermeer](#)

To: treetops@dbn.stormnet.co.za

Sent: Tuesday, August 31, 2010 1:01 PM

Subject: Date change - Nutrition knowledge questionnaire for Grade Rs

Dear Carolyn

If you are in agreement please could I change the dates until next term at a time convenient to the Grade R teacher.

Many thanks

Kind regards

Sue

Susan Inge Vermeer

From: Sonia Udal <sudal@dgc.co.za>
Sent: 28 May 2010 08:10 AM
To: Susan Inge Vermeer
Subject: RE: Nutrition education programme

Dear Sue

Les would be delighted for our Grade R girls to be involved in the nutrition programme – could we include both classes which would mean 46 girls in total (23 in each class)? Sarah can then contact Les directly when she's ready to plan towards the two terms ahead.

Have a lovely, cool weekend

Kind regards
Sonia

From: Susan Inge Vermeer [<mailto:suev@dut.ac.za>]
Sent: Thursday, May 27, 2010 2:20 PM
To: Sonia Udal
Subject: RE: Nutrition education programme

Dear Sonja

Thanks for the reply and hope Les will be in agreement.

Kind regards
Sue

From: Sonia Udal [<mailto:sudal@dgc.co.za>]
Sent: Thursday, May 27, 2010 1:23 PM
To: Susan Inge Vermeer
Subject: RE: Nutrition education programme

Dear Sue

My sincere apologies for the delay in getting back to you...am so, so busy at the moment. I would like the opportunity to chat to Les Deg in Grade R first regarding your request and will get back to you shortly thereafter. Am sure it will be no problem having Sarah here I just need to be sure of time availability etc from the teaching staff before committing.

Kind regards
Sonia

Susan Inge Vermeer

From: Penzance Pre-Primary School <penpre@mweb.co.za>
Sent: 08 September 2010 11:35 AM
To: Susan Inge Vermeer
Subject: RE: Nutrition education programme

That will be fine- just get her to give me a ring before the end of this term so we can plan it into next term! Thanks a mil!
KO

From: Susan Inge Vermeer [mailto:suev@dut.ac.za]
Sent: Wednesday, September 08, 2010 10:22 AM
To: Penzance Pre-Primary
Cc: Sarah ; Sarah Vermeer
Subject: FW: Nutrition education programme

Dear Kerry

This term has flown by and I hope you have not been too severely affected by the strike.

The nutrition questionnaire is now suitable for use after testing and changes made to make it more suitable for Grade R. Please could Sarah Vermeer organize dates with you or your staff for next term for both grade R classes for the following:

The pre test half an hour required per class.
Eight one hour lessons per class can have 2 in one week if necessary
The post test – identical to the pretest – half an hour per class.

I did ask Sarah only to start with this in the 2nd week of the 4th term. Her cell no: 072 203 2284. My cell 082 82 100 47

Looking forward to meeting you and the children.

Many thanks
Kind regards
Sue
Mrs Sue Vermeer
Head of Department :Food and Nutrition Consumer Sciences
Faculty of Applied Sciences
Durban University of Technology
P.O. Box 1334, Durban, 4000
Tel: (031) 373 2323, Fax: 0866 741 366, suev@dut.ac.za

From: Susan Inge Vermeer
Sent: Tuesday, May 25, 2010 11:22 AM
To: 'penpre@mweb.co.za'
Subject: Nutrition education programme

Dear Kerry

Thank you for your interest in the nutrition education programme which would involve all Grade R learners. This programme requires 8 lessons with one hour per lesson to be delivered in the 3rd and 4th term, at a time to suit your school. The nutrition education tools were developed and tested as a result of research

conducted in Gauteng by nutrition educationalists. We wish to test these nutrition education materials in Durban. The programme will be conducted by Sarah Vermeer, a qualified foundation phase school teacher.

A nutrition knowledge questionnaire will need to be answered by the learners prior to the start of the programme and on completion in order to assess the impact of the nutrition education programme.

The learning outcomes of this nutrition education programme are based on the SA Paediatric food- based dietary guidelines for children between the ages of 1 to 7 years old which were introduced in 2003.

