IMPLEMENTATION OF THE SCHOOL NUTRITION PROGRAMME IN SELECTED HIGH SCHOOLS IN KWAZULU-NATAL PROVINCE: IMPLICATIONS ON LEARNERS' NUTRITION EDUCATION

BY

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(201615063)

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PROMOTER: PROF COSMAS MAPHOSA

DECLARATION

I, Tafirenyika Mafugu, hereby solemnly declare that, to the best of my knowledge and belief, the thesis entitled: “Implementation of the School Nutrition Programme in Selected High Schools in KwaZulu-Natal Province: Implications for Learners’ Nutritional Education,” is my original work. It has not been submitted to any other institution of higher learning for the awarding of a degree or qualification. In instances where I have made use of either published or unpublished work of other scholars, I have acknowledged the sources, both in the text and in the list of references appended to the thesis.

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ABSTRACT

The study sought to: examine training, monitoring and support provided to NSNP stakeholders; establish what informs the procurement and preparation of the food; determine its nutritional value; identify challenges encountered in the implementation of the school nutritrition programme; and evaluate the implications of the NSNP on learners' nutritional education in Pinetown district in South Africa. Underpinned by the pragmatic research paradigm, the study followed a mixed methods research approach which utilised a convergent parallel research design. A random sample of 108 learners and purposive samples of 32 different stakeholders participated in the study. Descriptive and inferential statistics were used to analyse quantitative data, while qualitative data were categorised into themes which were presented in tables and text. The two forms of data were merged at the interpretation phase through triangulation of results. The study found that some of the key stakeholders of NSNP were not adequately supported and trained, and that monitoring was only done regularly by the teacher coordinators. District field officers lacked adequate expertise to train stakeholders. Food was prepared following a menu which was not updated in some schools, and food handlers in two schools could not understand quantities on the menu. The suppliers used the menu for procurement of food. The observed mean intakes per child per day for energy, protein, total fat, cholesterol, dietary fibre, vitamin K and sodium were significantly lower than the expected mean nutrient intakes, while the intakes of all other nutrients were not significantly different statistically, from the expected nutrient intakes. The intakes of all nutrients were below the minimum of 30% of RDA which was recommended by the Department of Basic Education. Fruits were rarely supplied. Nutritional education was not adequately taught across the curriculum and most respondents were not aware of basic nutritional principles. Training stakeholders and early payment of the suppliers could significantly improve learners' benefit from the programme. The study's proposed framework of implementation of the school nutrition programme recommends ways to improve the implementation process, including the incorporation of nutrition education into the Life Orientation curriculum to enhance good food choices that curb prevalent nutrient disorders among South Africans.

DEDICATION

The doctoral study is dedicated to my three daughters, Tatenda, Tariro and Tapiwa who were supportive when I was overloaded with work. They gave me all the space to study and sometimes typed for me. The thesis is also dedicated to Doctor Mukumba Patrick who gave me the confidence and inspiration to engage in the study.

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LIST OF ACRONYMS AND ABBREVIATIONS

AI	Adequate intake level for nutrients
CESD	Centre of epidemiologic Studies Depression Scale
DIC	District Implementation Committee
EAR	Estimated average requirement
GSFP	Ghana School Feeding Programme
HGSF	Home-grown school feeding programme
NAFCO	National Food Buffer Stock Company
NSNP	National School Nutrition Programme
PNAE	Programa Nacional de Alimentação Escolar (National school feeding programme of Brazil)
RDA	Recommended Dietary Allowances
SDEV	Standard Deviation
SIC	School Implementation Committee
SPSS	Statistical Package for Social Sciences
TMIS	Task Management Index Scale
UL	Upper intake level for nutrients
USA	United States of America
USDA	United States Department of Agriculture
USDHHS	United states department of health and human services
WHO	World Health Organisation

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CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The chapter focuses on the background to the study, statement of the problem, research questions, research objectives, significance of the study, research methodology, delimitation and definition of terms. It also gives an outline of all chapters to be covered in the study, as well as a summary of the chapter.

1.2 BACKGROUND TO THE PROBLEM

Approximately 368 million children in the world, from pre-school to secondary school levels, receive food at school every day (World Food Programme, 2016). World Food Programme provides meals to more than 20 million children every year (World Food Programme, 2016). In countries with the highest poverty rates, the school meal is the only regular nutritious meal that the child receives but few children benefit from school meals due to lack of funding for the school feeding programmes (World Food Programme, 2016). School meals improve attendance in schools, promote the health of children so that the children develop into productive adults, and help children to focus on their studies (Darko, 2014; World Food Programme, 2016). The fact that some learners in these poverty stricken countries do not access school meals is unfortunate considering the benefits that derive from such feeding programmes. In very poor countries, the school meal is the only regular nutritious meal that the child receives (World Food Programme, 2016).

Since 1983, Finland provided a free meal to all students in schools and in sixth form colleges. The meal provided 33 percent of the learners' daily food requirements and the food was funded by the Ministry of Social Affairs and Health (Roos, Lean & Anderson, 2002). Each municipality was responsible for procurement of meals and received about 70 percent subsidy of the costs from the Government (Ministry of Social Affairs and Health Finland, 2005). Meals were provided by the municipality council or by a private catering company where children served and returned the food trays themselves (Harper, Wood and Mitchell, 2008). Currently, the challenge in

the feeding programme in Finland includes the need to reduce high calorie foods to curb obesity and overweight (Aliyar, Gelli & Hamdani, 2015).

According to Hayes and Berdan (2013), schools in the United States of America (USA) provide breakfast, lunches, snacks and sometimes supper meals. The school feeding programmes have been available since 1800. The meals follow the American dietary guidelines, and most of the programmes are funded by the United States Department of Agriculture (Hayes & Berdan, 2013). The objectives of the school feeding programmes are to provide meals to learners from poor families, to fill the gaps of various nutrient deficiencies, to promote healthy weight, and to make learners alert in class and improve their performance (Hayes & Berdan, 2013).

The school nutrition programmes in USA includes seven major programmes which are school breakfast programme, national school lunch programme, special milk programme, fresh fruit and vegetable programme, after school snack programme, after school supper programme, and summer food service programme (Hayes & Berdan, 2013). The programmes are available to all the fifty states in the USA and they assist children from low income households. The programmes are managed by local districts in collaboration with state departments of education or agriculture.

The national school lunch programme was signed into law in 1946 by President Harry Truman after discovering that most men were underweight (Hayes & Berdan, 2013 and Texas Department of Agriculture, 2016). It provides nutritious free or low cost lunches to more than 3 million Texas children in public and private schools, as well as child care institutions (Texas Department of Agriculture, 2016). Food research and action centre (2015) indicates that 21.5 million children received free and reduced price lunch in America during the 2012-2013 school years. The centre also indicates that in 2014, more than 48.1 million Americans were struggling with hunger.

The school breakfast began in 1966 and in the 2014-2015 school years, 11.8 million children received free or reduced price breakfast (Hayes & Berdan, 2013; Food Research and Action Centre, 2015). The after-school snack programme provided food to children who had regular, organised and monitored activities, whereas, the after-school supper provided evening meal to children in the low income group (Food

Research and Action Centre, 2015). Summer feeding programme provided food to low income children on school holidays as they could not get the school lunch as well as breakfast (Texas Department of Agriculture, 2016).

According to Hayes and Berdan (2013), school feeding programmes were affected by limited budget and taste preference by some learners who could not eat some meals because they were not appealing to them. Moreover, small portion sizes were sometimes served.

Brazil has fulfilled the commitment of Millennium Development Goal 1,which was to 'eradicate extreme poverty and hunger' between 1990 and 2015 (Bundy, Woolnough, Burbano & Drake, 2016). Over the past 10 years, about 20 million Brazilian people have been relieved from the condition of absolute poverty through comprehensive strategies and programmes which promoted food and nutrition security. An example is the school feeding programme which is a central pillar in the Zero Hunger Strategy (Bundy et al., 2016). In 2014, the 'Programa Nacional de Alimentação Escolar (PNAE) — the National School Feeding programme' reached 42 333 722 school children making the PNAE the second largest programme in the world behind India (Bundy et al., 2016).

School feeding was first introduced in the early 1940s when the Institute of Nutrition proposed to the Federal Government to provide food in schools (Bundy et al., 2016). The name was changed from the School Meals Campaign in 1955 to the National School Lunch Campaign in 1956, which was modified again to the National School Feeding Campaign in 1965 (Bundy et al., 2016). The National Institute for Food and Nutrition was created in 1972 to administer the programme and was attached to the Ministry of Health. It was a highly centralised programme where the States and municipalities were responsible only for storage and delivery of foodstuffs to schools. In 1979, the programme was given its current name the 'Programa Nacional de Alimentação Escolar (PNAE) — the National School Feeding programme' and is Brazil's oldest ongoing food programme (Bundy et al., 2016).

Otsuki and Arce (2007) assert that the school feeding programme in Brazil aims to reduce malnutrition among school children and increase school enrolment, to

provide healthy good quality food, and to provide nutrition education. The programme had a budget US$ 1,1 billion to feed about 41 million students in public schools in 165 thousand public schools in 2008 (Otsuki, 2011). The school feeding programme aimed to provide 20 per cent of the individual daily nutritional needs for the 200 learning days in 2008 (Otsuki, 2011).

According to Otsuki (2011), from 1955 to 1974, the school feeding programme in Brazil relied on international donations. Between 1974 and 1994 the programme was no longer dependent on international donations but on the Brazilian government's own budget, and it was centralised (Otsuki, 2011). The central government procured food for schools and the food was stored in central warehouses at both the federal and state levels, from where it was distributed to schools (Otsuki, 2013). The food was often spoiled before it was distributed to schools (Otsuki, 2013). A transition from centralisation to full decentralisation was done in 1997 when resources were transferred from the central government to municipalities, with allocations made according to their number of students in public schools (Otsuki, 2011: Otsuki, 2013). Local authorities were now procuring food for public schools (Otsuki, 2013). Local governments were required to spend seventy percent of the money on basic food and most of the food was to be purchased from local producers. Nutritional guidelines were provided.

Brazilian school feeding programme (PNAE) is administered by a central government, 26 states and federal districts, and 5564 municipalities (Otsuki, 2011). Municipalities in brazil have their own school feeding committees which consists of the municipality and state secretaries of education, town councillors and representatives from the parents and teachers' associations (Medeiros, Lima, de Almeida Maffi, de Lima Abadia, Martins, Dalamaria & Ramalho**,** 2015; Otsuki, 2011). The function of the school feeding committee was to provide a financial account and a final report of the school nutrition programme, and failure to provide an account would result in suspension from further allocation (Medeiros et al., 2015). The school feeding committees are also responsible for food procurement and ensuring that the menus are in accordance with the learners' and their parents' needs (Medeiros et al., 2015). Furthermore, school feeding committees had to monitor the quality of school meals and assist in the development of school lunch menus. They also notify the

executive of any problems they encounter, notify the FDNE or other control bodies in case the executing entity fails to comply with legal requirements in the use of school nutrition programme funds (Otsuki, 2011).

In developed municipalities in the south and southeast Brazil, fresh vegetables and fruits were included in the menus and about 15 to 30 percent of nutrient intake was to be provided using local fruits, fresh vegetables and meat from local farmers (Medeiros et al., 2015 & Otsuki, 2013). The PDNE purchased a variety of food from the locals to promote the local culture as well as good eating habits. In 2009, a new law came into effect and every municipality in Brazil was to spend 30 percent of its financial resources on purchasing produce from family farms (African Union, 2015, Otsuki, 2011; Otsuki, 2013). This created a viable market for family farms. The municipal market now employs nutritionists who assist schools to develop menus. Otsuki (2013) highlights that the Zero Hunger Action Programme nominates over 30 municipalities each year and provide incentives to improve school meals. In 2006, under President Lula da Silva, the National Food Security and the Nutrition Programme started to promote the idea of having adequate quantity of good quality food (Otsuki, 2013). The central government only monitors the financial operations and the school feeding committees' compliance with the federal guidelines .

The school feeding programme is implemented by the School Feeding Committee which is formed by each municipality or state government. The money for the programme is transferred from the National Fund for Development of Education to the local governments in ten instalments per year (Otsuki, 2013).

Chatterjee (2016) asserts that the zero hunger programme in Brazil decreased hunger among learners but the problem of overweight and obesity began. Children refused to eat some fruits and vegetables (Chatterjee, 2016). Due to these problems, nutrition and nutrition education became critical areas in the implementation of the school nutrition programmes. Sidaner, Balaban and Burlandy (2013) observed that national standards regarding menu composition have not yet been met, and small scale-farmers were not able to meet the demand for their products. Brazil has a successful home-grown school feeding programme (Otsuki, 2013). HGSF offers many benefits, especially for low-income countries that are in the period of transition

from a donor based programme to the programme financed and implemented by the national budget (African Union, 2015).

As Brazil has more than 50 years of experience in school feeding, it is now playing an important role of sharing lessons learned and best practices with other countries (Bundy et al., 2016). Many African countries have had study visits to Brazil to check on how Brazil implements its school feeding programme so as to adopt some of the strategies when they implement the feeding programmes in their own home countries (African Union, 2015). In Sub-Saharan Africa, among low and middle-income countries, food programmes are usually available only in certain geographical locations where problems such as conflicts, food insecurity, low enrollment rates or a combination of factors have been identified (African Union, 2015). Sometimes the food programmes fail to provide food significantly in areas with intensive hunger and poverty and the countries concerned need to improve the their feeding programmes in such areas (African Union, 2015).

Gelli, Neeser and Drake (2010) note that small-scale farmers in sub-Saharan Africa lack modern farming techniques. The farmers are unable to sell their produce in markets and they sometimes do not have transport to carry their produce to these markets. Their potential markets are school feeding programmes.

Ghana School feeding programme aims at reducing hunger and malnutrition, increasing school enrolment, attendance and retention, as well as to increase domestic food production (Aliyar, Gelli & Hamdani, 2015). In Ghana, Catholic Relief Services (CRS) and World Food Programme have been responsible for school feeding programmes since 1958 (Aliyar, Gelli & Hamdani, 2015). Food used in the school feeding programme was imported from United States food surpluses.

In 2004, Ghana developed its own national school feeding programme which used local produce to provide hot meals to school children in the poorest communities (Aliyar, Gelli & Hamdani, 2015; Commandeur, 2013). The African Union, 2015 indicates that the World Food Programme complements the school feeding programme in Ghana by connecting small-scale farmers to the school caterers. In 2005, the World Food Programme started to buy corn, salt and palm oil from local

communities (Aliyar, Gelli & Hamdani, 2015). The Ministry of Local Government and Rural Development collaborates with the Ministry of Food and Agriculture, the Ministry of Finance, the Ministry of Health, the Ministry of Women and Children's Affairs, the Ministry of Education, and the Ghana Education Service, in the implementation of the school feeding programme at national level (Afoakwa, 2010; Commandeur, 2013). The District Implementation Committee (DIC) is responsible for procurement of food and ensuring the proper running of the programme (Afoakwa, 2010; Buhl, 2010; Commandeur, 2013). The School Implementation Committee (SIC) ensures that food is provided to learners (Karg, Ekpe, & Abu, 2015). The menu composition is variable across Ghana relative to the time of year. The feeding programme targets to buy 80 percent of the learners' food from smallholder farmers (Aliyar, Gelli & Hamdani, 2015; Karg, Ekpe, & Abu, 2015).

A study carried out in Ghana by the World Food Programme (2007) indicates that there was no control or checks on the quality and safety of food served in Ghana school feeding programme. Okae-Adjei, Akuffo and Amartei (2016) observed the lack of personal hygiene among caterers. Low quality and quantity of food in Ghana school feeding programme was observed in the studies by Sulemana, Ngah, and Majid (2013), Darko (2014) and Okae-Adjei, Akuffo and Amartei (2016). Sulemana, Ngah and Majid (2013) also observed that suppliers and cooks were not paid on time in the schools in their study. Adumanu and Ayaast primary schools did not provide vitamin and iodine supplements to support learners in meeting their nutritional needs (Darko, 2014). Moreover, the two schools did not have a deworming programme. Conversely, a different study that involved schools in Akuapem North Municipality in Ghana showed that deworming was done once per term (Okae-Adjei, Akuffo & Amartei, 2016). Ineffective monitoring was also observed as a challenge among the schools in the North Municipality (Okae-Adjei, Akuffo & Amartei, 2016). Another study of the school feeding programme in Northern Ghana revealed that school food was not bought from local farmers (Sulemana, Ngah & Majid, 2013). Home-Grown School Feeding (HGSF) is a programme that is being adopted by some countries to provide solutions to short-term hunger in schools while providing a closer market for agricultural products to rural local families (African Union, 2015). Food processors and school cooks also benefit from the programme. In instances where the

programme incorporates nutrition education, households also benefit from the information (African Union, 2015).

World Food Programme (2007) observed that the school cooks and caterers were not checked for communicable diseases and hence, could easily spread infections to learners. The study also highlighted the issue of inadequate funding compromising the quality of food provided. Several studies revealed the absence of infrastructure (World Food Programme, 2007; Sulemana, Ngah & Majid, 2013; Okae-Adjei, Akuffo & Amartei, 2016). Sulemana, Ngah and Majid (2013) noted that, in some schools, food was cooked under the trees
. That compromised the hygiene of the food cooked and served to learners.

In 2012, the school feeding programme was implemented in Mali to 166 poorest municipalities with 651 schools and 229540 learners (Commandeur, 2013). Cereals, beans and oil were provided by the government while vegetables, groundnuts, spices, dried fish were supplied by parents (Commandeur, 2013; Maijers & Nalla, 2014). The municipality bought fifty percent of the foodstuffs from small scale farmers and the rest from selected traders and the School Meal Committee was in charge of storage, cooking and serving learners (Commandeur, 2013; Maijers & Nalla, 2014). Mali used the “school canteen” model where canteens were set up by schools to prepare and supply food to learners. Each school canteen had a committee “Comites de Gestion Scholares” which consisted of representatives from the community and the school.

The United States Department of Agriculture (2010) reports a number of challenges in the school feeding programme in Mali. One of the major problems is lack of funding which results in the programme relying on donations from parents. The donations could be in the form of cash, equipment or produce from their small farms. This results in small-scale farmers’ loss of income from their produce. Moreover, farmers may not have enough to donate as they struggle to produce their own food due to poor rainfall patterns, lack of technology, inaccessibility to loans to purchase raw materials and poor soil types. The United States Department of Agriculture (2010) also indicate that there was no training on food safety and quality and there were no guidelines on food safety. Furthermore, management and monitoring of the

programme was poor since there were no policy guidelines to guide the implementers.

In Kenya, schools purchase the food from selected suppliers and hired cooks. The "school model" is used in the Home Grown School Meals Program (HGSM) whereby schools are responsible for procurement of foodstuffs and other goods and services used in preparation and supply of meals to pupils. Schools use a public procurement process, which involves a competitive bidding process (Commandeur, 2013).

It has been observed that in some cases, School Feeding Programmes have led to school children being fed less at home as some parents view the School Feeding Programme as a replacement of home feeding; yet it is meant to complement the child's home diet (Aliyar, Gelli & Hamdani, 2015). The United States Department of Agriculture (2010) reported that implementation of the nutritional programme was not adequately done. The same department also noted that farmers lacked the capacity to diversify and increase production to meet the demand of the school nutrition programme. Due to the rainfall pattern, crops were only grown seasonally, resulting in food being procured from large scale farmers who had the capacity to use irrigation.

1.2.1 School feeding programme in South Africa

The white paper on reconstruction and development discussed in parliament on 15 November 1994 sought to address problems of poverty and inequality (Kallman, 2005). The NSNP was introduced by the government of South Africa in 1994 under the Presidency of Nelson Mandela. Department of Basic Education (2009) and the Department of Basic Education (2016) indicate that the National School Nutrition Programme aims to reduce short-term hunger, address certain micronutrient deficiencies and improve attendance as well as alertness among learners in class, by providing one meal at school per day. In addition, the programme promotes the establishment of school food gardens and nutrition education among learners and the community. Providing meals at school may have a significant impact on the nutritional status and achievement of a learner. The programme was initially introduced in primary schools, and later in secondary schools in quintiles 1, 2 and 3

in public schools in poor communities (Department of Basic Education, 2009; Lacey, 2012). The quintile system is a grouping of schools according to the severity of poverty in a geographical area with the poorest being in quintile 1 and the school in rich geographical areas like low density suburbs being in quintile 5. Targeting of schools for the school feeding programme was also based on nutritional status of the learners. According to Buhl (2010), there was a great need to meet the nutritional needs of children in poor communities. Moreover, the school nutritional programme also aimed at imparting knowledge and skills to learners through the introduction of school gardens that were intended to supplement micro-nutrients and assist learners to sustain a living even in their homes (Department of Basic Education, 2014; Lacey, 2012). Furthermore, Lacey (2012) also highlights that the NSNP had the objective of developing and strengthening partnerships to support the programme. According to Msila (2013), school garden projects are increasing in South Africa. This assertion needs more evidence since Msila's (2013) study conclusions emanated from the observations made only in some Eastern Cape Schools.

The NSNP was among the programmes meant to address the issues of poverty and inequality in education. The constitutional rights that are addressed by the NSNP are the right of access to sufficient food; section 27 (1), (b) the right to basic nutrition section 28 (1), and (c) the right to basic education; section 29(1) (a) (Kallman, 2005; Lacey, 2012).

Department of Basic Education (2009; 2016) indicates that the National School Nutrition Programme aims to reduce short-term hunger, address certain micronutrient deficiencies and improve attendance as well as alertness among learners in class. According to Lacey (2012), the NSNP aims to assist children in poorest communities by eliminating poverty, upholding the rights of children to basic food, and by enhancing learning through providing good, nutritious meals. In addition, the programme has the objective of promoting the establishment of school food gardens and nutrition education among learners and the community. The introduction of the NSNP was an important step since a large proportion of South African citizens live in poverty where there are huge problems of malnutrition as well as micronutrient deficiency (Caraher & Coveney, 2016; Lacey, 2012; Department of Basic Education, 2009). Providing meals and nutritional education at school may

have a significant impact on the nutritional status and achievement of a learner. The programme was initially introduced in primary schools, and later in public secondary schools within quintiles 1, 2 and 3 (poorest primary and secondary schools) (Lacey, 2012; Department of Basic Education, 2009). According to Lacey (2012), the NSNP covers about sixty percent of primary and secondary schools.

The National Department of Education receives a conditional grant from the National Treasury, which is distributed to provinces in terms of Division of Revenue Act 5 of 2004 (Lacey, 2012; Kallman, 2005). According to the act, the provinces must comply with minimum norms and standards determined by the government decision of 23/01/02 and the implementation guidelines of the national department with regards to approved menus, nutrition quality and quantity and food safety (Kallman, 2005). Provinces must report quarterly to national treasury. Monitoring visits must report on nutrition quality, quantity and food safety.

The National School Nutrition Programme is managed by twenty-one officials at national level. These include one director responsible for strategic planning and leadership, seven deputy directors and five assistant directors responsible for supporting the director in monitoring and planning programme implementation (Department of Basic Education, 2014). Moreover, the programme includes five senior administration officers and one administration officer, all of whom are involved in administration, training and monitoring programme activities, and one senior secretary who provides clerical and administrative support (Department of Basic Education, 2014).

Below the national level, the National School Nutrition Programme is managed by 115 officials, 20 at provincial level and 95 at district level (Department of Basic Education, 2014). The officials are responsible for programme implementation and monitoring.

Rendall-Mkosi, Wenhold and Sibanda (2013) assert that there are two food procurement models used in different provinces in South Africa. Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and Western Cape use the centralised model while Eastern Cape, Free State, Northern Cape and North West provinces use the decentralised model (Rendall-Mkosi, Wenhold & Sibanda, 2013). According to

Rendall-Mkosi, Wenhold and Sibanda (2013), the centralised approach involves a tender system where suppliers are contracted to supply food to schools and are later paid by the provincial office for the food they deliver. Conversely, schools that use the decentralised approach receive funds to cover food, gas, food handler stipend and transport (Rendall-Mkosi, Wenhold & Sibanda, 2013).

Schools have a school nutrition committee which consists of the principal, teacher coordinator, school governing body member, food handler and food gardener (Rendall-Mkosi, Wenhold & Sibanda, 2013). The principal manages the programme while the teacher coordinator receives and records the stock, and keeps updated records of all invoices, all meals served and the number of learners fed per day (Rendall-Mkosi, Wenhold & Sibanda, 2013). The school governing body member monitors the provision of meals and does the financial management (Department of Basic Education, 2014). According to the Department of Basic Education (2009), the food handler prepares, cooks, serves meals and maintains hygiene around the cooking area. The food gardener is responsible for maintaining vegetables and fruits. The stakeholders are expected to attend training workshops that will equip them with necessary skills for effective execution of their duties (Department of Basic Education, 2008). Horticulture manuals for schools, compact discs, equipment and utensils guidelines, food specification guidelines, food preparation rules, Mnandi 4 sure recipe book, NSNP guidelines for tuckshop operators, NSNP healthy lifestyles poster and NSNP lunch box brochure are supplied to schools to ensure efficient implementation of the programme by providing additional information to various stakeholders (Department of Basic Education, 2010; Department of Basic Education, 2014).

The national school nutritional problem in South Africa is faced with many challenges including unavailability of the required infrastructure, delays in the delivery of food, non delivery of food, lack of vegetable gardens and poor monitoring and evaluation (Dei, 2014; Rendall-Mkosi, Wenhold & Sibanda, 2013). Delays in delivery were also reported in a study in KwaZulu-Natal in South Africa (Kwatubana & Makhalamele, 2015). Lacey (2012) notes that in South Africa, there is inadequacy of human resources to monitor the programme at district level. Furthermore, monitoring and evaluation seem to be ineffective since programme implementers appear not to have

been trained on programme implementation and financial management (Rendall-Mkosi, Wenhold & Sibanda, 2013).

Aliyar, Gelli, and Hamdani (2015) observed that for all countries that had nutritional guidelines, there was no literature verifying the implementation of the guidelines and menus. Therefore, the researcher found it necessary to verify if guidelines and menus in the school nutrition programme were being followed. According to Kwatubana and Makhalamele (2015) and Quila, Tyilo (2014) and Rendall-Mkosi, Wenhold & Sibanda (2013), stake holders of the NSNP in South Africa appeared not to have been trained on programme implementation and financial management. The researcher determined to assess if lack of training of some stack holders did not negatively affect the implementation of the school nutrition programme. In addition, Rendall-Mkosi, Wenhold and Sibanda (2013) observed that visits to schools by district and provincial officials appeared to be irregular and there seemed to have been no mechanism in place to monitor the quantity and quality of food prepared and served to the individual learners each day at each school. The alleged lack of monitoring triggered the researcher to determine if the quality as well as quantity of food provided to learners was not reduced since the lack of monitoring renders the programme prone to numerous unfair practices by stake holders. Hochfeld, Graham, Stuart and Gent (2015) alleged that there was misappropriation of funds in the NSNP. Hence, the researcher wanted to verify if the quality and quantity of food was not further compromised due to the alleged corruption.

Although South Africans include iodised salt in their menus, school children are reported to have insufficient iodine intake (WHO, 2016). Health24 (2016) highlights that the prevalence of iron deficiency exists in both developed and developing countries resulting in more than 30% of the world's population being anaemic due to iron deficiency. Rendall-Mkosi, Wenhold and Sibanda (2013) and Altman, Hart and Jacobs, (2009) assert that the most critical nutrient deficiencies for South Africa are vitamin A, Iodine and iron. This further triggered the researcher to assess how the school nutrition programme was addressing the various nutrient deficiencies.

Oldewage-Theron and Egal (2012) observes that Life Orientation teachers in South Africa were lacking health and nutrition related knowledge. This gap needs to be closed if learners are to get adequate nutrition knowledge and skills. The researcher sought to assess if the school nutrition programme or the school curriculum was adequately providing nutrition education to learners.

1.3 STATEMENT OF THE PROBLEM

Several problems have been cited in the implementation of the school nutrition programme in South Africa. A study carried out by Hochfeld et al. (2015) reveals that adding breakfast to the National School Nutrition Programme reduced stunting. Schools that received National School Nutrition Programme only had more learners who were stunted (14.5%) compared to schools that received both the National School Nutrition Programme and breakfast (9%). Hochfeld et al. (2015) also indicate that fruits and vegetables may not have been adequately consumed. The assumption is given credence by a study by Rendall-Mkosi, Wenhold and Sibanda (2013) which revealed that fifty percent of the schools visited had no vegetable gardens. A diet lacking vegetables reduces the amount of vitamins and other minerals consumed. Hochfeld et al. (2015) also revealed that there was misappropriation of funds for the school nutrition programme. Funds would run out before the next budget, compromising the varied nature of food eaten by learners since some of the foodstuffs could not be purchased. This suggests that the National School Nutrition Programme may not be adequately providing all the intended nutrients to learners due to poor implementation. Poor budgeting and lack of funds at a particular stage results in lack of foods from some of the food groups leading to deficiencies of nutrients which the school nutrition programme is meant to supply. This is not in line with the white paper on reconstruction and development which was discussed in parliament on 15 November 1994, which specifies that the NSNP should address: (a) the right of access to sufficient food, section 27 (1); (b) and the

right to basic nutrition, section 28 (1); and (c) and the right to basic education section 29(1) (a) (Kallman, 2005).

Jooste and Zimmermann (2008), Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers and Rivera (2008), and USDA (2015), note that malnutrition severely affects learners' physical and mental development. Nabarro, Menon, Ruel and Yosef (2012) assert that children who consume insufficient amounts of key nutrients, including calcium, potassium, iron and vitamin C, may not be able to concentrate and achieve their full potential at school. Several studies on intelligence tests performed in Africa, Latin America and United States of America indicated that children who were undernourished attained lower scores than children of similar social and economic status who enjoyed balanced diets (Fanzo, 2012).

In a study by Dei (2014), 75% of the teachers and seventy-one percent of the learners indicated that sometimes there were delays in cooking and serving food. Due to the delays, the same study revealed that seventy-eight percent of the teachers and eighty percent of the learners were ill prepared for the next lesson. Delays in feeding greatly disadvantage learners who come to school with an empty stomach (World Health Organisation, 2013). Implementation should focus on eradicating the nutritional problems which, unfortunately, does not seem to be the case according to several observations cited. Dei (2014) observes that seven percent of the learners were not happy about the quality of the food that was served. This is in agreement with the observation in a different study by Hochfeld et al., (2015) who indicated that learners and educators were not happy about the poor quality, poor delivery and low quantity of the food served in the school nutrition programme in Eastern Cape and Limpopo. In some instances, the food was not delivered at all. This is a violation of the Division of Revenue Act 5 of 2004 which requires provinces to comply with minimum norms and standards. As highlighted in the study background, the Act requires the meals to comply with approved menus, nutrition quality and quantity. The school nutrition programme had a budget of R5.2 billion in the 2013 to 2014 academic year and the proposal was to increase it to R6 billion in the 2016 to 2017 academic year (Department of Basic Education, 2014; Education - National Treasury, 2015). Such a large financial input should be in line with good programme implementation practices that should result in maximum

benefit to the learner. Despite the government effort to reduce short term hunger and increase learner alertness as well as academic achievements, most schools in South Africa seem to be failing to effectively implement the school feeding programme. The reasons why learners may be partially or totally deprived of their crucial and deserved benefits need to be investigated. Hence, this study sought to examine the implementation of the school nutrition programme by various stakeholders and the implications on learners' nutritional education.

1.4 MAIN RESEARCH QUESTION

How is the school nutrition programme implemented in selected high schools in KwaZulu-Natal Province?

1.4.1 Sub-research questions

1.4.1.1 How is training, monitoring and support provided to key role players in the school nutrition programme?

1.4.1.2 How is the procurement and preparation of food accomplished for the food served in the school nutrition programme?

1.4.1.3 What is the nutritional value of food consumed in the school nutrition programme?

1.4.1.4 What are the challenges encountered in the implementation of the school nutrition programme?

1.4.1.5 What are the implications of the school nutritional programme on the learners' nutritional education?

1.5 PURPOSE OF THE STUDY

The main objective of this study was to assess how the school nutrition programme was implemented in selected high schools in the KwaZulu-Natal Province.

1.5.1 Research objectives

1.5.1.1 Examine training, monitoring and support provided to key role players in the school nutrition programme.

1.5.1.2 Establish what informed the procurement and preparation of food served to learners in school nutrition programme.

1.5.1.3 Determine the nutritional value of food consumed in the school nutrition programme.

1.5.1.4 Analyse the challenges encountered in the implementation of the school nutrition programme.

1.5.1.5 Evaluate the implications of the school nutrition programme on the learners' nutritional education.

1.6 Research Hypothesis

The various null hypothesis and alternative hypothesis that were performed in the study are as follows:

H_0: $U_1 = U_2$. There was no significant difference between the observed nutrient value and the expected nutrient value for maize meal according to the menu quantity schedule.

H1: $U1 \neq U_2$ There was a significant difference between the observed nutrient value and the expected nutrient value for maize meal.

H_0 : $U_1 = U_2$ There was no significant difference between the observed nutrient value of soya mince and the expected nutrient values (The nutrient values for the two data sets were similar)

H_1: $U_1 \neq U_2$ There was a difference between the observed nutrient intake data set and the expected nutrient intake data set for soya mince.

H_0: $U_1 = U_2$ There was no significant difference between the observed average nutrient intake data set for each school and the expected nutrient intake data set according to the menu quantity schedule.

H_1: $U_1 \neq U_2$ There was a significant difference between the observed nutrient intake data set for each school and the expected nutrient intake data set.

1.7 Research Strategy

A summary of the research plan of action whose details are given in the research design and methodology chapter is presented on Table 1.1 below.

Table 1-1: Study plan of action

Guiding Research Question	
How is the school nutrition programme implemented in selected high schools in KwaZulu-Natal Province?	
Paradigmatic Suppositions	
Epistemological Models	The study makes use of pragmatic research paradigm
Methodological Model	The study makes use of the mixed methods research Approach.
Research Design	
Concurrent Triangulation Research Design was used in the study	
Sample and sampling strategy	
Population Sample type: Quantitative sample(Learners) Sampling strategy: Stratified random sampling	Population size: 685 Sample size: 108
Qualitative sample Principals Nutrition Teacher co-ordinators Food handlers Service providers District Nutrition officers Sampling strategy: Stratified purposive sampling	Sample size 4 4 15 7 2
Data Collection	
Data Collection Methods: Semi-structured questionnaire. Face to face in-depth semi-structured interviews. Observations. Document analysis.	Data Collection tools: Questionnaire Video recorder & Interview schedule Observation checklist Departmental manuals for nutrition (downloaded). Records of food received.
Data Analysis and Interpretation	
Data Analysis Methods	Cronbach's alpha for reliability analysis.

	Test-retest followed by Spearman's Correlation coefficient to measure consistency of survey items. Calculation of the actual and expected mean nutrient intake by an individual per day. T-test to determine if there was any significant difference between the observed and the expected nutrient intake values. SPSS and Microsoft Excel to calculate frequencies and percentages. N VIVO software aided the analysis of qualitative data. The data was coded and categorised, and themes or patterns were identified. The identified themes was described to a similar sample of participants who did not contribute to the initial data collection to determine if the second group agrees with the themes. Data collected from different sources was synchronised during analysis.
Validity and Reliability/Data Credibility and Trustworthiness	
Measures to ensure validity.	Pilot testing, triangulation of data sources and data collection methods. Random sampling of participants, representative sample size, crosschecking data from different sources and expert review of questions on the questionnaire.
Measures to ensure reliability	Pilot testing, Cronbach's alpha on SPSS, test-retest and Spearman's Correlation coefficient.
Measures to ensure data credibility and trustworthiness	Expert review of sampling, data collection and data analysis procedures, member checking, data and method triangulation. Thick description of data, research processes and settings, audit trail, respondent validation and strong data collection methods.
Ethical Considerations	
Ethical Elements attended to.	Informed consent by learner, food handlers, service providers, teacher co-ordinators, principals and departmental officials. Anonymity. Confidentiality. Clearance by the faculty of Research Ethics Committee and institutional Research Ethics Committee of the University of Fort Hare. Permission was requested from the Head of Department Kwazulu Natal Department of Basic Education. Permission letter was handed to the district manager, circuit manager and school principals.

Conclusions:
Recommendations:

1.8 SIGNIFICANCE OF THE STUDY

Recommendations made at the end of the research in line with training, monitoring, support and food preparation would assist the learners to get maximum benefit in the NSNP through improved nutrition programme implementation strategy by stakeholders. The improved programme implementation would enhance learners' alertness and participation in class, and eventually improve individual, school, district and provincial results. These learners would then be afforded the opportunity to acquire skills from higher learning institutions.

The study might assist teachers to help learners to change their perceptions on different types of foods. This would be a stepping stone towards fighting diseases like overweight, obesity, high blood pressure, heart attack, stroke and nutrient deficient diseases which are prevalent in the society. Curriculum developers might get insight on the absence of nutritional education in the high school curriculum and may be encouraged to include it in the school curriculum.

Programme implementers would gain more insight into the challenges besetting the implementation of the NSNP. Findings would assist stakeholders to reflect on their roles in the hope of improving the NSNP implementation process in various schools. The researcher proposed an implementation framework which might improve the programme implementation process, making it more efficient and resulting in maximum benefit to the learner.

The researcher's study might also assist organisations or researchers who may want to investigate on issues of implementation of the school nutrition programmes in different countries. Most of the studies (Department of Basic Education-UNICEF, 2008; Clacherty and Associates, 2006; Child Health Unit, 1997) focused on the implementation of nutritional programme in primary schools. The study would be one

of the few studies focusing on implementation of nutritional programmes in secondary schools in Pinetown District in KwaZulu-Natal.

1.9 BRIEF RESEARCH METHODOLOGY

The research followed the pragmatic research paradigm. It made use of the mixed methods research approach and concurrent triangulation design in which the researcher collected quantitative and qualitative data simultaneously, with the two forms of data being merged during analysis and interpretation. The quantitative population consisted of 685 learners from which the quantitative sample was selected using stratified systematic sampling. The qualitative sample was obtained through the use of stratified purposive sampling from populations of principals, teacher co-ordinators, food suppliers, food handlers and field officers. The data were collected through the use of a semi-structured questionnaire, face to face in-depth interviews using semi-structured interview guide, observations and document analysis.

1.10 DELIMITATION OF THE STUDY

In this study, the researcher focused on evaluating the training, monitoring and support available to key role players, and establishing what informs the procurement and preparation of food served in the school nutritional programme. Furthermore, in the study, the researcher determined the nutritional value of the food consumed and identified challenges encountered in the implementation of the National School Nutrition Programme. The researcher's study highlighted the effects of the School Nutritional Programme on learners' nutrition education in seven secondary schools in quintile 2 and quintile 3 in KwaZulu-Natal Province of South Africa. Initially, eight secondary schools were selected from Pinetown district, Umhlatuzana Circuit Management Centre, and Molweni circuit. However, one school was not willing to participate in the study and only seven schools were involved in the study. The study made use of the pragmatic research paradigm, mixed methods research approach and concurrent triangulation research design. Data was collected using semi-structured questionnaires, face to face in-depth interviews, observations and document analysis. The respondents were grade 12 learners while participants for

interviews were principals, teacher coordinators, service providers, food handlers and district officials. The study was conducted between April 2016 and January 2018.

1.11 DEFINITION OF TERMS

This section gives both a scholarly and an operational definition for each of the key terms used in this study.

1.11.1. **Quintiles** are categories in South African schools which are based on the poverty of the community around the school (Dei, 2014). It determines the amount of funding that a school receives each year, and whether learners should pay fees or not.

1.11.2. **Volunteer Food Handlers** are people who are responsible for the preparation of food, cooking, serving meals and maintaining hygiene around the cooking area (Department of Basic Education, 2009). They are expected to have one or two children in the schools they will be serving.

1.11.3. **School meals** are meals fed to children within the school in a feeding programme (Lawson, 2012). In this study, a school meal refers to the meal provided to learners through the National School Nutritional Programme or any other programme.

1.11.4. **Management** refers to the organisation, motivation, monitoring and co-ordination of the activities of an institution in order to achieve defined goals (Appelo, 2011). In this study, it would refer to a set of activities that involve budgeting, monitoring, and co-ordination of the school nutrition programme to enable optimum benefits to the learner.

1.11.5. **School feeding** is providing food to children in schools which can be classified into two main groups based on their modalities: (1) in-school feeding, where children are fed in school; and (2) take-home rations, where families are given food if their children attend school (Bundy et al., 2016). In this study, school feeding would refer to in-school feeding.

1.11.6. National school feeding programme refers to a programme managed by the government, either alone or with the support of development partners, to provide food in schools throughout the country on a regular basis to school children (Bundy et al., 2016). In this study, the national school feeding programme is managed by the government only, and provides food to learners in quintiles one to three throughout the country.

1.11.7. Procurement refers to food sourcing, buying and receipt of products (Bundy et al., 2016). In this study, refers to sourcing, buying and delivering food to schools.

1.11.8. Preparation and distribution involves the range of different activities generally undertaken at the school level to provide the meals to the school children (Bundy et al., 2016). In this study, preparation and distribution refer to all processes done by food handlers which eventually results in the learners getting food for the school nutrition programme.

1.11.9. Nutrition Education includes provision of information about dietary requirements or food that meets children's nutritional needs and any combination of educational strategies, accompanied by environmental support, designed to facilitate the development of healthy eating behaviours and other food and nutrition related behaviours conducive to health and well-being (Burns, Dunn, Brady, Starr, & Blosser, 2013). In this study, nutritional education includes the provision of dietary information and strategies that are used in the school nutrition programme or education curriculum to promote healthy eating behaviours.

1.11.10. Implementation refers to the process of putting a decision or plan into effect or execution (Rouse, 2015). In this study, implementation refers to all processes involved to ensure that learners get food for the school nutrition programme.

1.12 CHAPTER OUTLINE

The chapters to be covered and the relevant headings are outlined below:

Chapter	Description
Chapter 1	Background to the study. International context, African context and South African context on implementation of the school nutrition programme
Chapter 2	Literature view of each research objective and theoretical framework guiding the study.
Chapter 3	Quantitative and qualitative research methodology used in the study.
Chapter 4	Qualitative and quantitative data presentation, analysis and discussion.
Chapter 5	Qualitative and qualitative findings, conclusions and recommendations

1.13 SUMMARY

The chapter focused on the background to the study where the centre of focus was on international context specifically USA, Finland and Brazil, African context where the focus was on Ghana, Mali and Kenya and eventually South Africa. The chapter also highlighted the statement of the problem, research questions, research objectives, significance of the study, research methodology, delimitation and definition of terms. A summary of the research strategy was shown in Table 1.1. The next chapter reviews the relevant literature and the theoretical framework that guided the study.

CHAPTER TWO

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter focused on the background to the study. It also highlighted the statement of the problem, research questions, research objectives, significance of the study, research methodology, delimitations of the study and definition of terms. This chapter reviews the theoretical framework and the relevant literature. The theoretical framework covers the importance of the theoretical framework and the Role Theory. The literature reviewed include training, monitoring and support given to stakeholders in school feeding programme, procurement and preparation of food, the nutritional value of food, challenges encountered in the implementation of the school nutrition programme, nutrition education, previous empirical studies and chapter summary.

2.2 CONCEPTUAL AND THEORETICAL FRAMEWORK

The following sections define a conceptual framework as well as a theoretical framework. The sections also explain the importance of a theoretical framework in research. They further explain the role of a theory and its importance in the study.

2.2.1 Conceptual framework for effective implementation of the school nutrition programme (EISNP)

The EISNP is a comprehensive, multifaceted and dynamic implementation reform which is driven by children's rights to access to healthy and nutritious food. Figure 2.1 illustrates the interrelatedness of the EISNP approach's key pillars.

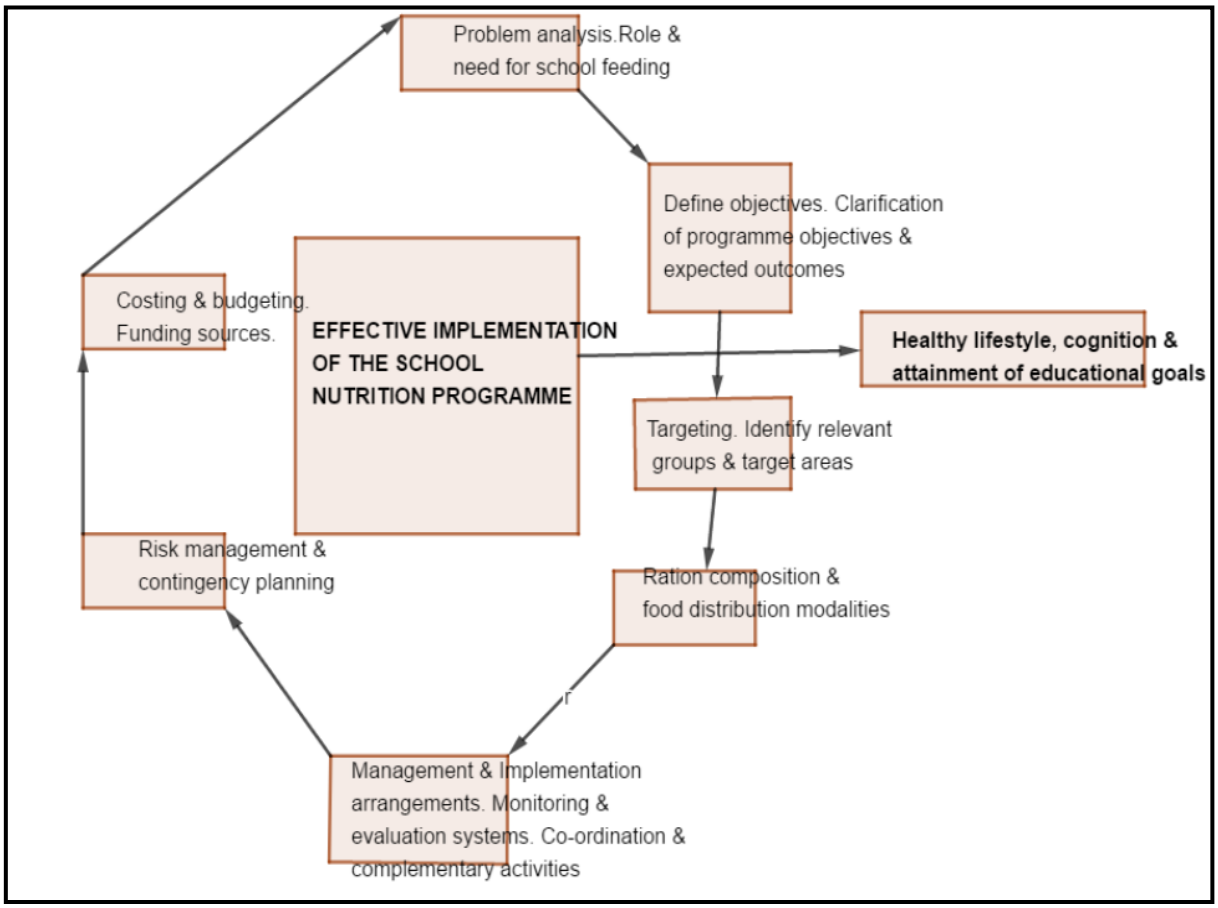

Figure 2-1: Effective Implementation of the school nutrition programme model

Source: Bundy et al. 2009

It is evident from Figure 2.1 that effective implementation calls for proper planning and clarification of the programme objectives. Food with the correct nutrient content to meet the needs of the target group must be supplied. The programme needs to be well monitored and evaluated to assess the possible need for improvement. Activities in the implementation process need to be well coordinated and key stakeholders must be adequately supported. Possible risks such as the spread of communicable diseases and strategies to mitigate them have to be identified. Funding sources must be sought and a clear budget must be made. A well organised implementation process will lead to a healthy life style, improve learners' cognitive development leading to attainment of educational goals.

2.2.2 Theoretical framework and its importance in research

A theoretical framework is a worldview with a set of ideas that determine a set of questions that are examined using a specific methodology (Anfara & Mertz, 2014). According to Hartas (2015) and Fitzpatrick and Kazer (2012), a theoretical framework is a collection of interrelated concepts that guide research, determine what things the research will measure and what statistical relationships will be established. A theoretical framework links together individual parts of a study to explain what the researcher is looking for (Fitzpatrick & Kazer, 2012). According to Fitzpatrick and Kazer (2012), a theoretical framework consists of assumptions that clarify the underlying truth about a phenomenon. Swanson (2013) asserts that a theoretical framework connects the reader to existing knowledge.

Bandessolli (2013) indicates that a theoretical framework helps to design the study. Anfara and Mertz (2014) posit that a theoretical framework helps to identify the starting point of the research problem and to decide what to look for. They add that a theoretical framework determines and defines the focus and goal of the research problem. Swanson (2013) notes that it helps to address the questions why and how. Fitzpatrick and Kazer (2012) say that a theoretical framework guides research and helps to organise existing knowledge and in making new discoveries. Swanson (2013) adds that a theoretical framework stimulates research and extends knowledge by providing both direction and the driving force to research. Swanson (2013) also highlights that a theoretical framework connects the reader to existing knowledge and helps to identify relevant research methods. According to Anfara and Mertz (2014) and Swanson (2013), a theoretical framework helps to establish connections between observations and facts, as well as to predict and control situations. Anfara and Mertz (2014) and Swanson (2013) reveal that a theoretical framework helps to make research findings more meaningful and to generalise various aspects of the phenomenon observed. A theoretical framework, according to Swanson (2013), helps to identify limits to generalisations. A theoretical framework plays a very important role in a study. The study is guided by the role theory which will be discussed in the subsequent section.

2.2.3 The Role Theory

The Structural Role theory, developed by Ralph Linton in 1936, Talcott Parsons in 1951 and Bruce Jesse Biddle in 1970, focuses on the division of labour where people within a group occupy distinct positions in which they perform a set of functions or roles (Biddle, 1979; Turner, 2006). The theory argues that role expectations influence role behaviour in an individual (Biddle, 1979). Expectations are norms or rules specifying how a person should behave and what rewards would result from performance or the punishment that will result for non-performance (Turner, 2006). Group members check each other's performance to determine whether it conforms to group norms. This theory informed this study in examining and establishing the expected roles and behaviour of stakeholders in effective implementation of the school nutrition programme. The constructs of the theory: role confusion, role conflict, role strain and role distance would help to explain challenges encountered by stakeholders in the implementation of the school nutrition programme. The theory guided the formulation of research questions since the questions are based on the roles played by different stakeholders. The theory also assisted in formulating questions on the instruments. Questions on preparation of food, for example, only focused on food handlers who were directly involved in the preparation of food and the principals who are involved in the monitoring process. Furthermore, it guided the data collection and analysis process. The time for data collection might have to be aligned with the time that a particular role is performed. Data from suppliers could be best collected at a time when they are supplying food to the schools.

2.3 LITERATURE REVIEW

This section reviews literature on (i) training, monitoring and support given to stakeholders in the school feeding programmes, (ii) procurement and preparation of food, (iii) nutritional value of food, (iv) Challenges encountered in the nutrition programme and (v) nutrition education in school feeding programmes.

2.3.1 Training, monitoring and support given to stakeholders in school feeding programmes

The Department of Basic Education (2009) indicates that workshops were conducted with teacher co-ordinators, district officials, the school governing body officials, volunteer food handlers, and principals. The workshops were to clarify programme requirements, roles and responsibilities of various stakeholders. The Department of Basic Education (2009) also indicates that the workshops on basic nutrition and vegetable production were conducted for field workers in an effort to improve their knowledge and skills as Nutrition Assistants. Menus were to be in compliance with the NSNP Grant Framework (Department of Basic Education, 2009).

According to Langsford (2012), training in the National School Nutrition Programme in Gauteng Province of South Africa involved district officials who were supposed to pass knowledge and skills on to schools. Successful schools were prsesented as model schools from which unsuccessful schools could emulate. Langsford (2012) highlight that the Department of Basic Education in South Africa pays for cooking equipment, food and gas, as well as a stipend for people involved in cooking the meals. However, Kwatubana and Makhalamele (2015) observe that food-handlers were not supported in maintaining the gas stoves, cooking utensils as well as in the purchase of cleaning material. Langsford (2012) further indicates that large organisations such as Massmart, were supplying mobile kitchens across the country. Langsford (2012) also notes that some schools in Gauteng were being further funded by an international donor organisation and the funds donated were monitored by a local partner. The organisation funded the school for a period of three years.

Despite the workshops that were held, information in the background to the study shows that monitoring and evaluation was ineffective in some schools in South Africa. Furthermore, Kwatubana and Makhalamele (2015) highlight that programme implementers were not trained on programme implementation and financial management. A different study by Quila and Tyilo (2014) gave evidence of lack of training among the NSNP stakeholders who participated in their study in South Africa. Training, monitoring and support result in effective implementation and maximum benefit from the programme by learners.