The outcomes for the programme are as follows:

1. Identify the 5 different food groups
2. Identify the 5 different colour vegetable and fruit groups
3. Know the importance of regular meals
4. Know to drink sufficient water each day
5. Understand why exercise is important for a healthy body
6. Understand the dangers of too many sweet foods
7. Understand the importance of good hygiene practices

Each learner will receive a 'Healthy Eating Activity Book' which Sarah will work through with the children. The children will need crayons/ rollups for the lessons. During the lesson group activities will also take place. The learners will play card games, a board game and a food plate puzzle so that learning can take place while having fun. The games will become the property of the school on completion of the programme.

Please let me know if you are willing to allow the Grade R learners to participate in this education programme and let me know the number of learners in Grade R.

Sarah will contact you to make the necessary arrangements for times and dates for the testing and the education programme. Her contact details are: 072 203 2284. I will also attend a number of the sessions. If you have any queries please do not hesitate to contact me on (031) 373 2323 or on 082 82 100 47.

Thank you for your support in this nutrition education programme for Grade R learners.

Kind regards

Sue

Mrs Sue Vermeer
Head of Department :Food and Nutrition Consumer Sciences
Faculty of Applied Sciences
Durban University of Technology
P.O. Box 1334, Durban, 4000
Tel: (031) 373 2323, Fax: 0866 741 366, suev@dut.ac.za

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Department of Food and Nutrition,

Tel. (031) 373-2326, Fax (031) 373-2795

NUTRITION KNOWLEDGE QUESTIONNAIRE

Pre-school children

Information





















This questionnaire is to be completed by the pre-school children in Grade R and it will test their current nutrition knowledge and healthy eating habits. The answers to these questions will be kept strictly confidential and the information will not be identifiable from any reports or publications.

Instructions

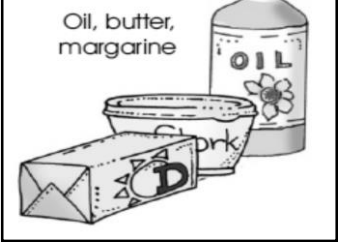
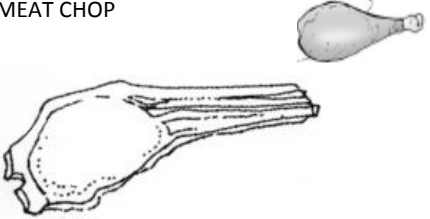
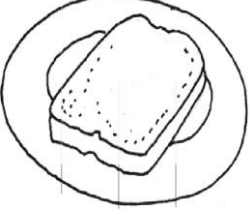
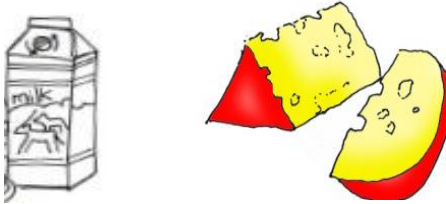

- The children will be in groups of 5 or 6 with a teacher/ field worker who will ask the questions and request the children to respond on the answer sheet **without copying each other's work and shouting out the answer**. The children should use a pencil and can share an eraser.
- **PLEASE CHECK THAT THE CHILDREN ANSWER ALL THE QUESTIONS.**
- Question 1: Explain to the children that on the answer sheet they will draw in a smile on the face to make a HAPPY face if the answer to the question is YES or make a SAD face if the answer is NO.
- Question 2: Firstly go through all the pictures on the answer sheet with the children. Then instruct them to put their pencils on No. 1- Dairy Foods and they must draw a line to the food that belongs to that group. Continue with No. 2-Vegetable and Fruit group and so on.

Thank you.

1. If the answer is YES, you must draw a HAPPY face. If the answer is NO, you must draw a SAD face.

1. QUESTIONS	ANSWERS	
1. Does a child need to sleep for 10 hours at night for a healthy body?	Yes 	No 
2. Must a child eat 5 fruit and vegetables every day to be healthy?	Yes 	No 
3. Should you play outside every day to stay healthy?	Yes 	No 
4. Does a child need to eat different types of food to be healthy?	Yes 	No 
5. Must fruit be washed before you eat it?	Yes 	No 
6. Must you wash your hands before you eat?	Yes 	No 
7. If you eat meat and fish will it give you strong muscles ?	Yes 	No 
8. Is it healthy to eat LOTS of sweets, cakes and biscuits every day?	Yes 	No 
9. Do you need to have milk, yoghurt or cheese every day for healthy bones and teeth ?	Yes 	No 
10. Must a child drink 6 glasses of water every day?	Yes 	No 

2. Go through all the pictures with the children. Match up the food group with the correct food picture. Draw a line from the food group to the picture of the food that belongs to that group.