The Department of Basic Education (2009) noted that food handlers were trained on hygiene and safety of food. Despite the alleged training, Dei (2014) notes that some learners were not happy about the food supplied in the school nutrition programme. A case study in one of the primary schools in the South Coast of Kwazulu Natal revealed that, when goods were delivered to the school, they were inspected by the principal and the school governing body for quality and quantity (Dei, 2014). In the NSNP study by Rendall-Mkosi, Wenhold and Sibanda (2013), in Mpumalanga Province, standard monitoring tools were completed by the school nutrition coordinators on a monthly basis, and sent to the provincial office. Rendall-Mkosi, Wenhold and Sibanda (2013) noted that visits to schools by district and provincial NSNP staff were irregular and there was no mechanism in place to monitor the quantity and quality of food prepared and served to the individual learners each day at each school. In the Eastern Cape Province, funds were monitored through a standardised monitoring tool that schools submitted monthly (Rendall-Mkosi, Wenhold and Sibanda, 2013). Monitoring visits were done by the provincial programme coordinators and district monitors who visited each school at least once per quarter, and there were more frequent visits in schools that were facing challenges (Rendall-Mkosi, Wenhold and Sibanda, 2013). The observations highlighted in the background generally reveal that training and monitoring was insufficient and there was inadequate support given to key role players, resulting in inefficient implementation. It has been indicated in the background to the study, that Mnandi 4 sure recipe books, brochures, and posters were supplied to schools to support the programme implementation. The frequent change of suppliers and food handlers creates the need for regular training to update new suppliers and food handlers with relevant information. This may not always be possible due to financial constraints. In addition, the stakeholders were not called for in-service training workshops (Quila & Tyilo, 2014). Generally, lack of training results in inefficiency in one's performance of duty. As a result, the implementation of the nutritional programme in secondary schools was beset with many challenges.

In the decentralised procurement model, the School Governing Bodies account for the expenditure within the National School Nutrition Programme. This engenders transparency by having more people monitoring programme implementation at the school level (Bundy et al., 2016).

Bundy et al. (2016) indicate that the Nigerian School Feeding Programme is monitored at three levels:

- State level: The State Universal Basic Education Board collects enrolment data and the Ministry of Health collects data on general child health.
- Local Government Area Council level: The Local Government Area Council Education Secretaries collect weekly feeding forms that indicate the number of school children fed.
- School level: The principal and nutrition teachers monitor the food quality and portion sizes daily. The Local Government Area Council verifies this two times per month as they collect feeding allowance report from each school.

In Mali School Feeding Programme, the community plays a critical role in the programme as they engage in management of cooking, covering costs of perishables, maintenance of community gardens and building of infrastructure like kitchens and stores (Bundy et al., 2016).

In Ghana, Mali and Kenya, several ministries support the school feeding programme in various ways. Maijers and Nalla (2014) assert that the Ministry of Education is responsible for policies related to the School Feeding Programme (SFP) in Ghana, Kenya and Mali. According to Maijers and Nalla (2014) the ministry of education formulates policy provides funds, supervises and monitors the programme implementation. The implementation is done as per SFP manual, which stipulates the tendering system, procurement, payment of menus, and quality control. In Ghana and Kenya, the government decides on the menu for School feeding (Maijers & Nalla, 2014). In some cases, in Ghana, caterers decide on the menu depending on fund flows, price and foodstuff availability constrains. Maijers and Nalla (2014) highlight that the Ministry of Public Health is responsible for programme inspection to ensure good food storage and feeding conditions. This is done to ensure that the safety and nutritional requirements stipulated by the programme are met.

According to Maijers and Nalla (2014), the Ministry of Local Government and Rural development in Ghana, is responsible for supervising and monitoring the

implementation of SFP in districts and for organiaing the flow of funds from the government to the districts level. Maijers and Nalla (2014) observe that the Ministry of Food and Agriculture focuses on the policy for nutrition, on planning and co-ordination, and is responsible for capacity building of farmers, assisting them to access markets, provision of extension service and technological transfer of information. The Ministry of Food and Agriculture is also involved supervision of 30% of storage facilities, and for research into improved varieties of crops and breeds of animals. In Kenya, the Ministry of Agriculture (MoA) and the Ministry of Health (MoH) supervises all school stores, whereas, there is no supervision on the use of school storage facilities in Mali (Maijers & Nalla, 2014).

The School Feeding Programme in Ghana has special training programmes for managers of the school and caterers, where they are trained on food quality services and hygiene (Maijers & Nalla, 2014). There are full-time cooks. The key employees or caterers did not receive any formal training and they relied on instructions form caterers and on their own experiences. National Food Buffer Stock Company (NAFCO) is responsible for storage and transportation of food in Ghana (Maijers & Nalla, 2014). NAFCO purchases cereals from local farmers, stock sit in warehouses and supplies state institutions. Food is directly delivered to the school or caterers after directly receiving order.

Previous independent evaluations of the Ghana School Feeding Programme (GSFP) showed that assessment of nutritional quality of the GSFP meals was based on unscientific reports by observers who had no objective measures of meal adequacy (Laar, 2016). Assessing improvements in the farmers' livelihood was also based on word of mouth. In view of these gaps, GSFP, in collaboration with stakeholders, developed new tools to monitor and evaluate the programme successfully. The monitoring tools include the daily feeding monitoring tool for caterers, which collects daily information on type of meal cooked, number of pupils fed, ingredients (grouped under proteins, carbohydrates, fats) and the amounts used in meal preparation, procurement form for caterers to record food purchases, seller's information (if available), the source of food commodity (district, region, outside), as well as daily feeding monitoring tool for principals designed to capture daily information on meals

prepared and portions of meals given to each child (Laar, 2016). The school term monitoring tool for principals is used by the principals at the end of the school term to record pupil enrolment, drop outs, and the number of meetings by the school implementation team, while the sanitation and hygiene tool is used by a regional monitoring personnel as an observation checklist to record the availability and maintenance of sanitation facilities, drinking water, and hand washing station in a GSFP beneficiary school (Laar, 2016).

Fernandes et al. (2016) highlight that representatives from Ghana Health Services, School Health and Education Programmes and GSFP participated in training on the proper usage of the School Meals Planner Tool. The training was on the use of the tool to design school menus and to identify and select nutrient rich foods for menus (Fernandes et al., 2016). According to Fernandes et al. (2016) training also involved advice on the use of the foods rich in complementary proteins, such as rice and legumes, as an alternative to animal proteins which are expensive and difficult to store when there is no refrigeration. The training provided guidance on the use of appropriate types and quantities of vegetables.

Fernandes et al. (2016) indicate that trainers consisting of the project team, national and regional officials, carried out training at the community and school levels (caterers, cooks, head teachers and circuit supervisors) to support the implementation of the school Meals Planner Package in schools in Ghana. Caterers and cooks, according to Fernandes et al. (2016) were urged to participate in training where they learnt to prepare meals according to new menus. They were also trained on how to use handy measures of food items and were provided with education on food safety hygiene, cooking practices and nutrition. These included hand washing with soap and quality of water for cooking, drinking and washing (Fernandes et al., 2016). Caterers and cooks were also encouraged to use iodised salt in meal preparation so as to prevent goitre. Head teachers and some members of the community were trained to monitor meal preparation and the usage of handy measures.

Fernandes et al. (2016) assert that training in Ghana School Feeding Programme was also provided by local non-governmental organisations that were recruited to undertake regular behaviour change communication activities in the communities. They provided information on water, sanitation and hygiene, food preparation and consumption, and improved hygiene and sanitation behaviours (Fernandes et al., 2016). They also distributed and monitored the use of behaviour change communication materials including posts.

Monitoring information was reported monthly by district officers to GSFP secretariat and monitoring visits were done in all districts at least once every school term (Fernandes et al., 2016). The monitoring and evaluation team asked caterers and teachers about different aspects of the intervention. The visits, according to Fernandes et al. (2016), served the purpose of providing additional training especially in schools which had assigned new caterers.

Quality assurance and accountability mechanisms like tracking, reporting and monitoring and evaluation systems are important in tracking the programme quality and effectiveness. This helps to improve the quality of the programme and to ensure that resources are being used effectively. Accountability, monitoring and evaluation systems are weak across many of the school feeding programmes except Brazil, with a system of checks and balances implemented by different stakeholder groups across State government institutions and civil society (Bundy et al., 2016).

2.3.2 Procurement and preparation of food

As highlighted in the background to the study, five provinces use centralised procurement system while four provinces use the decentralised procurement system in South Africa. According to Rendall-Mkosi, Wenhold and Sibanda (2013), schools can only have a decentralised procurement model if they have a section “21 status” which indicates that they have enough skills and expertise to handle school finances and procurement. The section is based on the South African School’s Act of 1996.

2.3.2.1 The centralised procurement model in South Africa

This model is used in KwaZulu-Natal, Limpopo, Mpumalanga and Western Cape where the Preferential Procurement Policy Framework Act number 5 of 2000 guides the provincial head office in the tendering process (Rendall-Mkosi, Wenhold and Sibanda, 2013). Bundy et al. (2016) indicate that funds are accounted for at provincial level except the funds for fuel and voluntary handlers, which are transferred directly into the school account. The tendering system involves a point system of scoring the tenders, which favours historically disadvantaged people in terms of race, gender and disability (Rendall-Mkosi, Wenhold & Sibanda, 2013). The tendering system used in KwaZulu-Natal differs from ones used in other provinces in that, it emphasises community empowerment by appointing suppliers from the local community (Department of Basic Education, 2011). The schools hire voluntary food handlers and pay for the gas using the money which they receive on a quarterly basis. They are then expected to account for the expenses monthly.

Rendall-Mkosi, Wenhold and Sibanda (2013) highlight that in Mpumalanga, selecting tenders and making payments is handled by the procurement unit within the Provincial Department of Education which awards tenders ona three-year basis. The food supplier delivers menu items to schools either weekly or monthly. According to Bundy et al. (2016), in Mpumalanga province, suppliers deliver dry food once per month and perishable food items once per week. Bundy et al. (2016) also indicate that in Mpumalanga food commodities are sourced through wholesalers or from local commercial farmers. The school nutrition coordinator checks the quantities, quality, expiry dates of food items and tastes every meal that is served to learners. According to Bundy et al. (2016) and Rendall-Mkosi, Wenhold and Sibanda (2013), the tender based system in Mpumalanga was observed as benefitting larger companies instead of uplifting the poor according to the Preferential Procurement Policy Framework Act. Therefore, economic inequality was increasing. The same sentiments were echoed by Mtapuri, Kekana and Thabethe (2015) in a different study conducted in Limpopo Province in South Africa. However, Mtapuri, Kekana and Thabethe (2015) indicated that the competitive tender system promotes economic empowerment among citizens, encourages the development of business minds, creates jobs, empowers small business entities, eliminates the risk of

financial mismanagement in schools and takes away the school's burden of managing extra funds.

2.3.2.2 The Decentralised Procurement Model in South Africa

The decentralised procurement system is used in Eastern Cape, Free State, Northern Cape and North West. The schools receive funds to pay for gas and for the volunteer food handlers' stipends directly into their accounts from the provincial office and procure food as well. According to Rendall-Mkosi, Wenhold and Sibanda (2013), a school can only receive funding for procurement if it has "Section 21" status based on the Schools Act of 1996. This status is given to schools which have enough skills and expertise to handle school finances and procurement. The school governing bodies are trained annually on financial management and reporting. After receiving the funds in their school accounts, district officials for schools in Eastern Cape communicate the budget to schools and monitor how funds are used. Schools use the quotation system to identify the best supplier in terms of costs of commodities.

Food items are purchased from local wholesalers while the few perishables are obtained from farmers (Bundy et al., 2016). The nutrition co-ordinator and SGB members identify the suppliers in their local community or business district. However, the nutrition coordinator sometimes buys the food. The decentralised system has the advantage of lower transportation and storage costs and it involves more community members. However, Rendall-Mkosi, Wenhold and Sibanda (2013) indicate that some of the money saved is misused by principals, governing bodies or redirected to other school activities. The observation is further endorsed by the Department of Education (2009) which states that the school-based model is subject to mismanagement of funds by the school leadership. From their study in Limpopo Province, Mtapuri, Kekana and Thabethe (2015), the school based model meant that learners could not receive meals on the first day of school because the money was not delivered to schools, yet the company contracted could only deliver when they receive their cash. On the contrary, in the tender system, suppliers could provide food for even three months before they are paid.

Parents in the Eastern Cape and Mpumalanga Provinces provided firewood for meal preparation for no pay, but in the Eastern Cape Province, the community members were paid for the firewood (Bundy et al., 2016).

The role of School Governing Bodies is clearer in the decentralised Model, where the School Governing Bodies may procure menu items, equipment and assist in appointing the volunteer food handlers.

Either of the two models used requires regular visits by district and provincial officials who will monitor the use of the finance, or the quality and quantity of food provided to learners. However, the study by Hochfeld et al. (2015) in Eastern Cape indicated that there were too many schools to be monitored. As a result, only 10% of the schools were monitored per month. This makes the programme prone to corruption by service providers or school principals who may buy low quality food as observed in primary school implementation studies cited in the background to the study. The money for NSNP could be misused.

2.3.2.3 Procurement in Nigeria (Decentralised procurement)

In Nigeria, cooks purchase all food items except eggs, beef, fresh fish, and chicken, which is purchased from poultry farmers, fish farmers and meat sellers associations and distributed to the cooks per day, based on the menu (Bundy et al., 2016). The eggs, beef, fresh fish, and chicken are sourced from suppliers to ensure that quality and size portions per child are adhered to (Partnership for Child Development, 2012). Funds are transferred in advance by the financial institution supporting the Government initiative and by the Elementary School Feeding and Health Programme implementation unit, which is responsible for preparing schedules per week and requesting funds from Government directly into accounts belonging to individual cooks in commercial banks (Bundy et al., 2016). This procurement procedure design ensures that money is not diverted from its intended purpose of ensuring that cooks receive full payment for their services (Bundy et al., 2016; Partnership for Child Development, 2012). The cooks do not have the authority to change the menu

requirements, the availability of ingredients, and the price constraints. Bundy et al. (2016) also highlights that all cooks are certified and have passed a three-month self-funded certification course on food quality, preparation and basic hygiene. They also indicate that all cooks undergo a health check process to ensure school children will not be exposed to any communicable disease. Bundy et al. (2016) observe that in the Nigerian school food programme, cooks go through a one-day refresher training on interpersonal skills, food preparation, and basic hygiene. The same authors indicate that cooks are responsible for managing their own budgets and procuring ingredients for preparation of the daily school meals. They work in cooperative groups of 25 members each to minimise costs in procurement of food items.

2.3.2.4 Procurement in Kenya School Feeding Programme (Decentralised procurement)

Bundy et al. 2016 assert that Kenya also uses a decentralised procurement process where cash is transferred directly to the school accounts on a biannual basis and procurement of food items is undertaken at the school level and co-ordinated by the School Meals Committee. Schools are informed of how much money has been credited into their school accounts. The procurement process for food is done termly depending on the school's storage capacity by registered/licensed local farmers or suppliers, and is guided by circulars from the Ministry of Finance (Bundy et al., 2016). They also assert that the School Meals Committee and parents are responsible for setting up the modalities for food procurement and purchases hence; procurement steps are not similar across the programme as each community has its own unique method of decision making and the school pays for commodities through a bank cheque (Bundy et al., 2016).

Both Nigeria and Kenya use decentralised procurement models which are different in the sense that in Nigeria, procurement of food items is done by cooks who also prepare and serve meals while the School Meals Committee does the procurement in Kenya. Procurement of food items in Mali is done by the School Management Committee in a similar manner to that of Kenya. However, in Mali there is more emphasis on purchase from small holder farmers resulting in less focus on the

nutritional value of food (Bundy et al., 2016). Moreover, the food procured is delivered into canteens and a payment for procurement is made in advance.

2.3.2.5 Procurement in Ghana School feeding programme (Decentralised procurement)

In Ghana School Feeding Programme (GSFP), procurement, preparation and serving of food to pupils is done through private caterers who are awarded contracts by the Metropolitan, Municipal and District Assemblies, based on GSFP guidelines (Bundy et al., 2016). According to Laar (2016), caterers are selected through a tendering process that requires them to be local residents with the capacity to self-finance procurement of food items. Caterers hire cooks who assist them in preparation and serving menus. Cash transfers are made through the District Assemblies, under the supervision of the District Implementation Committees (DICs), to caterers, based on daily allocation of a child per day. As highlighted in the background to the study, the District Implementation Committee (DIC) is responsible for ensuring the proper running of the programme (Afoakwa, 2010; Buhl, 2010; Commandeur, 2013). Caterers may serve a maximum of three schools each, not exceeding a total enrolment of 400 pupils, and profit is derived from savings made after food has been procured, prepared, and served (Bundy et al., 2016; Laar, 2016). Caterers procure food items on a competitive basis without being restricted to purchasing from small-scale farmers. Procurement can be done at district or national levels when food items are not available at local level. Hence, the government's target to purchase 80% of food for the GSFP from local small holder farmers is not easily achieved (Aliyar, Gelli & Hamdani, 2015; Karg, Ekpe, & Abu, 2015). The background to the study also made it clear that the School Implementation Committee (SIC) ensures that food is provided to learners (Karg, Ekpe, & Abu, 2015).

2.3.2.6 Procurement in Brazil School Feeding Programme

In Brazil, procurement is done using the decentralised model, centralised model or a mixture of the two models (Bundy et al., 2016). The model used is determined by the

context, which consists of all the complexities and challenges at the local level. In the decentralised model, National Fund for Educational Development resources are transferred to the state secretariat for education who signs a formal agreement or contract with the Parent–Teacher Association that will be responsible for procurement, preparation and serving meals to learners (Bundy et al., 2016). Money is transferred into the account but they use cheques to purchase food items since they do not have access to money in the account (Bundy et al., 2016). The decentralised model is used in states that have schools spread throughout the territory.

In the centralised model, the municipality purchases food according to a pre-defined menu, stores the food in the warehouses, prepares meals and then distributes the food to all schools (Bundy et al., 2016). Normally, this arrangement occurs in medium/large municipalities where buying the whole food requirement for all schools is more practical and cost-effective. The non-perishable food is normally distributed for 26 school days while perishable foods together with some agricultural products are distributed normally once or twice a week directly at the schools and supervised by the municipality (Bundy et al., 2016). Payments are all organised by the Municipal Secretariat of Education.

In mixed implementation procurement, both centralised and decentralised management models are used. Normally, non-perishable foods are bought at the municipality or state level and perishable foods are purchased by the schools. Fresh perishables such as fruit and vegetables are mainly procured from local rural farmers (Bundy et al., 2016).

2.3.2.7 Food Preparation

The Department of Basic Education (2014) provides NSNP food preparation rule posters to each school in the NSNP. The poster emphasizes the maintenance of good hygiene throughout the programme. However, the background to the study indicated that hygiene was compromised in some primary schools in provinces that were studied previously.

The preparation of the menu is guided by Mnadi 4 sure recipe book (Department of Basic Education, 2014). It shows different quantities that should be prepared for different numbers of learners. The background to the study has also cited situations where deviations from the menus occured. Cases where learners and teachers were not satisfied with the meals were also indicated.

Hahnemann, (2016) asserts that heat destroys all vitamins in food (except vitamin K and vitamin B3), changes the chemical composition of fats, and the change is associated with a variety of health risks, change in taste and unpleasant smells in the food. Freezing causes the water to damage vegetable cells such that when they are heated during the cooking process, more nutrients are lost from damaged cells (Hahnemann, 2016). Water soluble nutrients are readily released into the water, and as the water is boiled during cooking, the nutrients are also lost in the vapour while some are lost when excess water is discarded (Brown, 2015; Hahnemann, 2016). Leaving your food out in the open can cause loss of nutrients like vitamin C, which decomposes when exposed to sunlight and air for long periods (Brown, 2015; Hahnemann, 2016). Hence, it is important to ensure maximum retention of nutrients during preparation and cooking.

2.3.3 The nutritional value of food

Nutrition refers to the science of nutrients and how the nutrients interact with organisms to promote and maintain good health (Joshi, 2010). Nutrition, according to Joshi (2010), also involves the processes by which all parts of the body receive and utilise nutrients that are necessary for the performance of body functions and for the growth and renewal of all components. The nutrients are found in food and they help the body to meet its needs for energy, maintenance of health, growth and reproduction (Joshi, 2010). Nutrients are chemical components of food that supply nourishment to the body (Edelstein, 2014; Joshi, 2010). Nutrients include proteins, carbohydrates, fats, mineral salts, vitamins and water, all of which perform specific functions in the body (Joshi, 2010). Water is not a nutrient but is a very important component which helps in many chemical reactions, dissolves and transports nutrients, and helps to maintain normal body temperature (Alters & Schiff, 2009).

Proteins are important in the growth, repair and maintenance of all cells; in the production of enzymes, antibodies and hormones; in the movement of substances across the membrane; and in cellular communication and molecular recognition (Alters & Schiff, 2009: Kessel & Ben-Tal, 2010). Some of the rich sources of proteins are dried beans, peas, nuts, soya products, meat, fish, poultry, eggs and dairy products (Alters & Schiff, 2009). Meat also provides iron, zinc and vitamin B_{12}.

Carbohydrates serve as the primary energy source. Carbohydrates minimise ketosis or the breakdown of proteins, and are precursors of substances that are actively involved in metabolic processes such as fertilisation and blood clotting (Embuscado, 2014). Some of the foods rich in carbohydrates are grain products like maize/corn, rice and bread, potatoes, beans, fruits, and honey (Alters & Schiff, 2009; Embuscado, 2014).

Different types of lipids perform different functions in the body. Triglycerides provide energy while cholesterol is used in bile and vitamin D production, as well as in maintenance of skin; ensuring proper functioning of nerves and to produce steroid hormones like testesterone and oestrogen (Alters & Schiff, 2009; Marshall, Lapsley, Day & Ayling, 2014). Phospholipids and cholesterol are components of the cell membrane (Marshall et al., 2014). Rich sources of lipids are vegetable oils, nuts, margarine, fatty meats, cheese, cream, butter and fried foods (Alters & Schiff, 2009).

Vitamin A is a fat soluble vitamin which is important for normal cell division and development, normal body functioning, and for promoting good vision (Sizer, Whitney & Piche, 2012; United States Department of Agriculture, 2017). A man needs about 900 µg of vitamin A per day while a woman requires about 700 µg per day (Sizer, Whitney & Piche, 2012). Children need less amounts of vitamin A than adults. A deficiency of vitamin A results in decreased cell division, impaired immunity, reproductive and growth abnormalities, exhaustion and death (Sizer, Whitney & Piche, 2012). Excess consumption of vitamin A is just as bad as consumption of inadequate amounts because it results in various negative effects. Consumption of over 3000 µg per day may result in over-stimulated cell division, skin rashes, joint pain, abdominal pain, bone and muscle soreness, damage to the liver

and enlargement of the spleen (Sizer, Whitney & Piche, 2012; Alters & Schiff, 2009). A single massive dose of vitamin A can be dangerous. To ensure safe intake of vitamin A, it is recommended that one avoids supplements and obtain it from a regular balanced diet with recommended servings of fruits and vegetables (Sizer, Whitney & Piche, 2012). Foods rich in vitamin A include dark green leafy vegetables, carrots, pumpkins, spinach, sweet potato, liver, fish oil, butter and eggs (Food and Agriculture Organisation of the United Nations, 2016; Sizer, Whitney & Piche, 2012; Health24, 2016).

Another fat soluble vitamin is Vitamin D, which helps in the absorption of calcium from the intestines, in the recycling of calcium into the blood from the glomerular filtrate, and also in regulating blood phosphorous level (Sizer, Whitney & Piche, 2012). Furthermore, it plays a role in bone and teeth development, and in the proper functioning of the brain, heart, pancreas, skin, stomach and reproductive organs (Sizer, Whitney & Piche, 2012; Alters & Schiff, 2009). Deficiency of vitamin D results in osteoporosis, high blood pressure, cancer, diabetes and heart diseases, while excess intake results in damage to the bones, kidney, brain, nerves, heart and arteries. The signs of excess include loss of appetite, nausea, vomiting, increased urination and thirst, and psychological depression (Alters & Schiff, 2009; Sizer, Whitney & Piche, 2012). The body can make its own vitamin D when exposed to sufficient sunlight and can also be obtained from eggs (Alters & Schiff, 2009; Sizer, Whitney & Piche, 2012).

Vitamin E is also a fat soluble vitamin that stops the chain reaction where oxygen radicals attack fatty acids, DNA, protein and cholesterol resulting in the formation of other free radicals (Sizer, Whitney & Piche, 2012). Hence, vitamin E is an antioxidant as it prevents the detrimental reactions initiated by oxygen in the body (Sizer, Whitney & Piche, 2012; Alters & Schiff, 2009). This is particularly important in the lungs and red blood cells where cells are exposed to high oxygen concentrations that can destroy their membranes. Sizer, Whitney and Piche (2012) assert that vitamin E also plays some role in boosting immunity and nerve developments. According to Alters and Schiff (2009) high doses of vitamin E may cause intestinal upsets and bleeding problems. Sizer, Whitney and Piche (2012) and Alters and

Schiff (2009) point out that vitamin E deficient is very rare because it is present in most foods, the body stores much of it in its fatty tissues, and cells recycle their vitamin E supply to ensure that there won't be any vitamin E deficiency. Symptoms of vitamin E deficiency include loss of muscle coordination and reflexes, vision and speech (Sizer, Whitney & Piche, 2012). Vitamin E deficiency is associated with diseases that cause malabsorption of fats or injury to the liver, gall bladder, or pancreas; and that eventually affect fat digestion and hence absorption of fat soluble vitamins including vitamin E (Sizer, Whitney & Piche, 2012). Foods rich in vitamin E include safflower oil, mayonnaise, canola oil, wheat germ and sunflower seeds (Alters & Schiff, 2009; Sizer, Whitney & Piche, 2012).

Vitamin K, according to Sizer, Whitney and Piche (2012), is also fat soluble and is important in the formation of blood clotting proteins and bone proteins as well as ensuring good health of bones in conjunction with vitamin D (Sizer, Whitney & Piche, 2012). The dietary reference intakes for vitamin K are 120 micrograms per day for males and 90 micrograms per day for females. Some good sources of vitamin K include cabbage, cauliflower, canola oil, lettuce, spinach, soya-beans and liver (Sizer, Whitney & Piche, 2012). Vitamin K deficiency may result in haemorrhage and abnormal bone formation while excess intake may cause jaundice (Sizer, Whitney & Piche, 2012).

Vitamin B and C are the water soluble vitamins that are easily leached out by cooking and washing with water (Sizer, Whitney & Piche, 2012). Like vitamin E, vitamin C also acts as an antioxidant and is also important in the proper functioning of the immune system and in scar formation and maintenance (Alters & Schiff, 2009). Inadequate intake of vitamin C may result in frequent infections, bleeding gums, bruises and poor wound healing; while excess intake is associated with diarrhoea, nose-bleeding, headache, weakness and kidney stones (Alters & Schiff, 2009). The B vitamins, which are abundant in liver, nuts and whole grains, are important in energy metabolism, protein and fat metabolism, and DNA production (Alters & Schiff, 2009).

Nutrition status is the condition of the body which results from consumption and utilisation of nutrients contained in food (Joshi, 2010). Good nutrition occurs when there is optimal nutrition or balanced diet which results when a person is receiving and utilising all essential nutrients in correct proportions as required by the body, while providing for an adequate reserve (Joshi, 2010). A balanced diet is reflected through resistance to diseases, increased life span, and good cognitive development (Joshi, 2010; Nabarro, Menon, Ruel and Yosef, 2012; USDA, 2015). Poor nutritional status is a condition that results when there is inadequate or excess intake or poor utilisation of the nutrients to meet the body's needs (Joshi, 2010). Poor nutrient utilisation may occur due to malabsorption syndrome (Eagle, 2012; Frazier & Drzymkowski, 2016). Malabsorption syndrome occurs when the small intestines cannot absorb important nutrients and fluids (Eagle, 2012; Frazier & Drzymkowski, 2016). According to Eagle (2012), malabsorption syndrome may slow down the absorption of macronutrients (protein, carbohydrates and fats) and micronutrients (vitamins and minerals). Eagle (2012) and Frazier and Drzymkowski (2016), assert that malabsorption may be caused by Crohn's disease, parasitic diseases, diseases of the gall bladder, liver or pancreas, damage to the intestine due to infection or radiotherapy, prolonged use of antibiotics, and birth defects such as biliary atresia where the bile ducts become blocked and prevent the flow of bile from the liver. Alkaline conditions required for enzyme digestion in the duodenum and small intestines will not be created and digestion is significantly slowed down (Mackean & Hayward, 2014). Risk factors of malabsorption syndrome include excessive alcohol consumption, cystic fibrosis and family history of malabsorption (Eagle, 2012). Nutrition is influenced by age, religion, culture, economic status, genetics, medicine, health, technology and education (Berdanier, Dwyer & Heber, 2014; Joshi, 2010). It is quite unfortunate to note people eat what they like and not what is influenced by awareness of the nutritive value of food.

According to USDA (2015) and Joshi (2010), the Food Guide Pyramid divides food into six categories. These include: six to eleven servings of the bread, cereal and pasta group that, as highlighted before, mainly provide energy. Whole grain cereals contain thiamine and cellulose (Joshi, 2010). Cellulose provides dietary fibre which prevents constipation. Whole grains are of better nutritive value than polished grain

such as polished rice. Two to four servings of fruits are recommended. These supply natural sugars, fibre, and vitamins and are low in calories and fats. Three to five servings of vegetables that contain many vitamins and minerals are recommended per day (Haywood, 2005; Joshi, 2010). Concentration of vitamins and minerals varies in different vegetables (Eldestein, 2014). This suggests that different types of vegetables must be consumed to obtain the required quantities of vitamins and minerals. Dark green and yellow vegetables are rich in vitamin A, dark orange and vegetable like cabbage, tomatoes and potatoes are rich in vitamin C, and vegetables like broccoli are good sources of iron, calcium, fibre and other minerals (Eldestein, 2014; Joshi, 2010). A diet rich in fruits and vegetables reduces various cancers, heart diseases and stroke (Hou, 2010).

The food guide pyramid recommends two to three servings of the milk, cheese and yoghurt group which is rich in calcium, riboflavin but also provide protein, phosphorous, vitamin A and vitamin D (Hou, 2010). Milk and milk products also contain carbohydrates and thiamine. Many dairy products are also high in saturated fats and cholesterol which are not good for health. From the meat, poultry, fish, beans, eggs and nuts group, two to three servings are recommended. The components from meat, poultry, fish and eggs are major sources of protein, iron, thiamine, niacin, fat, phosphorous and riboflavin. Beans, other legumes and nuts supply zinc and vitamin B12, in addition to the above nutrients (Hou, 2010; United States Department of Agriculture, 2015). The egg yolk is rich in vitamin A and fat (Hou, 2010). Meat, poultry, fish, beans, eggs and nuts, like dairy products, are also high in saturated fats and cholesterol (United States Department of Agriculture, 2015). The group of fats, oils, and sweets should be used in small quantities to avoid excess energy and/or fat which may cause diabetes, high blood pressure and cancers (United States Department of Agriculture, 2015).

Berdanier, Dwyer and Heber (2014) posit that dietary guidelines help in making food choices that promote health and reduce the risk of diseases. The dietary guidelines for 1980, 1985 and 1990 focused on dietary variety and weight maintenance among adults; and reduction of much total fat, saturated fat, cholesterol, sugar and sodium (Berdanier, Dwyer & Heber, 2014). Less than thirty percent of the total calories was to come from total fat and less than ten percent was to come from saturated fats

(Berdanier, Dwyer & Heber, 2014). Similarly, the 1995 dietary guidelines emphasised the consumption of variety of foods from each of the five major food groups in the food guide pyramid (Berdanier, Dwyer & Heber, 2014). The 1995 guidelines placed emphasis on physical activity and moderate alcohol consumption for reducing the risk of heart diseases (Berdanier, Dwyer & Heber, 2014). Unlike the previous guidelines, the 1995 guidelines included nutrition education tools such as the food guide pyramid, and nutrition facts labels that consumers could use to maintain a healthy diet (Berdanier, Dwyer & Heber, 2014).

The dietary guidelines for the year 2000 specified physical activity for adults for thirty minutes or more per day, while sixty minutes or more per day was recommended for children (Berdanier, Dwyer & Heber, 2014). The guidelines further placed emphasis on food safety and separate guidelines for grains, fruits/vegetables which were previously in the same group (Berdanier, Dwyer & Heber, 2014). This made it easier to interpret and put into practice. The 2005 guidelines were exactly the same as the 2000 guidelines. However, the 2005 food guidelines took into account the nutrients that were lacking in the diet of a large proportion of individuals in the American population (Berdanier, Dwyer & Heber, 2014). These included vitamin E, calcium, magnesium, potassium and fibre in adults and children, and vitamin A and vitamin C in adults. Like the previous guidelines, the 2005 guidelines emphasised the need to take many fruits and vegetables, whole grain, low fat dairy, as well as imposed limits on added sugars, fats and salt. There was also a new emphasis to avoid trans fatty acids (Berdanier, Dwyer & Heber, 2014). Trans fatty acids raise the blood cholesterol level and increase the risk of heart diseases and are found in margarine, baked foods and fried foods (Alters & Schiff, 2009).

According to the United States Department of Agriculture (USDA), United States Department of Health and Human Services (USDHHS) (2010) as well as Berdanier, Dwyer and Heber (2014), the 2010 dietary guidelines for Americans focused on the need to reduce the incidence and prevalence of overweight and obesity, by reducing caloric intakes and consumption of foods like solid fats, alcohol and added sugars. It also focused on improving physical activity, reducing time spent in sedentary behaviours, reducing the intake of sodium to less than 2300mg per day, limiting

refined grains, and moderate consumption of alcohol only by adults of legal drinking age (Berdanier, Dwyer & Heber, 2014; United States Department of Agriculture and United States Department of Health and Human Services, 2010). The 2010 dietary guideline further recommended the consumption of less than 300mg/ day of dietary cholesterol, keeping intake of fatty acids low, increase intake and variety of vegetables (dark green, red and orange vegetables) and fruits, consumption of at least half of all grains as whole grains, increase intake of low fat milk, choosing variety of protein foods including seafood and using oils in place of solid fat (Berdanier, Dwyer & Heber, 2014; United States Department of Agriculture and United States Department of Health and Human Services, 2010). Solid fats contain a lot of saturated fats that raise the risk of heart diseases and raise blood cholesterol level (Alters & Schiff, 2009; Berdanier, Dwyer & Heber, 2014). Saturated fats are found in chicken fat, lard, beef fat, coconut oil and butter (Alters & Schiff, 2009). Seafoods (fatty fish such as salmon, herring, tuna and mackerel), canola oil and soyabean oil contain omega-3 fatty acids which reduce the risk of heart diseases (Alters & Schiff, 2009). According to Watson and Preedy (2013), pilchard fish are rich in omega-3 fatty acids, vitamins A, B, C, D and E, and minerals including iron, calcium, magnesium and phosphorous. Fish intake helps to maintain the ratio of good to bad cholesterol, which is important in sustaining good heart health and reducing the risk of stroke and cardiovascular diseases. Fish also contain vitamin B_{12} which protects the walls of the arteries and promote cardiovascular health (Watson & Preedy, 2013).

MyPlate provide additional guidelines and was introduced by the USDA Centre for Nutrition Policy and Promotion in 2011 (Berdanier, Dwyer & Heber, 2014). This was introduced after it was observed that most people had problems in putting the Food Guide Pyramid into practice as they did not understand the issue of servings and serving size (Berdanier, Dwyer & Heber, 2014). MyPlate uses a visual representation of recommended foods from dietary guidelines for Americans, using a plate with spaces for fruits, vegetables, grains, protein rich foods and dairy products (USDA, 2017 & Berdanier, Dwyer & Heber, 2014). MyPlate focuses on variety, amount and nutrition. MyPlate encourages people to consume more and varied fruits and vegetables, whole grains, low fat milk, low sodium; to reduce foods high in solid fat,

added sugars and salt; to eat the right amount of calories; and to be physically active (Dwyer & Heber, 2014). Half of the plate should be fruits and vegetables. According to USDA (2017), a healthy eating style avoids overweight and obesity, and reduces the risk of heart diseases, diabetes and cancer.

The aim of dietary guidelines is to determine nutrients that fall within the recommended dietary intakes. Berdanier, Dwyer and Heber (2014) define dietary reference intakes as recommendations for nutrient intake for healthy people of all age groups, which are needed to prevent nutrient deficiencies and chronic diseases. They can be used to asses if nutrient intake is adequate. Dietary reference values include estimated average requirement (EAR) and recommended dietary allowances (RDA), adequate intake (AI) and the tolerable upper intake level for nutrients (UL).

EAR is the average daily nutrient intake level that will meet the needs of half of the population group, whereas the RDA is the average daily nutrient intake level that will meet the needs of half the population group (Berdanier, Dwyer & Heber, 2014). The RDAs for individuals in the 14 to 18 year age group are shown in Table 2.1. AI is the amount of a nutrient that is assumed to meet the nutrient needs of healthy people. UL is the highest average daily nutrient intake level that is likely to pose no risks or adverse health effects (Berdanier, Dwyer & Heber, 2014).

Table 2-1: WHO Recommended Dietary Allowances for various nutrients per individual/day. (1Kcal = 4,184kj).

Nutrient component	Gender	14-18 years	Average for males & females
Energy (Kcal/day)	Males	2200	1000
	Females	1800	
Carbohydrates	Males	130	130
	Females	130	
Protein (g)	Males	52	49
	Females	46	
Fat (g)	Males	70	64
	Females	58	
Fibre (g)	Males	38	32

	Females	26	
Calcium (mg)	Males	1300	1300
	Females	1300	
Iron (mg)	Males	11	13
	Females	15	
Iodine (µg)	Males	150	150
	Females	150	
Zinc (mg)	Males	11	10
	Females	9	
Magnesium (mg)	Males	410	385
	Females	360	
Phosphorous(mg)	Males	1250	1250
	Females	1250	
Vitamin A (µg)	Males	900 (36000IU)	800 (32000IU)
	Females	700 (28000IU)	
Thiamin (mg)	Males	1.2	1.1
	Females	1.0	
Niacin (mg)	Males	16	15
	Females	14	
Vitamin C (mg)	Males	75	70
	Females	65	
Folate (µg)	Males	130	130
	Females	130	
Vitamin E (mg)	Males	15	15
	Females	15	

(Drake, 2017: RDAs 14-18; Damodaran, Parkin & Fennema, 2007; Otten, Hellwig, & Meyers, 2006).

Acceptable macronutrient distribution ranges are used to determine whether adults are consuming appropriate amounts of macronutrients (carbohydrates, proteins and fats). They determine the range of intake of macronutrients that is associated with reduced risk of chronic diseases. Infection by diseases may call for greater demand for some nutrients.

According to Fox and Cameron (1995) and Joshi (2010), diet must be balanced to maintain good health. Excess or inadequate quantities of food may result in

nutritional related disorders. In sub-Saharan Africa, vitamin A, iodine, iron, zinc, and folate lack in a significant proportion of the population (Health24, 2016; Buhl, 2010). Sub-Saharan Africa, according to Health24, has the highest prevalence of vitamin A deficiency, which is the leading cause of childhood blindness. Although iodine deficiency can be prevented through food fortification including salt, Health24 (2016) notes that 324 million people in Africa, who included a significant number of school children had insufficient iodine intake in 2011. Although South Africans include iodised salt in their menus, school children are reported to have insufficient iodine intake (WHO, 2016). Health24 (2016) highlights that the prevalence of iron deficiency exists in both developed and developing countries resulting in more than 30% of the world's population being anaemic due to iron deficiency. Aliyar, Gelli and Hamdani (2015) note that Vitamin C facilitates the absorption of iron, which makes it important to obtain enough vitamin C to minimise the possibility of iron deficiency. Anaemia results in impaired physical and mental development in children and reduced work productivity in adults (Health24, 2016). Addressing micronutrient deficiency requires interventions which include fortification of food and greater dietary diversity (Eldestein, 2014; Berdanier, Dwyer & Heber, 2014; Health24, 2016).

Rendall-Mkosi, Wenhold and Sibanda (2013) and Altman, Hart and Jacobs, (2009) assert that the most critical nutrient deficiencies for South Africa are vitamin A, Iodine and iron. There is need to research how these deficiencies are being addressed. There are also problems of underweight, overweight and obesity (Tathiah, Moodley, Mubaiwa, Denny & Taylor 2013; De Ridder & Coetzee, 2013). According to Tathiah et al. (2013) micronutrient deficiency in South Africa was partly caused by a shift from traditional diets rich in whole grain to diets rich in refined starch and sugars. High food prices in the poor communities must also have contributed the nutrient deficiencies. Shisana et al. (2014) posit that under-nutrition and over-nutrition in the South African population result from diet that mostly consists of cereals and limited animal protein and vitamin A enriched vegetables and fruits. Although fortification programmes have been introduced to try and curb micronutrient deficiency, the programmes appear not to have significantly improved dietary diversity or macronutrient intake (Shisana et al., 2014).

The problems of underweight, overweight, obesity, lack of dietary diversity and low protein intake were also observed in a study by Adamu, Adjei and Kubuga (2012) in Tamale Metropolis in Ghana. The school meals sometimes lacked vegetables and milk was sometimes supplied once per week as highlighted in the background. About 29.8 per cent of school-age children throughout the world do not take in sufficient Iodine (Anderson, Karumbunathan & Zimmermann, 2012). The food provided in the school nutrition programme needs to be fortified with critical nutrients to alleviate problems associated with deficiencies of such nutrients. Department of Basic Education (2009) highlights that maize meal, bread or flour should have a logo indicating that they have been fortified. Bundy et al. (2009) also notes that the school nutrition programme was intended to address micronutrient deficiency through the provision of fortified foods. However, the researcher observed that fortified foods tend to be more expensive than non-fortified foods. It is possible that suppliers may supply cheaper products to maximise on profit if they are not well monitored. The secondary school proposed menu for KwaZulu-Natal Province in South Africa is shown in Table 2.2.

Table 2-2: KwaZulu-Natal Province: Secondary School Menu

Day	Meal plan	Menu (food item)	Dry portion size
	Protein	Soya mince relish	45g
	Starch	Boiled rice	60g
Monday	Vegetable/Fruit	Braised cabbage	80g
	Protein	Sugar beans stew	40g
	Starch	Phutu	80g
Tuesday	Vegetable/Fruit	Carrots	80g
	Protein	Pilchard stew	40g
	Starch	Boiled rice	60g
Wednesday	Vegetable/Fruit	Braised spinach and tomatoes	80g
	Protein	Sugar beans stew	45g
	Starch	Cooked samp	60g
Thursday	Vegetable/Fruit	Boiled pumpkin/butternut	80g
	Protein	UHT milk	250ml
	Starch	Phutu	60g
Friday	Vegetable/Fruit	Whole fruit	1 medium size

Department of basic education (2016)

The daily food items consist of a major source of protein, starch as well as a vegetable or fruit as a major source of vitamins or minerals. The menu provides a variety of vegetables which include yellow and green vegetables which are rich in different types of vitamins and minerals.

Meals in the Mali feeding programme are enriched with vitamins and minerals and consist of staple foods (millet, sorghum, maize, and rice), legumes, oil and pulses (such as cowpeas), meat and/or fish (Bundy et al., 2016). There are no nutritional standards for quality or quantity set for school meals. The meals do not emphasize the consumption of fruits and vegetables which several studies have identified as lacking in the diets of many school children.

Unlike the menus in Mali, menus in the Osun State School Feeding Programme in Nigeria are well structured. The meals consist of yam, fish stew and orange on Mondays; rice, beans, chicken and orange on Tuesdays; beans porridge, bread, whole egg and banana on Wednesdays; rice, egusi garnished with vegetables, chicken and banana on Thursdays; and finally, Coconut porridge, vegetables, beef and pawpaw on Fridays (Bundy et al., 2016). The menus seem are excellent if properly followed as they contain *energy rich foods*, *protein* rich foods, and *vegetables or fruits* everyday which are good sources of vitamins and minerals.

According to Laar (2016) caterers in Ghana School Feeding Programme are expected to follow a weekly menu endorsed by the district and school implementation committees. Although meals may vary by region and according to season, they are made from *energy rich carbohydrates sources* (rice, maize, cassava, plantain, yams), main *protein source foods* (Beans, fish or fish powder) and vegetable oil, palm oil, and shea butter as the common *fats* used (Laar, 2016). The same author indicates that *vegetables* like okra, local green leafy vegetables (“edeme”, “nkontomire”), tomato and onions are used in sauces and soups while fruits are rarely used due to financial constraints. In the northern regions, food items such as maize, beans, rice, gari, soya beans, cowpeas, fish, yams, meat, eggs, groundnuts, vegetables, and fruits were considered in the menu while the southern region considers maize, beans, rice, gari, groundnuts, palm fruits, plantains, yams,

fish, meat, eggs, vegetables, and fruits (Bundy et al., 2016). There are no guidelines on the quantities of ingredients to be used per child or the serving per child. However, a typical ration breakdown for primary schools consists of 150 grams of cereal (rice or maize) with 40 grams of legumes (beans or peas) and 10 grams of vegetable oil per child per day. This provides slightly above the 30% recommended dietary allowance (approximately 760 kilocalories).

2.3.4 Challenges encountered in the implementation of the school nutrition programme

Several challenges exist in the implementation of the school nutrition programme. One of the problems that exists is the absence of infrastructure. In South Africa, Hochfeld, Graham, Stuart and Gent (2015) and Rendall-Mkosi, Wenhold and Sibanda (2013) highlight the absence of kitchens in schools that were observed in in Eastern Cape and Mpumalanga schools. Bundy et al. (2016) also observe the absence of proper kitchens as well as storage facilities in schools in South Africa. Lacey (2012) further observed the lack of preparation, cooking and eating facilities that meet health and safety standards. The problem of infrastructure exists in many countries in the middle and low income groups like Ghana (Okae-Adjei, Akuffo & Amartei, 2016).

It was highlighted in the background of the study that cooking in some schools in Ghana was done under the trees. As highlighted in the background, most countries in middle and low income groups lack sufficient funding to support the school nutrition programme (Okae-Adjei, Akuffo & Amartei, 2016). According to Quila and Tyilo (2014), lack of funding may result in irregular supply of food, stale food, lack of food variety, particularly lack of fruits and vegetables. Kwatubana and Makhalamele, (2015) as well as Overy (2010) further indicated that the food supplied was sometimes insufficient or stale, and vegetables were not always fresh. Sometimes food shortages resulted from food being stolen by caterers and teachers or corruption by some government officials due to lack of proper monitoring (Quilo & Tyilo, 2014). In some instances, lack of funding resulted in delays in payment of caterers. Kwatubana and Makhalamele (2015) indicated that food handlers/caterers in Sedibeng West district in Gauteng, and in the Fezile Dabi district of the Free State

province got frustrated as their contract expired as it was not easy for them to get employment elsewhere. Sometimes parents became reluctant to be involved in other duties where they were not paid due to the frustration that they got as the contract expired. Bundy et al. (2016) notes that food handlers and principals in Eastern Cape felt that the national school nutrition programme was a burden to them.

In South Africa, Rendall-Mkosi, Wenhold and Sibanda (2013) observe that, in some instances, corruption further deepens the problem of financial inadequacy. This result in poor quality of food delivered to schools (Lacey, 2012). Kwatubana and Makhalamele (2015) indicate that in one school, the food handler was responsible for receiving supplies and was forced to sign for fewer items supplied than the items on the list. The same report indicated that the principal did not allow the teacher co-ordinator to receive the food supplies. This was not according to the guidelines of the NSNP guidelines where the teacher co-ordinator was expected to check the deliveries of food to ensure that the standard guidelines of the food were met and the quantities supplied matched what was on the records.

The problem of maintaining nutritional quality and quantity was also experienced in Ghana School Feeding Programme where there were no guidelines for quantity of ingredients to be served (Bundy et al., 2016). Fernandes, Galloway, Gelli, Mumuni, Hamndani, Kiamba, Quarshie, Bhata, Aurino, Peel and Drake (2016) note that the guidelines in the Ghana School Feeding Programme instructed schools to provide nutritious meals but did not provide clear specifications. They also indicated that National Nutritional Guidelines were not available and there were no standard school meals, and menus did not specify the ingredients quantities and portion sizes, all of which are important to the nutrient content of the meals. Fernandes et al. (2016) assert that micronutrients (vitamins and minerals) did not meet international recommendations and there was no guidance available before 2014/15 school year on the tendering process of foods. Caterers, according to Fernandes et al. (2016), could have provided smaller or lower quality meals to maximise their profits due to lack of meal standard specifications.

The meal planner tool that was implemented in some schools in Ghana was intended to assist in providing meal standard specifications. However, Fernandes et

al. (2016) indicate that some participants in the Ghana School Feeding programme that used the meal planner tool did not have sufficient nutrition knowledge and had difficulty in working with the meal planner tool and in determining appropriate combinations and quantities of foods. Handy measures were positively recommended as they ensured that the amount of the food served was of the correct quantity. However, use of handy measures such as serving ladles, paint bucket, the wooden blocks for fish and meat, made the meals too expensive (Fernandes et al., 2016). Implementation of behavior change communication was uneven due to delays in the provision of training in schools. Some of the behavior change communication activities were played in 15 radio stations during 2014/15 school year in the form of jingles that were interesting to children and households but high costs of foods like fruits and vegetables were barriers to meal diversification (Fernandes et al., 2016). Fernandes et al. (2016) also noted that meals that met the 30% RDA targets exceeded the per meal allowance for caterers and it was important for the tool to suggest alternative low cost meals.

Where kitchens were available, Rendall-Mkosi, Wenhold and Sibanda (2013) observed that some schools in South Africa were keeping the gas cylinders inside kitchens. This was a violation of the safety standards provided in the National School Nutrition Programme safety directory (Hochfeld, Graham, Stuart, & Gent, 2015). Poor sanitation is also observed as a challenge in the school nutrition programmes as highlighted in the studies in Brazil by Medeiros, Lima, de Almeida Maffi, et al. (2015) and in the Eastern region of Ghana by Okae-Adjei, Akuffo and Amartei (2016), and further supported by Maijers and Nalla (2014) in a different study in Ghana.

Hochfeld, Graham, Stuart and Gent (2015) assert that involvement of community members in the programme activities like management and implementation was scarce. Moreover, food was procured from large shops and commercial farmers and not from small scale farmers around the school. Kwatubana and Makhalamele (2015) further endorse the idea that suppliers in Sedibeng West district in Gauteng, and in the Fezile Dabi district of the Free State province were not from the local community. This is similar to the school feeding programme in Osun in Nigeria (O'MEALS) which had many challenges including limited involvement of small holder

farmers due to inaccessibility to adequate fertilisers, technology, improved seed varieties and irrigation, in addition to insufficient capital and incompetitive products (Bundy et al., 2016). The same authors also highlighted that the O'MEALS programme in Nigeria also faced challenges of taste and preference of communities, which forced the suppliers to buy imported rice from outside leaving out the local produce. Lack of skills and technology was also evident in Kenya School Feeding programme, where the small holder farmers had to be linked to Agricultural Extension Officers for advice on farming and to organisations that provided agricultural inputs. The background to the study underscored the importance of involving small-scale farmers as it increased household income and brought in food that is consistent with the learners' culture and is likely to be more acceptable.

Stakeholders in some schools in South Africa indicated that they were not involved in decision making as policies were dictated to them, depriving them of the opportunity to share their divergent views (Quila & Tyilo, 2014). The department only communicated with the schools through meetings held with school principals who were to share the information for the meeting with other stakeholders.

According to The Partnership for Child Development (2012), the school feeding programme in the State of Osun in Nigeria had the challenge of having rigid meals which compromised the quality as well as the quantity of food. Price increases due to change in season determine food availability. Furthermore, small scale farmers were not well structured.

Caterers in the Ghana School Feeding Programme (GSFP) had the challenge of managing frequent price fluctuations of food items against delays in payments from the GSFP (Bundy et al., 2016). Although price increases of up to 400% were expected on some of the food items, caterers could not buy food in bulk at a cheaper price due to the delays in payment. Furthermore, caterers were reported to be buying on credit from traders and this weakened their overall negotiation power (Bundy et al., 2016). Furthermore, the small holder farmers were not willing to sell their produce on credit because they feared the risk of not getting their payment after providing service.

The school feeding programme in Brazil was centralised at Federal level and the logistics were very complex and expensive, with constant losses due to long distances. Furthermore, controlling and monitoring programme implementation were major challenges. The money transferred at federal level was complemented by funds from states and municipalities. Sharing responsibilities between the three Federative levels is an important principle of the Brazil School Feeding Programme (PNAE). The PNAE incorporated new dimensions and contributed to intersectoral co-ordination amongst the different ministries, especially between agriculture and education. The PNAE has shown progressive improvements through the years.

Feeding in a large setting is complex. This is so because humans have taste and a set of acceptable foods which is sometimes guided by culture (Hayes & Berdan, 2013). When people from different cultures meet in an organisation like a school, they must all be well catered for. This is not always easy due to financial constraints in the school nutritional programmes, as highlighted in the background to the study.

2.3.5 Nutritional Education

There is a prevalence of malnutrition (undernutrition and over-nutrition) and micronutrient deficiency in developing countries including South Africa (Mushapi, Dannhauser, Mbhenyane, & van Rooyen, 2015; Prince & Laar, 2014; Temple & Steyn, 2016; Van den Berg, Albera, Nel & Walsh, 2013). In a study carried in Tamale in Ghana by Adamu, Adjei and Kubuga (2012), the nutritional knowledge of respondents was observed to be very poor. One of the ways to deal with such problems is to introduce nutrition education in primary and secondary schools. In South Africa, nutrition education is one of the objectives of the national school nutrition programme (Department of Basic Education South Africa, 2014).