FOOD GROUP	FOOD ITEM
<p>1.</p> <p>DAIRY GROUP</p>	
<p>2.</p> <p>VEGETABLE AND FRUIT GROUP</p>	<p>MEAT CHOP</p>  <p>CHICKEN DRUMSTICK</p>
<p>3.</p> <p>PROTEIN GROUP</p>	 <p>BREAD</p>
<p>4.</p> <p>FAT GROUP</p>	 <p>MILK</p> <p>CHEESE</p>
<p>5.</p> <p>STARCHY/ CARBOHYDRATE GROUP</p>	<p>ORANGES</p>  <p>CARROTS</p>

NUTRITION KNOWLEDGE ANSWER SHEET

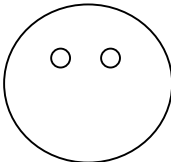
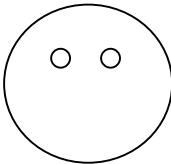
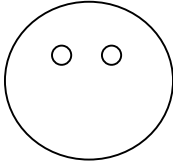
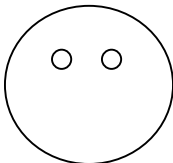
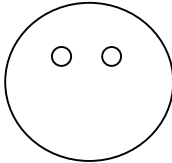
Participant's name:.....

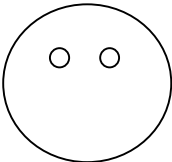
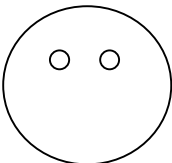
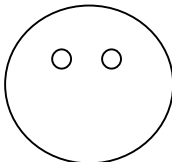
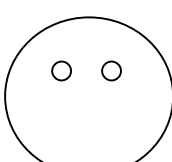
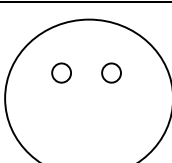
Date of birth: Sex :.....

School:

Completion Date:

2. If the answer is YES, you must draw a HAPPY face. If the answer is NO, you must draw a SAD face.

QUESTION NUMBER	ANSWERS
1.	
2.	
3.	
4.	
5.	

6.	
7.	
8.	
9.	
10.	

Game rules for pre-school children



Memory card game

Objective: The objective of this game is for memory development and to introduce a variety of foods into the diet

Game rules:

The player gets the pack of cards, each pack of cards has two packs in it.

Players can look at their cards and match the picture card with the alphabet card starting with the same letter of the alphabet.

The players must complete the whole alphabet matching the picture cards to the letter of the alphabet.



The good for you match the cards - card game

Objective: The objective of this game is to introduce the learners to “good for you” and “not so good for you” foods and activities.

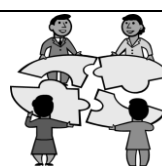
Game rules:

In this game the learners will play with the picture cards only and not the alphabet cards.

Take the “good for you” and “not so good for you” cards out of the pack and put it next to each other on the table

The learner then takes the pack of picture cards and matches each card to the card indicating “good for you” or the card marked “not so good for you”.

The game is completed when all the cards are matched to the correct category.



Food group puzzle

Objective: The objective of this game is to teach learners how to combine a plate of food making use of all the food groups to ensure a balanced meal

Game rules:

The objective of the puzzle game is to build as many meals from the different puzzle pieces.

The learner should build a plate of food consisting of all the food groups, meals could be for breakfast, lunch or dinner.

All the meals build are only correct when all five food groups are present at the end.



Board game

Objective: The objective of the game is to show the learners that it is good for you to practise healthy eating, activity and hygiene habits.

Game rules:

Two to four players can play this game.

Each player chooses a colour disk that he/she will use for the game to indicate his/her movement.

Throw the dice to decide which player shall commence the game; the player who has the highest score takes the first turn.

The game commences by each player in turn throwing the dice and moving the disk the number of blocks forward.

A throw that brings a player to a square in which the activity indicates that the player should move forward because of a good habit that player can move his/her disk to the block indicated and then wait for his/her next turn.

A throw that brings a player to a square in which the activity requires him/her to move back to a square to which the arrow is pointing because of a bad habit should move backwards and wait for his/her next turn.

The winner is the player who first reaches the winner square.