According to Contento (2010) and Stang and Story (2005), nutrition education involves various educational strategies and environmental support aimed at acquiring the knowledge, skills, attitudes and behaviour that enhance healthful food choices and active physical activity. Nutrition education, as highlighted by Temple and Steyn (2016), deals with nutrient functions, food groups, how the diet should be

constituted, and what happens if inappropriate quantities are consumed. Nutrition education may occur in group class, through verbal individual instruction, through written instructions, electronic communication and visual aids (Jansen, Kendall & Jansen, 1990). Fernandes et al. (2016) highlight that nutrition education in Ghana School Feeding Programme was done using posters and songs promoting healthy diets. According to Fernandes et al. (2016), the meal planner tool in Ghana School Feeding Programme enabled participants to learn about the nutrition value of locally available foods, and to determine the quantities of food stuffs to procure. The Meal Planner Tool according to Fernandes et al. (2016) also enabled the planners to correctly estimate the quantity of food the caterer needs to prepare per child and maintains the quality of food.

Lack of nutritional education results in various problems such as overweight and obesity. Overweight results from availability of cheap, high energy non-nutrient dense foods, and increased consumption of sugary carbonated drinks (Contento, 2010; Williams & Fruhbeck, 2009). According to Williams and Fruhbeck (2009), weight gain may also be a result of genetic diseases such as Prader-Willi Syndrome which is caused by a malfunction in the part of the brain that controls feelings of fullness and hunger. People with Prader-Willi Syndrome never feel full and have a constant urge to eat, that cannot be controlled.

Holli and Beto (2014) add biological factors such as high birth weight, maternal diabetes and obesity in family members as potential risk factors for overweight and obesity in children. Lack of physical activity, misconceptions, passing on harmful diet traditions and poor nutrition practices from parents to children also contribute to malnutrition (Van den Berg, Albera, Nel & Walsh, 2013).

According to the United States Department of Education (1996) and Lacey (2012), under-nutrition may result from poverty which reduces the opportunity of getting a varied diet. Another important factor that contributes to malnutrition is the lack of understanding of the specific role of nutrition in the development and treatment of diseases like obesity, cardiovascular diseases, dental caries and diabetes (Mnakwe, 2013; United States Department of Education, 1996). In schools, this information may be provided by teachers. Oldewage-Theron and Egal (2012) observes that Life Orientation teachers in South Africa were lacking health and nutrition related

knowledge. However, their knowledge improved after a nutrition education programme intervention. These teachers are expected to provide nutrition education knowledge to learners, which is a big challenge. This gap needs to be closed if learners are to get adequate nutrition knowledge and skills.

Nutrition education intervention programme in South Africa should be based on South African food-based dietary guidelines, and should address issues of variety of foods in each food group, hygiene and sanitation, starchy foods as the bases of meals, and eating plenty of vegetables and fruits everyday (Mushapi, Dannhauser, Walsh, Mbhenyane and van Rooyen, 2015). According to Lacey (2012), nutrition education can be provided through school curriculum, media campaigns and distribution of resource materials like charts, pamphlets and posters to deliver messages on good nutrition. Furthermore, Lacey (2012) highlights that nutrition education also involves the provision of gardening knowledge and skills. Williams and Fruhbeck (2009) further emphasise the importance of physical activity in nutrition education. According to Williams and Fruhbeck (2009) and the Department of Education South Africa (2014), nutrition education involves planning meals, making food budget, reading food labels, and eating a balanced diet. Moreover, nutrition education should include hand washing, food safety, healthy snacks, healthy beverages, food preparation and kitchen safety (Department of Basic Education South Africa, 2014; Williams and Fruhbeck, 2009).

Stang and Story (2005) assert that nutrition education involves teaching about the importance of nutrition, providing educational materials that reinforce messages about healthy eating, and teaching skills essential for making dietary change. It also provides information on how to sustain the changed behavior (Thompson, 1977).

2.3.6 Previous empirical studies

This section shows different empirical studies that were carried out on the school feeding programme as well as what the present study seeks to achieve.

The study entitled “A Review of Nutritional Guidelines and Menu Compositions for School Feeding Programs in 12 Countries” by Aliyar, Gelli, and Hamdani (2015) had the objective of analysing the nutritional guidelines and menu compositions of school

meal provision in various countries. This was a quantitative study. The study determined the nutritional value of the food served in the school nutritional programmes in different countries. It established the quantity of each food item served per day per person. It then determined the nutrient content in each quantity of food served. The daily nutrients content served to each person per day was expressed as a percentage of the recommended dietary allowances of the learners in the age group of 10 to 14 years. Literature search was done using Ovid MEDLINE databases. Nutrient composition of menus was calculated from nutritional guidelines of menu compositions using a nutrition linear programming tool NUTVAL.

Aliyar, Gelli, and Hamdani (2015) observed that high-income countries had guidelines and standardised menus in the school nutrition programme while low income countries lacked standards and guidelines in terms of menu composition. The focus of the study was on on-site feeding and lunch time meals only. Reviews were done to obtain nutritional guidelines and state school feeding documents to obtain menu compositions. The nutritional values were compared with the Recommended Dietary Allowances advised by the World Health Organisation for each nutrient. Nutrition guidelines were obtained for England, France, USA and Brazil and the percentage component of nutrients was calculated using these guidelines. There were no nutritional guidelines in Ghana, Kenya, India, Mali, and Rwanda. Nutrient values were calculated using the “Nutval” nutritional value calculator from a sample of menu compositions found for each country in the literature. Ghana did not have the guidelines or the daily ration amount for menu composition, so values were estimated in comparison with other countries in the region.

In their study, Aliyar, Gelli, and Hamdani (2015) indicated that high-income countries had very different objectives and goals compared to middle and low income countries. High income countries aimed to reduce fat intake as well as to ensure adequate intake of essential nutrients while middle and low income countries aimed to alleviate hunger, increase enrolment of children in schools and, in the long term,

to improve the nutritional status, cognitive development and retention of school children. In high income countries, healthy school meals seek to deal with the increasing prevalence of overweight and obesity. The meals are aimed at modeling healthier eating habits and food choices. There is also an increasing focus on education on healthier food choices. Policies in low and medium income countries are driven by the need to reduce poverty, promote food security and increase and enhance educational attainment for the population.

The same study by Aliyar, Gelli, and Hamdani (2015) revealed that England, France, USA and Brazil had nutritional guidelines, whereas Ghana, India, Kenya, Mali and Rwanda did not have nutritional guidelines. In all countries there was no literature verifying the implementation of these guidelines and menus. This is one area that the current study seeks to interrogate. In the study, high income countries and Brazil recommend that the menu provide 30% to 40% energy requirement of RDA while the remaining middle and low income countries, menu compositions propose that the menus contain about 30% of energy requirement of the RDA. Protein intake is variable in high income countries with England and France recommending 30% and 15% respectively. Protein intake in low and medium-income countries is high with Brazil recommending 40% and the rest of the countries range from 29% to 62% of RDA due to inclusion of large amounts of cereals.

According to the study by Aliyar, Gelli, and Hamdani (2015), school meals in high-income countries had high levels of fat (35% of the RDA in England and France and 30% in USA). Brazil recommends fat content of about 40% of RDA while in the middle and low income, the fat composition in the menu varies from 24% to 37%. High income countries guidelines recommend iron intake of up to 35% of RDA (England, USA) and 50% of the RDA in France. Brazilian guidelines recommend iron at 13% of the RDA. There is much variation in recommended guidelines for iron intake in medium and low income countries. There were no nutritional guidelines for iodine in high income countries. India, Kenya, Rwanda and South Africa menus provided 131%, 129%, 129% and, 59% of the RDA respectively. Ghana did not mention the inclusion of iodised salt in the menus.

Aliyar, Gelli, and Hamdani (2015) assert that guidelines in England and USA recommend that menus should contain 35% to 40% of the vitamin A RDA respectively. Brazil guidelines recommend 38%, while menus in Ghana and Kenya have 68% and 50% of the RDA for vitamin A respectively. This is due to consumption of palm oil in Ghana and maize in Kenya both of which are high in vitamin A content. Rwanda has 39% of the RDA for vitamin A while India and South Africa indicate very low vitamin a content of 9% and 2% of the RDA respectively. The study indicates that more research needs to be done to find out if this is being addressed.

The aim of the study by Hochfeld, Graham, Stuart and Gent (2015) was to evaluate the impact of the National School Nutrition Programme and Tiger Brands Foundation feeding programme on the learners in primary and combined schools in the Lady Frère district of the Eastern Cape Province in South Africa.

The objectives of the study were to evaluate the impact of the programmes on learners' nutritional status and to assess programme impact on attendance and school performance. The study also focused on school and social benefits related to the programme as well as challenges related to the programmes. In the study, a mixed method approach was evident as quantitative data was collected through the use of questionnaire while qualitative data was collected through interviews. The study data was collected in 2 phases. The first phase gathered quantitative data which included anthropometric data particularly weight, standing height, sitting height and triceps skinfold. A nutritional questionnaire was also administered in the first phase of the study. The questionnaire was a 24-hour dietary recall to indicate the food variety consumed by the learners over the 24 hour period.

In the study by Hochfeld, Graham, Stuart and Gent (2015), the intake of fruits and vegetables, which are sources of vitamin A and are most neglected, were also assessed in the 24-hour dietary recall. School attendance and performance records were assessed in the control schools, in schools implementing the NSNP only, and in schools implementing both the NSNP and the TBF breakfast programme. Qualitative data was collected in phase two through observation, key informant interviews with stakeholders, and focus groups with learners.

The results from the study by Hochfeld, Graham, Stuart and Gent (2015) indicate that children receiving the NSNP only, had stunting rates that were lower than the average stunting rate of 23% for the children living in the Eastern Cape aged between 0 to 15 years. Receiving two meals at school further reduced stunting among children. The results also indicated that, in all the schools included in the study, there were few learners who were under-weight. The differences observed between schools receiving TBF breakfast and NSNP food only was not significant. The study also indicated that learners in schools that were not receiving the nutrition programme were more likely to be overweight and obese than in schools receiving the nutrition programme. Females were more likely to be obese or overweight than males.

The nutritional information in the same study by Hochfeld, Graham, Stuart and Gent (2015) revealed no major differences in the quality of food served in schools. Most of the children ate none or one portion of fruit and vegetables the previous day and none ate the recommended five portions of fruits and vegetables a day. Dietary diversity was also poor with none of the children eating the maximum seven different types of foods and there were no major differences in dietary diversity among school types. The results further indicated that the learners' performance was better in schools receiving both the NSNP and TBF breakfast than in schools receiving NSNP only or none. The research further indicates that learners in control schools that did not receive any food had problems in participation due to hunger, while learners receiving one or both programmes were active in and outside the classroom.

The study by Hochfeld et al. (2015) found that attendance was good in schools receiving the NSNP, and much better in schools receiving TBF breakfast and NSNP food. School principals felt that the provision of meals motivated learners to attend. Community members like food handlers felt that the programme provided employment which was not easy to get. Learners were being taught about good eating habits in life skills lessons. Learners interviewed knew about the basics of healthy eating. They were able to list healthy food groups and unhealthy groups, such as fats and sugars.

A different study by Silangwe (2012) in KwaZulu-Natal in South Africa determined the nutritional status of children between 13 and 18 years old by anthropometric

measurements and further determined the dietary intake of adolescent girls through the use of a food frequency questionnaire and a 24-hour dietary recall.

The results of the study by Silangwe (2012) indicated that girls consume fast food at least once per week and the majority of the participants had more than 3 meals per day. The study revealed that a number of people were not meeting the dietary reference intakes for specific nutrients. The study revealed that the intake of most nutrients was below the Nutrient Adequacy Ratio, especially for vitamin A and calcium. This could be due to observed low intake of fruits and vegetables among the participants in the study. Rice and maize meal were the major sources of energy. The dietary fibre intake was observed to be less than the dietary fibre intake of 25g per day. Chicken and beef intake was observed to be low. Among learners who consumed beef stew, the portion sizes were observed to be too small. The body mass index data indicated that most girls had normal weight while a small percentage of the girls were underweight. A significant proportion of the girls were at risk of being overweight or obese.

Quila and Tyilo (2014) carried out a different study in the Eastern Cape in South Africa. The objectives of the research were to find out the involvement of stakeholders in the implementation of NSNP in primary schools, and to determine training and support given to stakeholders and challenges they encounter in the implementation of NSNP primary school. The research by Quila and Tyilo (2014) followed the interpretivist paradigm and a qualitative research approach. The instruments used were the face to face in-depth interviews and document analysis. There was no use of figures or statistical analysis. The results of the study indicated that stakeholders were not involved in the decision making process and there were no training workshops for the stakeholders involved in the programme. The stakeholders lacked the knowledge and skills that were appropriate for effective implementation of the programme.

The study on the school feeding programme by Langsford (2012) was based on two schools in Katlehong Township in Gauteng province in South Africa. The study focused on how menus were created and how the programme was implemented and managed. The study revealed lack of training for food handlers as well as lack of financial resources for regular training as limiting the knowledge and skills of food

handlers. The study also indicated that learners were not regularly involved in the school gardens. The school feeding programme was well managed in one school while in the other school it was poorly managed.

This study, in addition to other objectives, determined the nutrition composition including vitamin A, iron and zinc composition of the menus served in the school nutrition programme. The study also focused on the menu guidelines and investigated whether the guidelines were being adhered to. The mass of various food items consumed by learners at each school was determined. This information was obtained from food handlers and suppliers of food items. The average amount consumed by a learner was calculated. The nutrient composition of each food item was determined using food composition tables as well as nutrient composition shown on some of the food labels. The total nutrient intake value for each nutrient per school was determined. The mean nutrient intake per learner per day was obtained by dividing the total intake over five days by 5 and by the number of learners in the school. The study also focused on training, monitoring and support given to key role players in the National School Nutrition programme. This was obtained through the use of in-depth interviews and the questionnaire from learners, which provided some information on this aspect. The study also focused on how the preparation and procurement of food was accomplished through the observation of policy documents, observation of the real situation on the ground, and through interviews with various stakeholders. Training, monitoring and support given to stakeholders and challenges encountered were determined from various stakeholders. The study also determined the implications of the school nutrition programme on learners' nutrition education.

2.4 SUMMARY

Aliyar, Gelli, and Hamdani (2015) indicate that nutritional guidelines were present in countries such as England, France, USA and Brazil whereas countries such as Ghana, India, Kenya, Mali and Rwanda did not have nutritional guidelines. Aliyar, Gelli, and Hamdani (2015) observed that for all countries that had nutritional guidelines, there was no literature verifying the implementation of the guidelines and menus. Hochfeld, Graham, Stuart and Gent (2015) alleged that there was misappropriation of funds in the NSNP. According to Kwatubana and Makhalamele

(2015) and Quila and Tyilo (2014) stake holders of the NSNP in South Africa appeared not to have been trained on programme implementation and financial management. In addition, Rendall-Mkosi, Wenhold and Sibanda (2013) observed that visits to schools by district and provincial officials appeared to be irregular and there seemed to have been no mechanism in place to monitor the quantity and quality of food prepared and served to the individual learners each day at each school. For the proper implementation of the guidelines, service providers, food handlers and monitors need to be well trained to ensure that guidelines and menus are adhered to. Misappropriation of funds, lack of training and irregular visits by district and provincial officials may result in poor implementation of guidelines and menus. Hence, the researcher had to focus on the programme implementation process to ascertain if the learners were getting the maximum benefits out of the programme.

Sub-Saharan Africa has the highest prevalence of vitamin A deficiency, which is the leading cause of childhood blindness. Moreover, iodine, iron, zinc, and folate lack in a significant proportion of the population in Sub-Saharan Africa (Buhl, 2010; Health24, 2016). Although iodine deficiency can be prevented through food fortification including salt, Health24 (2016) notes that 324 million people in Africa, who included a significant number of school children had insufficient iodine intake in 2011. Although South Africans include iodised salt in their menus, school children are reported to have insufficient iodine intake (WHO, 2016). Health24 (2016) highlights that the prevalence of iron deficiency exists in both developed and developing countries resulting in more than 30% of the world's population being anaemic due to iron deficiency. Rendall-Mkosi, Wenhold and Sibanda (2013) and Altman, Hart and Jacobs, (2009) assert that the most critical nutrient deficiencies for South Africa are vitamin A, Iodine and iron. There was need to research how these deficiencies were being addressed. Although fortification programmes have been introduced to try and curb micronutrient deficiency, the programmes appear not to have significantly improved dietary diversity or macronutrient intake (Shisana et al., 2014). Under-nutrition and over-nutrition in the South African population result from diet that mostly consists of cereals and limited animal protein and vitamin A enriched

vegetables and fruits (Shisana et al., 2014). Hence, it was necessary to ascertain if the school nutrition programme was providing enough of the meat sources, vegetables and fruits to enable the learners to meet their nutrient needs.

Oldewage-Theron and Egal (2012) observes that Life Orientation teachers in South Africa were lacking health and nutrition related knowledge. However, their knowledge improved after a nutrition education programme intervention. These teachers are expected to provide nutrition education knowledge to learners, which is a big challenge. This gap needs to be closed if learners are to get adequate nutrition knowledge and skills.

The chapter discussed the role of theory as well as reviewed literature guided by research objectives. Literature reviewed reflects the absence of adequate training, monitoring and support in most of the school feeding programmes. Most countries were using the decentralised procurement model which is also used in South Africa and Brazil. South Africa and Brazil also use the centralised procurement model in some regions. This chapter also reviewed the relevant literature on the nutritional value of food and nutritional education. Chapter three focuses on research methodology. The chapter covers the following sub-headings: research paradigm, research approach, research design, population and sampling procedures, data collection instruments, validity, reliability and trustworthiness, data collection and analysis procedures and ethical issues.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The previous chapter reviewed the relevant literature on the theoretical framework, training, monitoring and support on key role players, procurement and preparation of food, nutritional value of food, and nutritional education. Chapter 3 discusses the methodology that was used to answer the research questions and justifies the selection of the methodology. Methodological procedures on population and sampling employed in the study are also described and justified. Data collection instruments, validity, reliability and trustworthiness, as well as data collection and analysis procedures and ethical issues are also examined.

3.2 RESEARCH PARADIGM

A paradigm is a worldview accepted by an individual or a society as an example, model or pattern of how things work in the world (Ratcliffe, 1983). Jane, Jane, Nicholas and Ormston (2013) assert that a paradigm is a theoretical perspective which provides a context for the research process, its logic and criteria, and a lens through which research is carried out. It refers to distinct concepts or thought patterns in a discipline or cluster of beliefs, that influence what should be studied, how research should be done, and how results should be interpreted (Jane et al., 2013). According to Ling and Ling (2017), a paradigm is a worldview or a set of assumptions and understandings about key aspects of the research namely; ontology, axiology, epistemology, methodology, and the nature of research outcomes. Ling and Ling (2017) and Teddlie and Tashakkori (2009) argue that a paradigm is a wordview comprising various philosophical assumptions or beliefs associated with that point of view. The same authors further argue that a paradigm is a wordview comprising higher order way of thinking about or categorising the approach or logic that underpins all aspects of a research undertaking from the motivation for the research to the final design, conduct and outcomes of the research.

According to Ling and Ling (2017) and Jane et al. (2013), epistemology involves the theoretical perspectives about how knowledge is best acquired or ways of knowing and learning about the world. Furthermore, epistemology involves the views held by researchers about the knowledge obtained through research and the relationship between the knowledge and the researcher. Sometimes the word understanding is used instead of knowledge. Epistemology is the nature of knowledge and ways of knowing and learning about the world (Jane et al., 2013). According to Teddlie and Tashakkori (2009), epistemology concerns the relationship between the researcher and the participants or subjects. Teddlie and Tashakkori (2009) highlight that knowledge can be obtained through induction, where patterns can be derived from research findings, or through deduction where logically derived propositions or hypothesis are tested against observations. Ling and Ling (2017) assert that epistemological position involves our understanding about objective and subjective approaches in constructing knowledge. These understandings influence the roles and actions of the researcher and participants or subjects. Jane et al. (2013) assert that knowledge can be acquired through the induction process where patterns are derived from observation of the world or a deduction process where logically derived propositions or hypothesis are tested against observations.

Ontology is about what exists or the nature of reality, what categories can be defined for things that exist and how these things are related (Tolk, 2013; Jane et al., 2013). According to Jane et al. (2013), ontology involves beliefs about the nature of the social world. Realism and idealism are the two ontological positions that exist in social science. Realism believes that there is an external reality which exists independent of people's beliefs or understanding, whereas idealism asserts that reality is mind dependent and is known through socially constructed meanings (Jane et al., 2013).

Ling and Ling (2017) highlight that a research exercise is underpinned by the researchers' understanding of the reality of the aspect of existence relevant to the research assignment and its accessibility. There are limitations on the accessibility of any reality or consistency. The level of certainty or uncertainty we accommodate in our research is a significant factor in the selection of a particular research paradigm.

The various paradigms that can be used include interpretivism, post-positivism, positivism, transformative, supercomplex and pragmatism. The study made use of the pragmatic research paradigm which will be discussed in detail in subsequent section paragraphs.

Creswell (2014) considers pragmatism as a worldview that arises out of actions, situations and consequences, and is socially constructed by the processes of institutionalisation, legitimisation and socialisation. Pragmatic research aims to find meaning and bring about change, and considers the context as very important (Harvey & Land, 2017). In pragmatism, reality is not an issue, but what works best to provide solutions to a problem or practical answers to questions (Creswell, 2014; Ling & Ling, 2017). Pragmatism is based on the fact that reality is constantly being renegotiated, debated and interpreted in light of its usefulness in new unpredictable situations. Creswell (2014) also highlights that researchers emphasize the research problem and use all approaches available to understand the problem. As a philosophical underpinning for mixed methods studies, Ling and Ling (2017) indicate its importance in focusing on the research problem and using multiple approaches to derive knowledge about the problem or to understand the problem. According to Ling and Ling (2017), the pragmatic research paradigm pertains to situations where the research undertaking is driven and shaped by a search of outcomes of value to the researcher. The paradigm is based on the function for thought (investigation and research) which facilitates prediction, problem solving and effective action. Ling and Ling (2017) also assert that research in the pragmatic paradigm will usually have conclusions satisfying a practical need for information. Conclusions may include a call for further research to test the findings or improve the potential for generalisation. Creswell (2014) highlights that pragmatism provides a philosophical basis for research. He/She indicates that pragmatism is not committed to any one system of philosophy and reality. This applies to mixed methods research where the researcher makes use of both quantitative and qualitative assumptions in the research. Researchers are free to choose methods, techniques and procedures of research that best suit their needs and purposes, and provide the best understanding of a research problem (Creswell, 2014). Researchers make use of multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis (Creswell, 2014).

Pragmatic researchers look to the *what* and *how* to research based on the intended consequences. According to Creswell (2014), researchers who undertake the pragmatic approach believe that a person's experience is primarily determined by the situation. The pursuit of a pragmatic research exercise, according to Ling and Ling (2017), is invested in the sense that there is an agenda and there is no prior commitment to a specific outcome but there is commitment to an outcome that provides a solution to a problem. According to Teddlie and Tashakkori (2009), pragmatists decide what they want to study depending on what is important within their personal value systems. Although pragmatic researchers are certain that they need to find an outcome that is useful in the context of research, Ling and Ling (2017) assert that they are uncertain about the way to achieve the solution and are open to any approach or methods that can assist them to reach the end result. The researcher may employ methods associated with objectivity or subjectivity or both subjective and objective elements (Ling and Ling, 2017). According to Teddlie and Tashakkori (2009), the researcher and the participants may need to interact intensively to answer complex questions whereas at other points such as in hypothesis testing, they may not need to interact. Ling and Ling (2017) and Teddlie and Tashakkori (2009) highlight that pragmatism is determined by the practical need relevant to the researcher. If the research exercise seeks to meet a practical need of a sponsor or to meet a practical need of a researcher, then the research undertaking falls in the pragmatic paradigm. Research in the pragmatic paradigm will have conclusions satisfying a practical need for information or provide associated recommendations for action that will give a constructed, evidenced and defended practical solution to a problem (Ling & Ling, 2017; Teddlie & Tashakkori, 2009). According to Ling & Ling (2017) and Teddlie and Tashakkori (2009), research underlying the pragmatic paradigm can make use of mixed methods, design based research and action research. Furthermore, Ling and Ling (2017) and Creswell (2014) indicate that research in the pragmatic paradigm can make use a combination of techniques used by positivists and interpretivists. It can also make use of usability testing and physical prototype.

3.2.1 Justification for locating study in the pragmatist research paradigm

The research adopted the pragmatic research paradigm. Pragmatism allowed the researcher to be free of mental and practical constraints imposed by post-positivism and interpretivism and the researcher was not restricted to a particular research method or technique (Creswell & Plano-Clark, 2007). The purpose for this choice was to simultaneously collect both quantitative and qualitative data, merge the data, and use the results to understand the research problem. The rationale for this design was that one data collection form would supply strengths to offset the weaknesses of the other form resulting in a complete understanding of the implementation of the school nutrition programme. The quantitative data from many learners in the study provided strengths that offset weaknesses of qualitative data gathered using in-depth interviews and observations from few principals, teacher coordinators, food handlers and field officers. Pragmatism emphasises the use of multiple methods with different perspectives and assumptions (Betzner, 2009). It believes in triangulation of data so as to minimise error and bias (Trochim, 2006). The researcher acknowledged that the implementation of the school nutritional programme would be viewed differently by different stakeholders within the schools and in different positions in the education department. The varied stakeholders would have varied views on the implications of the school nutrition programme and learners' nutritional education. The use of quantitative and qualitative methods enabled the researcher to collect large quantities of data through the use of a diversity of tools, team members and data sources so as to cross check information and neutralise biases (Olsen, 2004).

Pragmatism allowed the researcher to employ different strategies in the interaction with respondents and participants within their particular contexts, to gain insights on how stakeholders were engaged to ensure effective implementation of the nutrition programme, how learners were benefiting from those practices, and how best stakeholders could be professionally developed to ensure effective implementation of the programme.

3.2.2 An example of a research study conducted in the pragmatic research paradigm

Teddlie and Tashakkori (2009) cite an international study on school and teacher effectiveness by Reynolds, Creemer, Springfield, Teddlie and Schaffer in 2002. The research had both research questions and hypothesis that were answered using a combination of quantitative data (classroom observations employing numerical ratings, surveys and test scores) and qualitative data (interviews, observations and document analysis). The research was conducted in 9 countries where schools in each country were placed into (i) more effective (ii) typical and (iii) less effective categories based on achievement scores. The researcher then predicted that there would be greater evidence in more effective schools than in less effective schools. The hypothesis was statistically confirmed. Case studies allowed the researcher to answer three questions:

(i) Which school/teacher effectiveness factors are associated with schools/ teachers being effective in different countries?

(ii) How many of these factors are universal and how many are specific to certain countries?

(iii) What might explain why some of the factors were universal and some specific and what are the implications of these findings for policy and practice?

Each country team reported case studies of four schools (two more effective and two less effective). The case studies were qualitative in nature although some quantitative data were also reported. The research team synthesised all the data and developed lists of universal characteristics of school/teacher effectiveness and list the specific characteristics associated with effectiveness in one or more countries. The researcher used the information to explain how policy makers in any given country might fruitfully adapt effective educational practices from other countries.

The research was conducted in a pragmatic paradigm. Researchers decided what they wanted to study based on their own personal value systems and existing

literature. They conducted the study using a variety of quantitative and qualitative methods and they reported the integrated quantitative and qualitative results.

3.3 RESEARCH APPROACH

Creswell (2014) asserts that a research approach is the plan or proposal to conduct research, which involves philosophical worldview assumptions, research design related to this worldview, and the specific methods of the research that translate the approach into practice. Although there are three research approaches namely; quantitative, qualitative and mixed methods research approach, this section focuses on mixed methods research approach that was used in the study.

3.3.1 Mixed methods approach

The study employed the mixed methods research approach. This made use of both quantitative and qualitative procedures in a single study to collect data to answer the research questions. In mixed methods approach, collection, analysis and integration of data can be done in a single or multi-phase study. Multi-methods refer to mixing of methods by combining two or more qualitative methods in a single research study (in-depth interviews and observations) or using two or more quantitative methods (such as a survey and an experiment) in a single research study. Combining words, pictures and narratives with numerical data from a large scale study allowed the research results to be more reliable. According to Creswell (2014), mixed method approach combines open-ended and closed-ended responses in a single questionnaire. Multiple forms of data such as observations and interviews (qualitative data) and surveys, may be used to collect data in a single study, as was the case in this study.

Glinner, Morgan and Leech (2009) view mixed method approach as one that blends the qualitative and quantitative methods and use exploratory and confirmatory methods which increase the options for researchers with regard to data collection methods, data analysis tools and interpretations. According to Creswell (2014) and Mukherjee and Kamarulzaman (2016), mixing different approaches has the advantage of promoting triangulation which involves use of a variety of data sources,

different researchers, and multiple perspectives and positions to interpret the results. Furthermore, due to the fact that all methods have biases and weaknesses, Creswell (2014), point out that triangulation of data sources through the use of qualitative and quantitative data neutralises the weaknesses of each form of data. Use of mixed methods helps to check the accuracy of the other database; helps to explain the other database; explores different types of questions than the other databases. Moreover, one database could lead to better instruments or build on the other database. Glinner, Morgan and Leech (2009) further assert that pragmatic research studies combine the qualitative and quantitative approaches, focusing on methodological rather than philosophical concerns. Mixed method research draws from positive aspects of quantitative and qualitative research paradigms to better answer the research questions (Baran & Jones, 2016). Creswell (2014) asserts that a combination of the two approaches provides a better understanding of the research problem than the use of either of the two approaches in isolation. Use of one method will not give the best understanding of the research problem.

Creswell (2014) indicates that the use of mixed method design has become popular as a research design in all disciplines. Assessing the implementation of the school nutritional programme demanded the collection of information from learners, teacher coordinators, principals, food handlers, and district officials to become aware of the implementation process and the associated challenges. The researcher wanted to generalise the findings to the population and develop detailed views of the meanings of concepts for individuals.

3.3.1.1 Justification for following the mixed methods research approach

The mixed methods research approach enabled the researcher to gain understanding of how the school nutrition programme was implemented in some schools in Kwazulu Natal. Teddlie and Tashakkori (2009) assert that mixed methods enable the researcher to get different perspectives from participants in both quantitative and qualitative components of the study, resulting in an enriched understanding of the research problem. Mixing quantitative and qualitative data gave adequate insight into the phenomenon under study. Probability sampling of a large number of learners that was engaged in the quantitative component of the study

enabled the researcher to generalise the findings to the population and develop detailed views of the meanings of concepts for individuals. The qualitative data from the purposively sampled respondents enriched the quantitative data by providing specific views of respondents and their voices about the issues that were under investigation. Some of the data could not be adequately supplied by learners but was best supplied by stakeholders who were directly involved in the specific roles. A mixed method research approach is, according to Creswell (2014), best when either the quantitative or the qualitative research approach is inadequate to best understand a research problem, and where the strengths of both approaches can provide the best understanding. Some of the data that could not be adequately supplied by learners respondents include the data on training, monitoring and support given to key role players and procurement of food which could be best supplied by the participants - principals, food handlers, teacher co-ordinators, and field officers. Food handlers supplied the most relevant information on the preparation of food and quantities of food cooked per day as they were directly involved in the preparation. The quantitative component enabled the researcher to collect data from a large sample of learners while the qualitative component enriched the quantitative data by validating information or adding information which learners had limited access to.

The research question: “What is the nutritional value of food consumed in the school nutrition programme?” called for quantitative data as it required the researcher to determine the nutrient content of the food supplied to each learner per day. This was compared with the expected nutrient content according to the menu quantities schedule for the school feeding programme in Kwazulu Natal Province of South Africa. The study employed t-tests to determine if there was any significant difference between the expected nutritional value according to the menu quantities schedule and the actual nutritional value of the food that was observed to be consumed by the learners. T-tests were also employed to compare the observed nutritional value of maize meal and soya mince, with the expected nutritional values of the same products, according to the food specification guidelines.

All other research questions like “How is training, monitoring and support provided to key role players in the school nutrition programme? How is training, monitoring and support provided to key role players in the school nutrition programme? What are the challenges encountered in the implementation of the school nutrition programme?” yielded qualitative data from interviews and quantitative data from questionnaires, which generated learners’ responses in categories. The questionnaire solicited closed-ended quantitative data and open ended qualitative data that provided the most useful information. Thus, some of the quantitative data in the questionnaire were compared with qualitative data from interviews.

3.4 RESEARCH DESIGN

Creswell (2014) defines research designs as types of inquiry within qualitative, quantitative and mixed methods approaches that give the specific direction for procedures in the research. The following section briefly discusses two sequential research designs that fall under mixed methods research approach. The section discusses concurrent triangulation design in detail, gives examples of studies that made use of the design, and justifies the use of the concurrent triangulation design in the study.

3.4.1 Sequential research designs

Teddlie and Tashakkori (2009) assert that in sequential mixed method designs, quantitative and qualitative phases of the study occur in chronological order with questions or procedures of the last phase depending on findings of the first phase.

3.4.1.1 Explanatory sequential research design

The researcher, according to Creswell (2014), first collects quantitative data, analyses the results, and builds on the results to explain them in more detail in the qualitative component of the study. The term explanatory emanates from the fact that the original quantitative data is explained in more detail using the qualitative data, while sequential implies that the initial quantitative phase is followed by the

qualitative phase (Creswell, 2014). The design is popular in fields with a strong quantitative orientation.

3.4.1.2 Exploratory sequential research design

Creswell (2014) asserts that the exploratory sequential mixed methods research design begins with the qualitative phase of data collection, analyses data, and the information is used to build into the quantitative phase. The qualitative phase, according to Creswell (2014), may be used to build an instrument that best fits the sample under study, to identify instruments appropriate for the quantitative phase, or to specify variables for the quantitative study.

3.4.2 Convergent parallel research design (Concurrent Triangulation)

The study employed convergent parallel mixed methods research design to investigate how the school nutrition programme was implemented in selected high school in KwaZulu-Natal. Convergent parallel mixed method is also called concurrent triangulation. In concurrent triangulation, the researcher gathers both qualitative and quantitative data in one phase (roughly at the same time) of the research process, with independent research designs and data collection instruments and findings of both methods being integrated during data interpretation to provide a comprehensive analysis of the research problem so as to strengthen the research results (Onwuegbuzie & Collins 2007; Ader & Mullenbrgh, 2011; Creswell, 2014; Riazi, 2016; Taylor, 2017). Data from one strand of the study can be cross validated or corroborated by findings from another strand (Riazi, 2016; Taylor, 2017). The assumption was that the constructs from different instruments were the same, making it possible for using findings from different methods to support each other. The method merges the strengths of quantitative methods with those of qualitative methods (Ader & Mullenbrgh, 2011). This diminished the disadvantage of the separate use of each method. Mixing both quantitative and qualitative methods in the data collection process enabled the researcher to get numerous views from different data sources. That gave adequate insight into the issues under study. Concurrent triangulation also had the advantage of saving time and expenses.

3.4.2.1.1 Examples of studies that made use of concurrent triangulation research designs and reasons for adopting mixed methods

Mixed methods research allows methods triangulation which is the use of more than one method while studying the same research question in order to examine the same dimension of a research problem. The researcher looks for a convergence of the data collected by all methods in a study to enhance credibility of the research findings. Thus, triangulation fortifies and enriches a study's conclusions.

Mixed methods are used for complementarity which allows the researcher to better understand a research problem and to clarify a given research result. Both complementarity and triangulation are important in cross-validation when multiple methods produce comparable data. A basic example of concurrent triangulation mixed methods, according to Riazi (2016), would be a study that makes use of a questionnaire survey to collect quantitative data that will be supported by findings from qualitative interviews conducted with a sub-sample of participants of the quantitative population.

Taylor (2017) gives an example of a study where concurrent triangulation involved the use of a questionnaire, videotape and interviews. The study compared a self report of caregivers with an observation of care giving in action. In the study, caregivers rated themselves on the Task Management Index Scale (TMIS) which recorded the caregivers report of the frequency with which specific strategies were used e.g. "placing all items where they can be seen." Caregivers were then videotaped conducting a daily care task in which strategies on the TMIS may have been used. During a replay of the videotape, caregivers talked about their use of strategies in comparison to those reported on the TMIS and these interviews were recorded and transcribed. During analysis, the TMIS data were were written in the form of text and interviews were coded according to whether the frequency of caregivers' use of strategy was above or below the median of the sample. The investigator was able to sort data according to frequency of strategy use and examine both videotapes and interview data for these two groups. The sample size was large enough to conduct a chi-square test to examine the relationship between use of strategies and overall approach to care (quantified data from interviews and videotapes). This provided the opportunity to examine the data from multiple

perspectives, and to triangulate use of caregivers strategies form 3 sources; one quantitative (TMIS) and two qualitative (videotape and follow-up interview). This triangulation process served to strengthen trustworthiness by corroborating data from several sources (Creswell 2014; Riazi, 2016)

Creswell and Plano-Clark (2011) cited a different study that made use of concurrent triangulation. The purpose of the study was to understand concordance and discordance between patients and physicians about the former's depression status. The study made use of a questionnaire with categorical data and semi-structured interviews.

Patients were selected for semi-structured interviews using purposive sampling. At the index visit, the physician rated the patients' level of depression on a 4-point scale: none at all, mild, moderate, or severe. How well the physician knows the patient was rated as very well, somewhat, or not at all. The following measures were used to examine selected factors that have been associated with recognition of depression in primary care settings. The study used the center of Epidemiologic Studies Depression (CESD) Scale and the Back Anxiety Inventory (BAI) to measure the severity of anxiety symptoms. Thresholds used to indicate substantial depression symptoms on the CES-D scale range from 16 to 21, and scores of 14 and above on BAI typically indicate high levels of anxiety. Beck Hopeless Scale (BHS) was used to assess factors related to suicidal ideation. Questions from the medical outcomes study's 36-item short form health survey (SF-36) were used to assess functional status. Cognition was assessed with a standard measure of global functioning (mini-Mental State Examination) MMSE).

There were 3 perspectives about depression status of each patient:
1. Rating from physician at the index visit,
2. The patient's response on a standardised questionnaire (CES-D) and
3. The patient's self report as depressed.

Analytic strategy reflects the integration of hypothesis testing and hypothesis generation in a single study. In the first phase, personal characteristics of patients

who identified themselves as being depressed while their physicians did not, were compared with those who were concordant with their physician's ratings of depression (using Chi- Square {X^2} or t-tests for comparisons of proportions or means respectively).

In the second phase of analysis, constant comparative method was used moving between codes and texts to derive themes related to talking with the physician. This strategy involved taking one piece of data and comparing it with all others that could be similar or different, to develop conceptualisations of possible relations between various pieces of data. Themes were then related to personal characteristics and whether the patient and physician were concordant about depression status. Data analysis was carried out with the use of SPSS and QSR N6.O.

Teddlie and Tashakkori (2003) cite another study by Hossler and Vesper (1993) which also used concurrent triangulation. The study began with quantitative research questions: "To what extent are parents saving for post-secondary education? What factors are associated with parental saving? Do certain kinds of information appear to influence parental saving?" The data were collected simultaneously using questionnaire and interviews. Survey data were analysed separately from interview data. Quantitative data were analysed using logistic regression while qualitative data were analysed via thematic analysis where the data were put into units and then categorised. Both quantitative and qualitative data were discussed jointly. Significant factors identified by logistic regression were corroborated with the themes that emerged from interviews. Areas of overlap between the analyses were discussed. Triangulation allowed the authors to posit a model of parental saving. Combining methods of data collection also allowed for the construction of sensitive survey instrument and broader understanding of the phenomenon of interest. Directions for intervention and policy development were identified and discussed.

Mixed methods researches, according to Hesse-Biber (2010), were used in Europe in studies of poverty within families by researchers like Frederic Le Play (1855), Charles Booth (1892-1897) and Bohm Rowntree (1901). They incorporated both quantitative and qualitative techniques including the use of demographic analysis,

participant surveys, observations and social mapping techniques. Robert Park, a member of Chicago School applied a mixed method approach to the study of inner-city urban life by integrating both quantitative and qualitative data into his case studies.

A research study by Classen et al. (2007) on population-based health promotion perspective for older driver safety, made use of quantitative and qualitative data collection and analysis concurrently. The quantitative and qualitative results were compared for supportive and non-supportive findings.

A study may raise questions or contradictions that need further clarification. Use of mixed methods may provide answers to such questions or clear contradictions. Thus, mixing the methods extends the breadth as well as the range of enquiry, and produce detailed findings.

3.4.2.1.2 Justification for the use of concurrent triangulation research design

It was essential to obtain corroborating evidence from using a variety of methods in order to achieve validity. Mixed methods achieve validity through triangulation of methods. The rationale of triangulation was that the flaws of each individual method were compensated for by the counter-balancing strengths of another. Combining methods achieved the best results by overcoming unique deficiencies of each method.

3.5 POPULATION AND SAMPLING TECHNIQUES

KwaZulu-Natal Province consists of 12 districts. One circuit, Molweni, in Pinetown district, was purposively and conveniently selected. Molweni circuit consisted of eight secondary schools. Secondary schools in the circuit fall into quintiles two and three. Three secondary schools were in quintile two while five secondary schools were in quintile three.

3.5.1 Quantitative component: population and sample

Maxwell, (2005) and Neelankavil (2007) view a population as the largest set of individual units or objects with common observable characteristics of interest to the researcher, from which data can be collected. A population, according to Susan, Grove and Gray (2015), refers to the entire set of individuals or elements that meet a sampling criterion in a defined area. Susan, Grove and Gray (2015) consider elements to be the focus of the research, and these can be persons, events, objects or any other single unit of study. In quantitative research, people involved in the study are the subjects or respondents while they are only referred to as participants in qualitative research. Susan, Grove and Gray (2015) define the accessible population as the portion of the target population to which the researcher has reasonable access.

Susan, Grove and Gray (2015) define a sample as a subset of a population obtained using a particular sampling method or plan. If the sample is large enough generalisations from findings of the sample can be extended to the larger population. The sample should be representative reflecting many characteristics such as gender, ethnicity, income, and education that are similar to the accessible population as well as the target population.

The target population for the study was drawn from Molweni Circuit, Umhlatuzana Centre of Management of Circuits in Pinetown district. The quantitative population consisted of 685 learners.

For the quantitative sample, schools were stratified into quintile two and quintile three and learners were divided into males and females. The Quantitative sample size “n” was calculated using the formula:

$n = N/ (1+Ne^2)$ (Ryan, 2013).

$n = 685/[1+685(0.1)^2] = 87.26 \sim 87$. Where n = sample size, N=total number of learners in grade 12 in the eight schools, e= desired margin of error (10% at 90% confidence interval). The researcher decided to consider a large sample of 108 learners. This was done to ensure that the sample size was at least 10% even after some respondents withdrew from the study. Since participation was voluntary, school H was not interested in participating in the study. The final sample of 108 was

quite representative as it contained more than 10% of the learners in the quantitative population.

The proportion of learners in quintile two to quintile three was calculated and the same was done for males and females in each quintile. This was done to ensure that each sample selected was at least ten percent of the original population size so that they were representative of the population size (Mathews, 2010). Learners were selected from schools by systematic random sampling using class registers. Table-3.1 below shows the Quantitative Population and Sample sizes.

The numbers of respondents in brackets represent the calculated sample size while the other number represents the actual sample size that participated in the study.

School enrolment numbers in asterik (*) represent figures given in the schools while other enrolment figures were obtained from the district office.

Table 3-1: Quantitative Population and sample sizes

Identified School	Respondent Type	Total school enrolment	Number of students in quantitative population	Number of Respondents in the quantitative sample
School A	Boys	958	77	10 (10)
Quintile 3	Girls		77	7 (10)
Schools B	Boys	430*	15	4 (2)
Quintile 3	Girls		26	8 (3)
Schools C	Boys	1015*	42	7 (5)
Quintile 2	Girls		48	12 (6)
Schools D	Boys	510*	31	6 (4)
Quintile 3	Girls		32	7 (4)
Schools E	Boys	1135*	47	8 (6)
Quintile 3	Girls		75	14 (10)

Schools F Quintile 3	Boys	645	48	7 (6)
	Girls		57	8 (7)
Schools G Quintile 2	Boys	342*	18	3 (2)
	Girls		24	7 (3)
Schools H Quintile 2	Boys	535	38	-(6)
	Girls		30	-(5)
	Totals	5419	685	108 (87)

The numbers of respondents of the sample in brackets represent the calculated sample size while the other number represents the actual sample size that participated in the study.

3.5.2 Qualitative component: population and sample

The qualitative population consisted of eight of each of the following members; school nutrition programme (SNP) teacher co-ordinators, principals, service providers, and thirty food handlers in the eight secondary schools in Molweni Circuit. Two district officials were also part of the qualitative sample.

The qualitative sample consisted of four school nutrition programme (SNP) teacher coordinators, four principals, seven service providers, fifteen food handlers and in the five purposively selected secondary schools in Molweni Circuit. Two district officials were also involved. Stratified purposive sampling was used, and it is a process of dividing the sampling frame into strata to obtain relatively homogenous subgroups and a purposeful sample is selected from each stratum. The sample was drawn from two schools in quintile two and two schools in quintile three. Table 3.2 below shows qualitative population and sample sizes.

Table 3-2: Qualitative Population and sample sizes

Molweni Circuit Schools	Participant Type	Number of Participants in qualitative population	Number of Participants in qualitative sample
Secondary Schools A, B, C, D, E, F, G, H	Principals	8	4
	Teacher Co-ordinators(Nutrition)	8	4
	Food suppliers	8	7
	Food handlers	30	15
Pinetown District	Field officers	2	2

3.6 DATA COLLECTION INSTRUMENTS

According to Colton and Covert (2007), an instrument is a mechanism for measuring a phenomenon, which is used to gather and record information for assessment, decision making and understanding. This section will focus on questionnaires, in-depth interviews, document analysis and observational techniques.

3.6.1 Questionnaires

Colton and Covert (2007), Mitchel and Jolly (2010), and Ary, Jacobs and Sorensen (2009) observe that questionnaires are used to obtain factual information when assessing beliefs, attitudes and opinions. They may have a number of item formats including multi-item scales and open ended questions that can be used for data collection and verification. Questionnaire surveys can be used to collect sensitive information which respondents are not comfortable to share in focus groups or personal interviews (Mitchel & Jolly, 2010). Questionnaire surveys, according to Mitchel and Jolly (2010), should ensure confidentiality to address such obstacles. Questionnaire surveys may be combined with other data gathering instruments like interviews, to obtain thick details and explanations which the survey is not able to capture. Questionnaire surveys are fairly efficient to produce, administer and analyse data. Furthermore, questionnaire surveys are subject to misinterpretation, hence, pilot testing is done to reduce ambiguity (Mitchel & Jolly, 2010). They reduce human

error in the encoding process and cut down costs in the sense that a lot of information can be gathered on a large sample in a short period of time (Colton & Covert, 2007; Mitchel & Jolly, 2010).

3.6.1.1 Investigator administered semi-structured questionnaire

The investigator administered a semi-structured questionnaire to collect data from learners. The semi-structured questionnaire was completed in the presence of the researcher. An introduction was made and all the background information was given before learners could complete the questionnaire. A consent form was given to the learners who had to read and sign if there were willing to participate in the study. The questionnaires were completed by learners from the humanities, science and commerce classes during the different times allocated to the researcher by principals in different schools. The researcher clarified each question to the learners before giving them time to write their responses. The respondents had the opportunity to seek further clarification on questions that they did not understand well. Learners were encouraged to write responses without influence from friends. Learners who tried to influence others were discouraged and they cooperated well. A semi-structured questionnaire comprises a mixture of closed and open-ended questions (Harris & Brown, 2010). The semi-structured questionnaire was suitable in this study to cater for the large samples of learners. Likert scale question items were quick to answer and the open-ended questions offered respondents an opportunity to give comments, explanations and views on the implementation of the school nutrition programme. The semi-structured questionnaire collected both quantitative and qualitative data simultaneously from the same respondents. This saved time and financial resources. Mitchel and Jolly (2010) highlight that, in an investigator administered questionnaire, respondents can be surveyed at the same time and surveys can be conducted in a variety of locations. Moreover, investigator administered questionnaires have a higher response rate, low costs and the researcher is available to provide assistance or to answer questions (Ary, Jacobs & Sorensen, 2009; Mitchel & Jolly, 2010). High response rate and thoroughness in learners' responses helped the researcher to gather enough data that enabled the researcher to answer all research questions in detail. However, Mitchel and Jolly

(2010) indicate that in the investigator-administered questionnaire, respondents feel that their answers are less anonymous resulting in respondents being less honest due to fear of victimisation. The researcher gave the learners the assurance that the information would be confidential and anonymous. Ary, Jacobs and Sorensen (2009) add that the researcher is restricted in terms of when and where the questionnaire can be administered. The semi-structured questionnaire catered for a large number of learners in different schools. The semi-structured questionnaire was used to provide limited information on training, monitoring and support, as well as procurement and preparation of food, and challenges encountered in the implementation of the school nutrition programme. Respondents provided detailed information on the variety of foods consumed and learners' frequency of consumption of food in the NSNP over the 5 school days. Respondents also provided detailed information on nutritional education.

3.6.2 Face- to-face in-depth interviews

Frechtling and Sharp (1997) note that structured interviews involve the administration of a carefully worded questionnaire in order to obtain answers to carefully phrased questions. They further note that deviation from the question is minimal. According to Ferraro and Andreatta (2017), structured interviews result in the interviewer asking all participants the same set of questions in the same sequence and under the same set of conditions. Mitchel and Jolly (2010) and Beidel, Frueh and Hersen (2014) indicate that the structure reduces the risk of interviewer bias and increase reliability and validity because they assure that the diagnostic criteria are covered systematically and completely. In addition, Mitchel and Jolly (2010) feel that a structure of fixed alternative questions makes it easy to interpret responses. Frechtling and Sharp (1997) view an in-depth interview as a dialogue between a skilled interviewer and interviewee which is characterised by extensive probing and open ended questions. Face-to-face in-depth interviews provide the opportunity to explore topics in depth and yield rich data, details and insights (Frechtling & Sharp, 1997). Mitchel and Jolly (2010) and Colton and Covert, (2007) highlight that face to face in-depth interviews allow the interviewer to be flexible to particular individuals and enables him to explain or clarify questions. However,

Frechtling and Sharp (1997) and Colton and Covert (2007) highlight that face to face in-depth interviews are expensive, time-consuming and need well trained and highly qualified interviewers to produce a large volume of information that may be difficult to transcribe and reduce. The researcher conducted most of the interviews and the research assistant was thoroughly trained and made several observations when the researcher was interviewing. The research assistant conducted some of the interviews especially in cases where two interviewees availed themselves at the same time. The researcher was able to probe when responses were not clear. Frechtling and Sharp (1997) also highlight that face to face interviewees may distort information through recall error or the desire to please the interviewer. Flexibility might result in inconsistencies across interviews.

3.6.2.1 Semi-structured interviews

Face-to-face in-depth interviews were conducted using a semi-structured interview guide. Participants were introduced to the study and permission to audio record was sought with each interviewee. For one interviewee who refused to be recorded, the researcher had to seek for the interviewee permission to write notes based on the interview. Interviews were conducted in closed offices within the schools to maintain confidentiality of participants' responses. The time for the interview was variable for different participants due to their different time schedules. An interview guide with standardised questions was used to ensure that all questions based on each objective were completely answered and time was not wasted on irrelevant questions. Face-to-face interviews involved maximum engagement with respondent resulting in high response rate and rich information that included visual expressions (Mooi & Sarstedt, 2011). According to Mitchel and Jolly (2010), semi-structured interviews have standardised questions on the interview guide. Harrell and Bradley (2009) highlight that semi-structured interviews indicate the initial question that may be asked as well as the probes that the researcher might use to explore a given response in greater depth, to ensure complete and consistent information is received across different interviews. However, Beidel, Frueh and Hersen (2014) hold the view that, in semi-structured interviews, the interviewer can modify the standard inquiries

with individualised and contextualised probes. However, Beidel, Frueh and Hersen (2014) note that, in fully structured interviews, interviewers are trained not to deviate from the rigid structure. Harrell and Bradley (2009) indicate that semi-structured interviews collect detailed topic-relevant information, and enable the researcher to have a deep and thorough understanding of the answers provided.

Face to face interviews were conducted with food handlers, principals, teacher co-ordinators and district field officials to elicit information based on the implementation of the school nutrition programme guided by the five research objectives. The selected participants were directly involved in the school nutrition programme, and were able to provide detailed information about NSNP due to their long term experience with the programme. All questions asked were guided by the research questions and all interviews were recorded after seeking permission to record, from the participants. Only one participant refused to be recorded but allowed the researcher to take notes based on the interview.

3.6.3 Observational techniques

Frechtling and Sharp (1997) view observational techniques as methods employed by an individual(s) to gather data on programmes, processes or behaviours under study. Ferraro and Andreatta (2017) assert that observations enable the researcher to collect data on a wide range of behaviours and help to develop a holistic perspective. Frechtling and Sharp (1997) and Ary, Jacobs and Sorensen (2009) agree that observations provide direct information about the actual behaviours of individuals. Ferraro and Andreatta (2017) and Frechtling and Sharp (1997) assert that observations allow the researcher to understand the context and to distinguish between actual and expected behaviour. Moreover, Ferraro and Andreatta (2017) and Frechtling and Sharp (1997) highlight that observations provide an opportunity for identifying unanticipated outcomes and observations of non-verbal behaviour.

Frechtling and Sharp (1997) and Ary, Jacobs and Sorensen (2009) highlight that observations are expensive and time consuming. Frechtling and Sharp (1997) outline the following as other disadvantages of observations:

- They need well-qualified, highly trained observers who are experts in the content. The researcher had to make observations and record himself.
- They may affect behaviour of the participant and perception of the observer may distort data. The observations were not based on the behaviour of participants. The researcher used a checklist which he was ticking to speed up the process of observation and to ensure that all relevant aspects were observed.
- Researcher has little control over situations, and observations are only practical for a small sample size. Observations were only made on 5 schools.

Observations were made in the study. Merriam and Tisdell (2016) highlight that the best time to observe must be selected. The researcher began with informal visits followed by intense and target observations of issues under study mainly in the kitchen area (Merrian & Tisdell, 2016). Observations were made before, during and after serving the school meal.The researcher visited schools to make observations on the type and quantity of food consumed, hygiene, availability of nutrition education charts, storage of food infrastructure for food preparation, and where learners ate the food. A checklist was used to ensure that all issues to be observed were not missed. Participants could change their behaviour or routine ways of performing duties if they knew that they were being observed. The researcher had to observe on different days and at different times at each school so as to come up with correct conclusions. The data was also complemented by the data from the interviews with different participants as well as questionnaire responses from learners.

3.6.4 Document analysis

Document analysis involves examination of documents and records then analysing and interpreting data (Zeeger & Barron, 2015). Documents may be circulars on training stakeholders of NSNP, policy statements, legislation, or monthly reports (Bowen, 2009; Zeeger & Barron 2015). Document analysis helps to answer questions that would not have been addressed during the interview (Bowen, 2009). Document analysis gave a clear picture of what was going on implementation of the

programme in the schools, without any bias. Document analysis may provide information on training, monitoring and support given to stakeholders, food previously provided on various days by suppliers, and various challenges encountered in the nutrition programme. Documents that were analysed include the menu that was observed in the schools, menu quantities schedule, KwaZulu-Natal Province secondary school menu, Mnandi 4 sure recipe book, food specification guidelines for maize meal and soya mince, observation checklist by the district officials and food delivery notes for service providers. The documents were used to determine the expected quantities of food items which could not be provided during interviews or in the questionnaire. The delivery notes were useful in verifying the quantities of food items that were provided by food handlers during interviews. The documents provided provided accurate quantities of food items delivered over a particular period of time and the information was used to verify quantities of food items which were provided by food handlers and service providers. There observation checklists obtained in the schools were important in verifying the frequency of monitoring visits by departmental officials as well as verifying aspects that were observed. The observe aspects by monitors were compared with the observations by the researcher as well as the findings from in-depth interviews by various participants and questionnaire responses from learners. This enriched the research findings. In some schools some documents were not accessible and the researchers had to use the information from interviews and questionnaires as well as observations. In some instances, the information in the documents was different from what was on the ground. Participants and respondents had to verify some of the information. This assisted the researcher to get the true information about what was actually on the ground.

3.6.5 Alignment of research items

This section shows the alignment of research questions, objectives, units of analysis, instruments and nature of data.

Table 3-3: Alignment of research questions, objectives, unit of analysis, instruments and nature of data

Research Question	Research Objectives	Unit Of Analysis	Research Instrument	Nature of Data
How is training, monitoring and support provided to key role players in the school nutrition programme?	To examine training, monitoring and support provided to key role players in the school nutrition programme.	Principals, teacher co-ordinators, food handlers, suppliers, district field officers & learners.	In-depth interview. Document analysis. questionnaire	Qualitative & quantitative
How is the procurement and preparation of food accomplished for the food served in the school nutrition programme?	To establish what informs the procurement and preparation of food served to learners in school nutrition programme.	principals, teacher co-ordinators, food handlers, suppliers, district field officers & learners.	In-depth interview. Document analysis. Questionnaire.	Qualitative & Qualitative
What is the nutritional value of the food consumed in the school nutrition programme?	To determine the nutritional value of food consumed in the school nutrition programme.	principals, teacher co-ordinators, food handlers, suppliers, district field officers & learners.	In-depth interview. Document analysis. Questionnaire. Observation.	Qualitative & quantitative
What are the challenges encountered in the implementation of the school nutrition programme?	To identify the challenges encountered in the implementation of the school nutrition programme	principals, teacher co-ordinators, food handlers, suppliers, district field officers & learners.	In-depth interview. Document analysis. Questionnaire. Observation.	Qualitative & quantitative
What are the implications of the school nutrition programme on the learners' nutritional education?	To evaluate the implications of the school nutrition programme on the learners' nutritional education.	principals, teacher co-ordinators, food handlers, suppliers, district field officers & learners.	In-depth interview. Document analysis. Questionnaire. Observation.	Qualitative & quantitative

Table 3-3 indicates research questions and research objectives. The research questions are aligned with the unit of analysis, research instruments and the nature of data to be collected.

3.7 VALIDITY, RELIABILITY AND TRUSTWORTHINESS

This section discusses validity and reliability in line with quantitative data, and explains how this was achieved in the questionnaire that was used to collect data. It

further explains how trustworthiness was achieved in semi-structured interviews, and observations and document analysis.

3.7.1 Validity

Validity refers to the extent to which the data measures what it is intended to measure (Newman & Ridenour 2008; Riazi, 2016). The term validity is synonymous with credibility. However, the former is normally used in quantitative research while the latter is applied in qualitative research studies. The study employed content validity, triangulation, external validity and construct validity. Content validity is based on whether individual items are relevant and appropriate, and whether items adequately measure all construct dimensions (Brewer, 2000). Riazi (2016) asserts that content validity refers to the degree to which items on the test represent the domain or skill for which the test was developed. Validity was ensured by an expert and experienced researcher who reviewed the questions on the questionnaire, and by pilot testing done with ten learners who were not part of the study. This ensured that questions were comprehensive and clear for the particular group of respondents. The questionnaire had a sufficient set of relevant questions to adequately address each research objective.

Validity was also ensured through triangulation. A variety of data sources and multiple methods were used to study the research problem. External validity was achieved by random sampling of respondents across several strata (males and females in quintiles 2 and 3 in the commerce, science and humanities classes) that reflected the population to which the results were generalised (Ridenour & Newman, 2008). External validity was ensured by having a representative sample size which was more than 10% of the population size. Collection of qualitative data from department officials, principals, teacher co-ordinators, food handlers, service providers and learners in different schools increased the study's external validity. Construct validity is ensured when the instrument measures the construct it attempts to measure. The qualitative data from semi-structured interviews was transcribed and then coded to come up with themes or patterns that were compared with quantitative data from the questionnaire. Some of the data collected from the questionnaire and interviews was similar, and cross checking of the data from

different sources was done. Differences in data among participants and respondents were probed through follow up interview questions.

3.7.2 Reliability

Reliability refers to consistency of measurements by instruments, and accuracy of data (Brewer, 2000; Holloway & Galvin, 2010). It refers to accuracy and precision of a measurement procedure. The stability of a survey was obtained through pilot testing. Cronbach's alpha on SPSS was also used to measure internal consistency. SPSS was used to compute Cronbach's alpha by using the Analyse, Scale and Reliability Analysis options in the menu bar (Privitera, 2014). These actions displayed a dialog box that allowed one to identify the value of Cronbach's alpha for the scale (Privitera, 2014).

Reliability was also through the test-retest procedure where sections of the research instrument were tested by being subjected to the same subjects twice to check consistency of data. According to Litwin and Fink (1995), test-retest reliability is measured by having the same set of respondents complete a survey at two different points in time to see how stable the responses are by comparing the two sets of responses. Correlation coefficients were also calculated to compare learners' responses on related issues which, under normal circumstances, would yield almost similar responses if learners gave their response objectively. Litwin and Fink (1995) assert that correlation coefficients are considered good if they equal or exceed 0.70. The relationship between correlation coefficient and reliability is shown in Table 3.4. below.

Table 3-4: Correlation coefficient and level of reliability

Correlation coefficient	Reliability
1	perfect reliability
≥ 0.9	excellent reliability
≥ 0.8 < 0.9	good reliability
≥ 0.7 < 0.8	acceptable reliability
≥ 0.6 < 0.7	questionable reliability
≥ 0.5 < 0.6	poor reliability
< 0.5	unacceptable reliability
0	no reliability

An example of Test-retest Reliability of a survey instrument measuring crime rates is given by (Litwin and Fink, 1995). One of the survey items asked 50 deputy police chiefs whether grand larceny rates had been mild, moderate or severe during the past month. To gauge whether the respondents' answers to this item were consistent, an identical survey instrument was administered to the same 50 deputy police chiefs. A correlation coefficient of 0.89 was obtained indicating that the item produced moderate responses. The item had good test-reliability because it exceeded 0.70. The correlation coefficient is calculated using Spearman's rank correlation for ordinal scaled data (ranked data) random variables.

3.7.3 Trustworthiness

Trustworthiness means methodological soundness and adequacy (Holloway & Galvin, 2010). Trustworthiness was made possible through developing credibility, transferability, dependability and confirmability. This was done in the qualitative component of the study.

3.7.3.1 Credibility

Credibility, according to Mcnee and McCabe (2008), refers to the confidence that the researcher and the user of the research can have in the truth of the findings of the study. Credibility is demonstrated when readers believe that the data presented is a true representation of participants' views, experiences and beliefs (Moule & Goodman, 2013; Holloway & Galvin, 2010). The researcher ensured credibility through asking an expert in research to review the sampling, data collection and analysis procedures. Credibility was also achieved by member checking where the data and findings of the data analysis were brought back to the original participants to seek their input concerning the accuracy, completeness and interpretation of data (Mcnee and McCabe, 2008). Credibility was also ensured by spending time with participants and maintaining thorough, phenomenon-focused observations. It was further ensured through data and method triangulation.

3.7.3.2 Transferability

Transferability refers to the probability that the findings in one context can be transferred to similar situations in a different setting (Moule & Goodman, 2013). According to Mcnee and McCabe (2008), transferability refers to the extent to which the findings of a study are confirmed by, or are applicable to, a different setting from where the data were collected. Mcnee and McCabe (2008), highlight that transferability is different from generalisability where the focus is on predicting specific outcomes in a general population. The focus is on confirming that what was meaningful in one specific setting or with one specific group, is also meaningful and accurate in a different setting or group. Mcnee and McCabe (2008) indicate that one method used to ensure transferability is to describe themes that have been identified in one sample to a group of similar participants who did not contribute to the initial data collection to determine if the second group agrees with the themes.

Mcnee and McCabe (2008) also indicate that transferability can also be ensured if the researcher actively seeks sources of data that contradict the ideas that are emerging from the data. These can be used to modify or reinterpret the whole data to develop more comprehensive and credible findings. Findings that reflect breadth of experiences or ideas can be easily related to a different group. Tranferability was achieved through thick (thorough) descriptions of data, research processes and settings.

3.7.3.3 Dependability

Dependability refers to consistency and accuracy of interpretations made from qualitative data and analysis (Holloway & Galvin, 2010; Riazi, 2016). It is obtained through stepwise replication and inquiry audit (Flick, 2014). An audit trail was outlined in order to check procedural dependability which impacted on the accuracy of data.

3.7.3.4 Confirmability

Confirmability is a measure of the objectivity of data. According to Riazi (2016), it shows the degree to which the researcher is free of bias in the procedure of data

collection, data analysis and interpretation of research findings. It is achieved through triangulation, respondent validation, Efficient data collection methods and member checking (Moule & Goodman, 2013). Respondent validation occurred when participants were asked to check the accuracy of the study in areas of descriptions, themes and interpretations. The participants were afforded the opportunity to add the information and validate the accuracy of the research findings. Efficient data collection methods occurred when data was collected after repeated contact and data was seen, behaviour was observed and data was collected in informal settings. Member checking occurred when participants were given the opportunity to review the information which they provided (Obiakor, Bakken & Rotatori 2010). Members confirmed the quotes and granted approval to use the quotes.

3.8 DATA COLLECTION PROCEDURES

This section discusses how different forms of data were analysed. It also discusses ethical considerations including informed consent, anonymity, confidentiality and how permission was sought before the researcher collected data.

3.9 DATA ANALYSIS

The quantities of each food items prepared for the whole school were used to determine individual food intake over the week. The nutritional value of each food item consumed by an individual was determined using food composition tables. The total nutrient intake value was determined for the five days of the week. The total nutrient intake per week was then used to calculate the mean nutrient intake per learner per day in each school. The expected intake of each nutrient was calculated according to the district menu quantity guidelines schedule of the National School Nutrition Programme which was available in some schools. Simple t-tests were performed to determine if there was any significant difference between the observed and expected nutrient intake values. The Paired sample t-tests were also used to compare the observed nutritional value and the expected nutritional values of maize meal and soya mince. The Paired sample t-tests were also used to compare the observed nutrient intake data set per learner for each school and the expected nutrient intake data set.

After administering the survey instrument, some sections were re-administered to the same respondents on a different day. The survey items showed ordinal scale data which was tested for consistence using Spearman's correlation coefficient. The interpretation of the correlation coefficient is explained under reliability in section 3.7.2.

Quantitative data from questionnaires were analysed using SPSS and excel. The data were used to calculate frequencies and percentages of learners according to their responses on the questionnaire. The learners' responses were then presented in tables. Percentages were also used to show the distribution of learners' age categories, sex distribution, positions of responsibility distribution, and the distribution of learners who were in the particular school for a particular period of time and benefiting from the school nutrition programme.

Qualitative data analysis involves categorizing data, identifying patterns and interpreting the data. For qualitative data from interviews, thematic content analysis by coding and categorizing data was used. The NVIVO software was used to aid the analysis. Riazi (2016) asserts that NVIVO helps to organise and analyse data. The software can be used to examine data efficiently, to organise it around themes or patterns, and to synthesise large volumes of data. As the researcher identified data themes, different units of language or observations were categorised under these themes. As new themes arose, the data was reorganised consistently by the software. This ensured that the researcher was consistent in the analysis of all of the data. Results were then presented in narrative texts and tables. Data from document analyses and observations were also categorised and tabulated while some of it was in a narrative form. Some of the qualitative data was presented in the form of visuals. The analysis was done in view of policies, menu and menu quantity schedules which indicated the expectations of the programme. Role conflict, role confusion and role strain was determined where learners failed to benefit from the programme due to failure to deliver food or illnesses that resulted after eating the food. The quantitative and qualitative data were synchronised during analysis. Some of the data collected from the questionnaire and interviews, document analysis and observations enabled cross checking of the data from different sources. Some

differences in data demanded the researcher go back to the field to seek further clarification from participants or through observations.

The identified themes were described to a similar sample of participants who did not contribute to the initial data collection, to determine if the second group agreed with the themes.

3.10 ETHICAL CONSIDERATIONS

This section discusses how informed consent, anonymity, and confidentiality was ensured in the study. It further identifies the procedures that were taken by the researcher to obtain permission to carry out research in various institutions.

3.10.1 Informed consent

The researcher introduced himself to the respondents and participants and clarified what the study was about and what it intended to achieve. The researcher ensured that participation was voluntary. Research respondents signed informed consent forms before the data collection process. Respondents and participants were informed that they were free to withdraw any time from participation in the study without possible consequences or victimisation. All respondents were in grade 12 and were above 17 years of age. The participants were teacher co-ordinators, food handlers, service providers, principals and district officials.

3.10.2 Anonymity

Respondents' and participants' personal details such as names and addresses were avoided throughout the data collection, presentation and analysis process. The researcher made use of codes in the data collection, presentation and analysis process.

3.10.3 Confidentiality

Participates and respondents were assured that all the information obtained during the research would be kept confidential. Any published information would not be linked to any participants' names or addresses.

3.10.4 Permission

The researcher was cleared by the faculty Research Ethics Committee and Institutional Research Ethics Committee of the University of Fort Hare. An ethical clearance certificate was granted (See Appendix 18). Permission for the research was requested from the Head of Department in KwaZulu-Natal Department of Education Head Office (See Appendix 17). The researcher then requested permission to conduct research from the provincial head of department in Pietermaritzburg, from respective district managers, circuit managers as well as school principals. Letters to seek permission were given to them. Schools were guaranteed that their participation, or non-participation; and results of the study, would not affect the feeding programme in their schools.

3.11 SUMMARY

Chapter three discussed and justified the research methodology which was used in the study. The discussion included the choice made of the pragmatic research paradigm, the mixed method approach and the concurrent triangulation design which guided and directed the study. Attributes of semi-structured questionnaires, in-depth interviews, observations and document analysis, instruments used in the study, were also discussed. The chapter also discussed various ways of ensuring validity, reliability and trustworthiness as well as data collection and analysis procedures. Measures to ensure ethical conduct were highlighted. The quantitative sample consisted of 108 learners while the qualitative sample consisted of four principals, four teacher co-ordinators, seven service providers, 15 food handlers and two field officers. In Chapter four, data were analysed and findings were presented. The data were then discussed.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

The aim of the study was to investigate how the school nutritional programme was implemented in selected high schools. The previous chapter focused on the research methodology which encompassed research paradigm, research approach and research design. The previous chapter also indicated the population size, sampling techniques, data collection instruments, issues of validity, reliability and trustworthiness, data collection and analysis procedures, and ethical issues considered during the investigation. In Chapter four, research data gathered using interviews, questionnaires and observations is presented, analysed and eventually discussed. The research data is presented in line with research objectives or research questions.

An in-depth semi-structured interview guide was used with fifteen food handlers, seven service providers, four teacher co-ordinators and four principals, focusing on the same aspects as those in the questionnaire. It was used as a follow-up to confirm some of the responses given by learners and to give data which the learners would not be aware of. The two sets of data were analysed independently and merged during interpretation. The interview and questionnaire data were further enriched by observations made in five of the participating schools.

A semi-structured questionnaire was administered to learners. The questionnaire had biographic data of respondents in the first section to provide the context in which data was collected. The other five sections were guided by sub-research questions. A total of 108 questionnaires were administered to grade 12 learners in the seven schools that were willing to take part in the study. The return rate was 100% since the questionnaires were self-administered. This high response rate likely yielded valid results considering that the sample size was more than 10% of the population size. Some of the open ended questions were not answered by a significant

proportion of respondents. However, this was compensated for by responses in the interviews with different stakeholders.

4.2 BIOGRAPHIC CHARACTERISTICS OF RESPONDENTS AND PARTICIPANTS

This section presents the major stakeholders' gender, age categories, highest academic qualification, and period of service in the nutrition programme, to help in understanding their background to enhance the interpretation of the responses and comments made to the data collected. School positions of responsibility of learners is also be presented. The biographic data of food handlers and learners are presented in Tables 4-1 and 4.3 respectively. Teacher co-ordinators, food suppliers and principals' biographic data are presented in Table 4-2.

Table 4-1: Distribution of Biographical characteristics of participant female food-handlers (N=15)

Participant food handler	Age (years)	Service period in NSNP	Highest qualification	No. of interviews
FB1	35	1 year	Grade 12	2
FB2	38	1 year	Grade 11	
FB3	37	5 years	Grade 11	
FC1	32	5 months	Grade 9	1
FC2	34	5 months	Grade 11	
FC3	41	5 months	Grade 10	
FC4	44	5 months	Grade 9	
FD1	34	1 year	Grade 10	1
FD2	36	2 years	Grade 12	
FD3	43	5 years	Grade 10	
FE1	32	1 year	Grade 10	1
FE2	53	6 years	Grade 4	
FE3	57	2 years	Didn't go to school	

FG1	49	2.5 years	Grade 11	1
FG2	37	2.5 years	Grade 10	

(FB1= food handler number one from school B; FC1= food handler number one from school C; FD1= food handler number one from school D; FE1= food handler number one from school E; FG1= food handler number one from school G).

Table 4-1 indicates that nine food handlers were in the 31-40 year age category, four in the 41-50 category while two were more than 50 years. Table 4-1 also indicates that the experience of food handlers who participated in the research ranged from five months to six years. The presence of well experienced and less experienced food handlers was likely to give a clearer picture on how the programme was implemented. All food handlers from School C were only five months into the programme while schools B, D, E and G had at least one food handler who had at least two years experience of food preparation in the school nutrition programme. Food handlers in schools B, D, C and G had academic qualifications that ranged from grade 9 to grade 12. In school E, one food handler had no schooling and the other handler had up to grade 4 schooling. The following sub-section presents the biographic data of teacher co-ordinators, food suppliers, principals, the deputy district nutrition manager and the field officer.

Table 4-2: Distribution of teacher co-ordinators (N=4), food suppliers (N=7), principals (N=4), Nutrition manager (N=1) and field officer (N-1) by gender, age, service period in the NSNP and highest academic qualification

Participant Stakeholder	**Gender**		**Age (years)**	**Service period in the NSNP**	**Highest academic qualification**
Teacher Co-ordinators (T)	Male	Female			
TB		Female	52	8 months	Degree
TC		Female	29	2 months	Certificate
TD		Female	49	6 years	Degree
TG		Female	28	1 year	Degree

Food Suppliers (S)					
SB old		Female	>50	2 years	Certificate
SB new	Male		34	3 months	Diploma
SC	Male		32	3 months in School C, 3,5 years in other schools	Diploma
SD1		Female	42	3 months	Grade 7
SD2		Female	44	3 months	Grade 12
SE	Male		36	3 months in School E, 9 years other schools	Diploma
SG	Male		>40	9 Months	Diploma
Principals (P)					
PC	Male		50	6 years	Degree
PD		Female	49	2 weeks	Degree
PE	Male		>50	5 years	Degree
PG	male		52	6 months	Degree
District Deputy Nutrition manager	male		>40	23 years	Degree
Field Officer	male		>40	22 years	Certificate

(TB=teacher co-ordinator for school B; SB=food supplier for school B; PC=principal for school C).

Table 4-2 shows that the experience of participant teacher co-ordinators was between two months and six years. Participant food suppliers' experience in the school nutrition programme ranged from three months to nine years while that of school principals ranged from two weeks to six years. The district deputy manager had been in the nutrition programme for 23 years while the field officer was one year less experienced in the programme compared to the deputy manager. A total of

seven food suppliers were interviewed, one from each of the schools B, C, and E while two suppliers were all from school G, where one was an old supplier while the other was a newly appointed supplier. Two suppliers for school D were members of a co-operative that was supplying four different schools. One interview was conducted with them as they were members of the same co-operative.

One participant teacher co-ordinator had a certificate level academic qualification, while the rest, as well as principals, had degrees. The lowest educational level of participant suppliers was grade 7 and the highest achieved academic qualification for suppliers was a diploma. The district nutrition manager had a degree while the field officer had a certificate. Both were males. One teacher co-ordinator was interviewed from each school (B, C, D and G). All the teacher co-ordinators from schools B, C, D and G were females. Among the principals, one was a female from school D and the rest were males from schools C, E and G. Three of the food suppliers were females while four were males.

Two teacher co-ordinators were below thirty years of age while the other two were above 40 years. Four of the food suppliers who were interviewed were between 31 and 40 years, two between 41 and 50 years, and only one was more than 50 years old. The four School principals were above 30 years old. The district deputy manager for the nutrition programme as well as the field officer were above 40 years of age.

The diversity of experience among stakeholders assisted the researcher to have a more holistic understanding of the implementation of the nutrition programme. The researcher was able to collect qualitative data from participants who were aware of the programme expectations. Interview and questionnaire responses combined with observations helped to address the demands of each of the research objectives. The following sub-section presents the biographic data of learners.

Table 4-3: Distribution of Biographical characteristics of grade 12 learner respondents (N=108)

Biography variable	Variable description	Frequency	Percentage (%)
	Male	45	41.7
Gender	Female	63	58.3
Total		**108**	**100**
	Quintile 2	29	26.9
No of learners in Quintile	Quintile 3	79	73.1
Total		**108**	**100**
	15-20	96	88.9
	21-25	8	7.4
Age (years)	No response	4	3.7
Total		**108**	**100**
	None	88	77.8
	Class monitor	19	17.6
	Others	4	3.7
Position of responsibility		1	0.9
Total		**108**	**100**
	2	3	2.8
	3	14	13.0
	4	14	13.0
	5	71	65.7
	More than 5	5	4.6
Years in the same school	No response	1	0.9
Total		**108**	**100**

Table 4-3 shows that 45 (41.7%) of the respondents were males and 63 (58.3%) of the respondents were females. The total sample size was 108. Out of the three schools in quintile two, 29 (26.9%) respondents were drawn from two of the three schools that were willing to take part in the study. The third school in quintile two was not willing to take part in the study. Most of the respondents, 79 (73.1%), were from five schools in quintile three. The majority of the respondents, 96 (88.9%), were in the 15-20 age group, 8 (7.4%) in the 21-25 age group and the rest, 4 (3.7%), did not indicate their age group.

A substantial number of respondents, 88 (77.8%) did not have any position of responsibility, 19 (17.6%) of the learners were class monitors, 4 (3.7%) had other responsibilities other than that of class monitor, and 1 (0.9%) did not respond on the question on position of responsibility.

A significant proportion of respondents had been in the same school for at least three years. A small proportion 5 (4.6%) had been in the same school for more than five years, while the largest proportion 71 (65.7%) had been in the same school for four years. An equal number of respondents, 14 (13.0%) had been in the same school for four years and three years. One respondent (0.9%) did not answer the question on age while the rest, 3 (2.8%), had been in the school for two years. The fact that most of the respondents were in the same school for at least three years resulted in more valid responses from the learners since they were more familiar with the programme. Their responses were based on observations made over a long period of time. The next section presents and analyses data in line with sub-research questions that guided the study in providing answers to the main research question.

4.3 QUALITATIVE RESULTS OF TRAINING MONITORING AND SUPPORT PROVIDED TO FOOD HANDLERS, SERVICE PROVIDERS, TEACHER CO-ORDINATORS AND PRINCIPALS IN THE SCHOOL NUTRITION PROGRAMME

Six in-depth semi-structured interviews were conducted with fifteen food handlers, with four teacher co-ordinators, four principals and seven suppliers. The two suppliers for the same co-operative were engaged in a single interview, giving a total of six interviews with seven suppliers. The district deputy manager for the nutrition programme and one field officer were also engaged in a single in-depth interview at the district office. Themes and sub-themes emerged pertaining to training, as well as monitoring and support provided to the stakeholders of the nutrition programme. The main themes were derived from the sub-research question and were used to generate sub-themes. Table 4.4 presents the main themes and sub-themes which are discussed in detail in the subsequent sections.

Table 4-4: Main themes and sub-themes on training, monitoring and support given to key role players

Theme	Sub-Theme	Related issues
Training	Food preparation Teacher co-ordinators Principals Service providers Department officials	Understanding the purpose of the programme. Familiarity with food preparation and training needs of stakeholders. Role effectiveness. Orientation of stakeholders. Menu quality and quality.
Monitoring	Stakeholders involved in monitoring.	District based monitoring, school based monitoring. Teacher co-ordinator, principal, department officials and school governing body chairperson. Aspects that are monitored and training needs on monitoring.
Support	Food preparation support	Availability of recipe book, water, cooking utensils, cleaning materials and meal ingredients. Hygiene maintenance. Infrastructure availaibility. Vegetable gardens availability.
	Monitoring support	Accessibility to schools, availability of policy documents/checklists.
	Financial support	Late payment, food availability, food quality and food quantity.

4.3.1 Stakeholders understanding of the purpose of the NSNP

All stakeholders expressed that they understood the purpose of the nutrition programme. One teacher co-ordinator expressed that the NSNP is:

A programme that the government uses to help children who do not have enough food at home (TCD).

One food handler reiterated the statement by the teacher co-ordinator and added:

Nutrition programme helps learners who come to school without eating because there is no food at home. It helps them to learn well (FB2).

One principal echoed that:

The programme is aimed at assisting learners from challenged backgrounds whose parents cannot provide them lunch. It provides nutritious meals to learners from Monday to Friday (PE).

Suppliers were not left out in this echo as one of them said that the school nutrition programme is:

A programme for the department to assist learners from poor families who come to school hungry (SB old).

This understanding of the purpose of the programme is important as it helps stakeholders to achieve the objectives of the programme when they perform their roles.

4.3.2 Stakeholders familiarity with their roles in the NSNP

This section focused on training of different stakeholders. It includes who was involved and what was checked during the monitoring process and different kinds of support given to key role players in the school nutrition programme.

4.3.2.1 Training of stakeholders

This section elicited information on whether stakeholders were trained or not, their competence in performance of their roles, and whether they needed training or not.

4.3.2.1.1 Results from food handlers

Most of the participating food handlers expressed that they had limited information to assist them in performing their roles. The majority of food handler participants were never trained. According to one of the participants:

> *We were never trained. They ask you if you are able to cook before they consider you for the job. There was no in-service training. We need more training because we experience many challenges, for example, learners sometimes say that they don't like vegetables that we cook (FB1).*

Another participant indicated that she was not aware of how to perform her duties effectively due to lack of training and support. She said:

> *We were never told how much of each food item needs to be prepared. We are not sure whether what we are doing is correct or wrong because there was no training. We need training to do our jobs well, when we are given the opportunity. No one ever told us whether we cook correctly. The school does not assist us in improving our knowledge and skills in cooking (FC).*

Food handlers who have been in the programme for more than two years are expected to have undergone many training sessions. Despite serving in the programme for a longer period, the same sentiments of lack of training were echoed by a participant food handler from school G (FG):

> *There was no training from 2015. No one came to assist on how we should prepare meals. There was no training on quantities of food to cook for a certain number of learners. If learners are hundred we don't know how much food should be prepared. There is nothing to use for measurement of different quantities of ingredients to cook. We do not understand the information on the menu. The school does not support in training (FG).*

One of the food handlers indicated that although there was no training, she had acquired cooking skills from other women when community events like weddings were held. She revealed that:

We were never trained. We were just interviewed in the presence of the teacher co-ordinator and SGB members. We train ourselves. We have knowledge of cooking that we get when we go for special events. We learn from people who do catering in these events. I give myself above 100% in terms of cooking knowledge (FB2).

Another participant who was not trained indicated that a woman came to their school and showed them how to cook. She, however, indicated that training could improve their food preparation skills. Only food handlers at school D revealed that they were trained in the programme. One of them said:

We sometimes go for workshops where we are taught about the quantities of food to be prepared for the learners. We come with papers from the workshop. The suppliers are given papers that guide them about the food to deliver to the schools (FD).

The next section presents results on training from teacher co-ordinators.

4.3.2.1.2 Results from teacher co-ordinators

Two of the teacher co-ordinators indicated that they were not trained in monitoring the school nutrition programme. The lack of training seemed to be affecting the way they perform their roles as one of them revealed that:

I don't have sufficient knowledge because I didn't train. There is no knowledge and skills on monitoring provided by the school. I have no confidence in monitoring due to lack of training (TCB).

Lack of training was reiterated by the teacher co-ordinator from school G who said:

There was no training or invitation for training. I do not have sufficient knowledge on monitoring due to non-training. The school does not offer support on monitoring aspects (TG).

The teacher co-ordinators from schools B and G indicated that they were eager to train and improve their understanding and their monitoring roles. One teacher co-ordinator, TCB, identified the people that she felt needed more training in the programme:

> *Teacher co-ordinator and food handlers need more training.*

The same feeling was expressed by the teacher co-ordinator from school G who said:

> *I think all of us need training. I am not sure of the supplier (TG).*

The teacher co-ordinators from schools C and D indicated that they were trained in the programme but the training was not followed by in-service training. One of them said:

> *The guys from the department trained us. I don't remember when I was trained but I was trained three times. There was no in-service training (TD).*

The teacher co-ordinator from school C observed that there was training which was offered to them:

> *Yes, I was trained. There are in-service training programmes offered four times per year. I only went for training once in February 2017 (TC).*

However, the two teacher co-ordinators who indicated that they were trained reflected that they did not have sufficient knowledge and they needed more training. When they rated their knowledge on monitoring the programme on a three-point scale; good, adequate and poor, one rated her knowledge on programme monitoring as adequate while the other rated her knowledge as poor. One of the teacher co-ordinators confessed that:

> *I don't have sufficient knowledge in monitoring the programme. I need more training on how to check the food. I think the suppliers need more training on the programme. They don't do as we expect them. There are always many*

problems. There are delays in delivery and sometimes we don't have gas. Sometimes the quantities of food are lower than expected (TD).

One teacher co-ordinator reiterated that by saying:

I am new in the programme. Training was not enough as I arrived for the training late on the single day I attended. Teacher co-ordinators and food handlers need training because they were not trained at all (TC).

The next section presents results on training from school principals' perspectives.

4.3.2.1.3 Results from principals

All principals indicated that training of stakeholders is done by the nutrition section in the district office. One principal confirmed the training that was mentioned by one of the food handlers. He revealed that:

The training of stakeholders was done by the nutrition section in the district office. Food handlers were trained in cooking, reasons for the nutrition programme, cleanliness of the kitchen, as well as the food (PC).

Another principal reiterated that there was training that was done and there was no in-service training. He reflected that:

The department of education trained the teacher co-ordinators as well as the food handlers. I remember that it was offered once in 2012. I don't remember any other day when training was offered. There is no formal training of new food handlers except that the old food handlers are expected to guide the newly appointed food handlers. There is no training offered except the training that was offered by the department once in 2012 (PE).

One of the participant principal confirmed that training of new food handlers is done by old food handlers in the school. He/She had this to share:

When one food handler leaves the school, we have to hire another food handler who is not trained by the district. The food handler will be trained by the old food handlers in the school (PC).

The next section presents results on training from food suppliers.

4.3.2.1.4 Results from food suppliers

Food suppliers for school B (old supplier), C and E indicated that they were trained in providing food services to schools by the nutrition section in the district education offices. One of the food suppliers had this to share:

> *The department trained me. They train us every time there is a new contract. There is a massive training. They have training every 3 months or every 6 months they call us to make sure that we are familiar with programme requirements. So far, there have been two training sessions since June in Pinetown at the Department of Education. They do a very good job when they train us. The menu has quantities of food items per child. The problem of food handlers not knowing how to mix quantities in the menu is with the supplier. The supplier is given that information. If the menu indicates 40g per child for a particular food item, you multiply forty by the number of learners to get the total amount of the food item to cook per day (SC).*

On the same issue of training, another food supplier reported that:

> *The officials trained us on what type of food to buy, quantities, and specifications of what you have to supply. The training took a couple of hours. It happens when you get a new contact. I was trained at Pinetown district. It happens within the briefing. No paper is given its easy to follow. The department trained us, the cooks also undergo training. Rating myself out 10 on the knowledge of my roles as a supplier, I give myself seven out of ten. Based on what I am doing now, I don't think I need training. What we are doing is simple and straight forward. Training gives me confidence in purchasing the food to supply (SE).*

One of suppliers indicated the importance of pre-service and in-service training so as to perform duties more efficiently. The participant clearly indicated that although workshops are important, some stakeholders failed to attend.

Workshops were held for the chairperson, principal and teacher co-ordinator. They should be aware of what to monitor. Some people fail to attend the workshops because they will be at work. Training was based on food quantity, early delivery and all guidelines including the type of food to be supply. The training took one week. It started at nine o'clock and ended at three o'clock each day. We trained at Hammarsdale Education Centre. Training helped us as we were starting. Knowledge needs to be increased by in-serve training programmes. New people who are added also need training (SB old).

Although some food suppliers indicated that they were not trained, they were of the opinion that training was not necessary. One of the suppliers reflected that:

Neither pre-trained nor in-service training was offered to me by the department. My brother trained me. The department gave me something to guide me when buying. I think my knowledge of supplying food is good. I don't need any training. I have been supplying goods and services for many years. I have done it before, but was supplying for another company. I was supplying food to schools. I am not aware of documents in line with the food to be supplied. Sometimes the school guides one on the food to be supplied (SB new).

The same sentiments were reiterated by suppliers from school D who commented that:

We were never trained. We just applied as a co-operative. We applied to feed schools. They did not tell us what we should consider when buying the food. They don't need expired food. They need fresh food. We give ourselves 100% on the knowledge of supplying food. We work well and our schools are happy about us. We don't need any training (SD).

Contrary, some of the service providers needed training as they indicated that they did not have adequate knowledge for their roles. One of the service providers had this to share:

We and food handlers were not trained at all. We don't have enough knowledge as service providers. We need more training to perform our duties well (SG).

The next section presents results on training from departmental officials.

4.3.2.1.5 Results from department officials

The departmental officials concurred with one of the suppliers (SC) that training is done after every three months according to the policy. However, the district nutrition officials reflected that training was not done according to their plan. In September 2017, one of the district officials reflected that:

FUEL, a non-governmental organisation is working together with the NSNP in improving the monitoring process. We get regular training from FUEL. We train the food handlers together with the department of health and environmental health officials of the Durban Municipality. Food handlers change after every year. As a result, workshops are needed. We train teacher co-ordinators using policy documents. Training was last done in May 2017. It is supposed to be done on a quarterly basis but we are still planning for the second quarter. In my monitoring role as a field officer, I give myself seven out of ten since I can't visit all the schools due to the transport challenge (DF).

The next section presents results on monitoring of the nutrition programme.

4.3.2.2 Monitoring of the NSNP

This section focused on stakeholders involved and what was checked during the monitoring process

The teacher co-ordinators, food handlers, food suppliers and principals of schools B, C, D, E and G concurred that monitoring of the school nutrition programme was mainly done by the teacher co-ordinators and rarely by principals and SGB chairpersons and departmental officials. Principals were too busy with the day to day

running of school and had no time to monitor the nutrition programme. Most of the SGB chairpersons were working in places far from the schools, and could not monitor the programme. A principal in one of the schools had this to say:

> *The programme is monitored by the teacher co-ordinator while different class teachers are responsible for their classes. They monitor the quantity of the food and if all the learners have received the food. The teacher co-ordinator checks if the quantity delivered is equivalent to what the supplier will claim for. I can't remember seeing a departmental nutrition monitor this year. I am not sure about their frequency (September). They seldomly come. I am not directly involved in monitoring, but the nutrition teacher is directly in charge and I basically get reports from her in terms of the programme progress, such as food delivery. She checks the food and I get the reports from her. I only come in when there are problems or have received relevant documents from the department to give the co-ordinators or food handlers. We do have a check list for monitoring the programme (PE).*

A participant from a different school confirmed what the principal said and added on the aspects that she had seen monitored. She also mentioned the lack of storage guidelines which was mentioned by almost all participants. She expressed that:

> *The teacher co-ordinator checks if we cook food and serve learners well. They check if there are vegetables. They check the quantity of food cooked. If it's not enough you have to add more. No one else checks except the teacher co-ordinator who comes to check us every morning. When food is delivered, she checks expiry dates and whether the food is sufficient or not. There is no checklist. They only check the expiry date and quantity of food supplied. No one checks the quality. We decide on how to store the food. They never told us how to store the food. We have cupboards where we store the food (FB1).*

A different participant observed more people being involved in monitoring and checking more aspects than what other participants observed. The government body chairperson, unlike in other schools, seems to be involved in monitoring the programme. The participant had this to share:

Monitoring is done by the teacher co-ordinator, governing body chairperson, and two learner representatives – one male and one female. They check if the quantity of cooking oil is not too much. They check if there is not too much salt in the food. Governing body chairperson and supplier come to monitor. The supplier comes every week. The teacher co-ordinator checks the expiry date and quantities of items supplied. There is a paper which indicates the date of delivery and the last day to finish the food supplied. We were never shown how to store the food. We use our own understanding when storing the food. We put the food in the cupboards (FB2).

The district field officer highlighted the main monitor in the programme and aspects that were checked to ensure proper running of the programme. He confirmed the information to be checked which most of the participant teacher co-ordinators also mentioned. He/She expressed that:

The teacher co-ordinator inside the school monitors the programme. We monitor the files, check the kitchen area and gardens. Teacher co-ordinators check daily quantities as well as the food when the supplier is delivering. They check quantity, quality and expiry date. We are supposed to visit once a quarter. We have a challenge of transport in NSNP. We may have two or three visits per year depending on the availability of transport (DF).

The next section presents results on the various forms of support given to stakeholders of the school nutrition programme.

4.3.2.3 Support given to key role players in the NSNP

The section below presents information on various forms of support given to key role players in the National School Nutrition Programme.

4.3.2.3.1 Preparation Menu, infrastructure, water, and material support

Food handlers in various schools were supported by a menu in their preparation. However, there was no school based support from other stakeholders to assist some of them to understand the quantities of food items that they must prepare as was highlighted in earlier sections. Water to support cooking and hygiene was observed

by the researcher to be far from the kitchen and gas stoves presented problems in two of the schools. In all the five schools where qualitative data was collected, there were no posters to guide learners on hand washing and hygiene. In one of the schools, disposal of water outside the kitchen resulted in dirty conditions that were observed by the researcher and was also highlighted by the field officer in his monitoring report at the school. The kitchen had no electricity. One of the participants had this to say:

> *There is a menu that guides us when we prepare meals. Tomorrow we won't follow the menu because there is no gas. Samp and beans can't be cooked when gas is limited. We need a sink and tap of water here. We get water from afar. We don't give learners water to wash their hands. Even the gas stove has problems. It produces a lot of soot. We get water and wash the pots here. The departmental monitor who came in August 2017 told us that where we dispose waste is not the right place because the environment becomes dirty and invite flies that transmit diseases. We cook in a dark room because there is no electricity. They always say they will install electricity but that was never done. The school does not assist us in improving our knowledge and skills in cooking (FC).*

The dark room and lack of tap water or sink in and around the kitchen was confirmed by observations made by the researcher when he visited the school. Almost all schools visited by the researcher did not have proper kitchens to support the nutrition programme. Some schools used classrooms while others used metallic containers. Cleaning materials to support the programme were not always available. The floors of the kitchen were not very clean during the time of observation by the researcher after the food handlers had cleaned and were ready to go home. One of the participants commented that:

> *We can't clean well because of the computers. That is why it's dirty in that area. We can't clean the computers because that it is not our duty. We need a kitchen so that we can keep the kitchen clean. We do not have any protective clothing to prevent getting dirty. Cutting boards and working surfaces are*

always clean but it depends on whether the supplier provides enough cleaning material. Sometimes we bring soap for cleaning from home (FD).

Absence of proper kitchen infrastructure was reported and observed by the researcher in many schools during the data collection process. Some used classrooms which had no taps and sinks to access water. Some schools reported the presence of cutting boards while others did not have. One of the participants reflected that:

The place where food is prepared is not really a proper kitchen infrastructure. It needs to be improved. One cutting board is used to chop everything that is prepared in the kitchen. At some point in one school they were chopping on top of desks. There were no cutting boards and stainless steel (SE).

The shortage of cleaning materials was confirmed by one of the principals who had this to comment:

The environment around the kitchen is clean but not always clean. There are financial constraints with regards to the cleaning material on the part of the school. Sometimes there are workers to clean the area around but we do not have the equipment to do the thorough cleaning and consequently the area does not look very much neat. The cooking utensils are always clean although the standard is not the one that one would love to see (PE).

Another participant highlighted that the shortage of cooking ingredients affects the quality of food. One of the participants had this to share:

I would not say that meals are always of the same quality. At some point, there are shortages of ingredients like cooking oil, but that is very rare (PC).

One of the service providers indicated his support to new food service providers who were not getting enough orientation and support from the department. The old service provider was familiar with the programme and was well connected to some wholesalers and vegetable markets. The participant had this to share:

I am helping quite a few food suppliers who are just coming into the programme. I show them where to buy, quantities to buy, and where to buy vegetables and gas. I take them to the dealers. I am connected to dealers where I can get food on account and pay later. There is one in Phoenix called Phoenix Cash and Carry (SC).

4.3.2.3.2 Fruit and vegetable garden and documentary support

Different participants in different schools (B, C, D, E and G) concurred that there are no fruit and vegetable gardens, and gardening supporting documents in all the five schools where qualitative data was collected. Some participants indicated that there were documents to show the expected quality of fruits and vegetables whiles the same documents were reported to be absent in some schools. One of the food suppliers reported that:

There is no fruit and vegetable garden. We discuss with the school on food to be supplied. We are not aware of documents in line with the quality of fruits and vegetables to be supplied. But they have to be fresh (SB new).

The unavailability of fruits and vegetable gardens was further confirmed by the district field officer who commented that:

The availability of vegetable gardens is a challenge. The schools initially had vegetable gardens which are no longer functional due to shortage of water. There are no documents to support the growing of vegetables (DF).

Another food supplier reiterated the lack of fruit and vegetable gardens. He was quite familiar with the places to buy and the appropriate days on which to supply perishable food items to the school. However, the expected size of fruits was not clear to him. The participant commented that:

There is no fruit and vegetable garden in the school. Vegetables to be supplied must be fresh. That's why we bring the vegetables every Monday for the whole week and fruits every Friday. I buy fruits and vegetables from Clairwood Market. There are documents that show the expected quality and size of fruits (SC).

4.3.2.3.3 Financial support

All participant food suppliers complained of not getting financial support on time. The department follows a bureaucratic system which gets up to the provincial head office before the payments are effected. The system delays payment and compromises the quality and quality of food provided to schools. One of the suppliers had this to say:

> *The payment delays by the department compromises the quality of our work. At some point, it took me about five months before I got paid. As for now, I am in the third month but I have not been paid. When they delay payments, you take all the money from the other business and use it to buy food. If they pay us on time, there is enough profit due to the way it is designed (SE).*

Another service provider also highlighted the late financial support by the department but did not seem to be affected by this as he had established some business relationship with some wholesalers who could offer him food for the learners on credit until the department paid him. He/She commented that:

> *The challenge is that the department does not pay us on time. We are now in September. We have not been paid since July. For me, late payment does not compromise the food because I have a relationship with some wholesalers. Others who don't have a relationship do have a problem. The lady who has just called me now is a food supplier in one of the schools but she no longer has any money to buy food for learners (SC).*

Another food supplier reiterated the problem of late payment and added that the budget per learner per day was not enough to buy quality food for the learners. He/She had this to share:

> *There is a problem on remuneration. The main issue is that the department does not pay us on time. Although food handlers are not directly employed by us as food suppliers, we are expected to pay them on time every month, even if we struggle to raise the money to buy the food. If you do not pay suppliers on time, you will be creating disaster. If you deliver the first month and second*

month and there is no money from the department, everything including the food quality will be compromised. It's not enough support that you have given me the contract. You need to pay me on time. The budget of R3.25 per learner per day for secondary schools is too limited. That's not enough to supply quality food (SB).

Although there is limited budget, the suppliers appeared not to be supplying the same quality of food on the same budget. One of the participants commented that:

The last supplier was providing quality food. The current supplier supplies quality food. He supplies golden delight rice, honeydew milk and big first grade tomatoes (FB2).

The above section presented the qualitative data based on the first sub-research question. The next section presents the corresponding quantitative data from respondents.

Qualitative data reflected lack of training and limited knowledge among stakeholders, inadequate support to stakeholders, and unavailability of fruit and vegetable gardens. In an attempt to confirm and complement the qualitative responses in the first sub-research question: 'How are training, monitoring and support provided to key role players in the school nutrition programme?' a self-administered questionnaire was completed by learners from different schools, and the following section presents the results.

4.3.3 Quantitative results on training, monitoring and support given to key role players

In attempting to answer sub-research question one, a questionnaire was administered to 108 learners in seven high schools to elicit the information on food preparation support, gas security, hygiene around the kitchen, food quality,

monitoring of the NSNP, vegetable garden support, and reasons for learners' dislike of certain meals. Learners responded by ticking in a five point likert scale: always true (5), sometimes true (4), neutral (3), rarely true (2) and never true (1). On the issue of dislike of certain meals, learners had to write down the reasons for disliking some of the NSNP meals. The results of all the 108 participants who responded as well as the participants who did not respond to specific question items are presented in Table 4.5.

Table 4-5: Behaviour of stakeholders related to training, monitoring and support

Observed character	**Learners' response (Number & percentage of respondents)**							
	Always true 5	Sometimes true 4	Neutral 3	Rarely true 2	Never true 1	No response	Mean	STDEV
Food handlers prepare the food on time every day.	48 (44.4)	50 (46.3)	5 (4.6)	1 (0.9)	1 (0.9)	3 (2.8)	21.6	24.1
Food handlers have a recipe book which they use to prepare meals.	31 (28.7)	5 (4.6)	46 (42.6)	2 (1.9)	24 (22.2)	0 (0.0)	21.6	18.6
The kitchen always has sufficient equipment to prepare meals.	24 (22.2)	27 (25.0)	35 (32.4)	6 (5.6)	13 (12.0)	3 (2.8)	21.6	12.6
Broken equipments are immediately replaced.	11 (10.2)	19 (17.6)	44 (40.7)	13 (12.0)	18 (16.7)	3 (2.8)	21.6	14.0
The gas tank is outside the kitchen & is secure.	80 (74.1)	1 (0.9)	6 (5.6)	0 (0.0)	19 (17.6)	2 (1.9)	21.6	31.2
Food handlers are always	45	31	25	3	3	1	21.6	18.4

clean.	(41.7)	(28.7)	(23.1)	(2.8)	(2.8)	(0.9)		
A poster on hand washing principles is	13 (12.0)	3 (2.8)	16 (14.8)	7 (6.5)	68 (63.0)	1 (0.9)	21.6	25.2
Meals provided on each day are of good quality always.	30 (27.8)	35 (32.4)	23 (21.3)	10 (9.3)	8 (7.4)	2 (1.9)	21.6	13.3
The environment around the kitchen is always clean.	15 (13.9)	34 (31.5)	22 (20.4)	14 (13.0)	21 (19.4)	2 (1.9)	21.6	10.6
Utensils are cleaned using soap every day.	37 (34.3)	13 (12.0)	49 (45.4)	3 (2.8)	4 (3.7)	2 (1.9)	21.6	20.1
The principal monitors the food prepared.	6 (5.6)	9 (8.3)	42 (38.9)	6 (5.6)	44 (40.7)	1 (0.9)	21.6	19.5
Departmental officials monitor the food prepared.	7 (6.5)	9 (8.3)	52 (48.1)	6 (5.6)	32 (29.6)	2 (1.9)	21.6	19.8
The principal &/or teacher co-ordinator checks the food delivered by the supplier.	56 (51.9)	23 (21.3)	18 (16.7)	2 (1.9)	7 (6.5)	2 (1.9)	21.6	20.5
The SGB member	7 (6.5)	13 (12.0)	44 (40.7)	3 (2.8)	40 (37.0)	1 (0.9)	21.6	19.1
Vegetables are grown in the school garden.	2 (1.9)	0 (0.0)	5 (4.6)	2 (1.9)	97 (89.8)	2 (1.9)	21.6	38.7
Fruit trees are grown in the school garden.	2 (1.9)	0 (0.0)	4 (3.7)	0 (0.0)	100 (92.6)	2 (1.9)	21.6	40.2

The school has a fruit tree and vegetable.	1 (0.9)	1 (0.9)	2 (1.9)	0 (0.0)	101 (93.5)	3 (2,8)	21.6	40.7
Vegetables are well maintained in the school garden.	0 (0.0)	0 (0.0)	2 (1.9)	3 (2,8)	100 (92.6)	3 (2,8)	21.6	40.2
Fruits are well maintained in the school garden.	2 (1.9)	1 (0.9)	2 (1.9)	2 (1.9)	99 (91.7)	1 (0.9)	21.6	39.8
Vegetables are sprayed when attacked by diseases and pests.	1 (0.9)	0 (0.0)	11 (10.2)	1 (0.9)	91 (84.3)	4 (3.7)	21.6	36.0
Fruits are sprayed when attacked by diseases and pests.	1 (0.9)	1 (0.9)	9 (8.3)	2 (1.9)	91 (84.3)	4 (3.7)	21.6	35.9
Vegetables in the school garden are of good quality.	0 (0.0)	2 (1.9)	6 (5.6)	0 (0.0)	98 (90.7)	2 (1.9)	21.6	39.3
Fruits in the school garden are of good quality	0 (0.0)	2 (1.9)	6 (5.6)	0 (0.0)	99 (91.7)	1 (0.9)	21.6	39.7

Table 4.5 presents quantitative data based on sub-research question one. The next four sections present an analysis of the information on the table.

4.3.3.1 Food preparation support and gas security

Learners are the major beneficiary of the national school nutritional programme. They are likely to give unbiased responses since they want conditions to improve if there are problems in line with implementation of the school nutrition programme. In response to the questions on support in food preparation and gas security, learners'

responses revealed that food handlers were generally getting enough support to enable them to prepare and serve meals to the learners. A large proportion of respondents 48 (44.4%) were of the opinion that food handlers always prepared food on time and almost an equal number 50 (46.3%) were of the view that food handlers sometimes prepared food on time. Only five respondents (4.6%) were neutral on the issue of food handlers' preparation of food on time. Only one respondent (0.9%) indicated that food handlers rarely prepared food on time and an equal number was of the view that food handlers never prepared food on time, while three respondents (2.8%) never responded to that questionnaire item. This item confirmed the qualitative data which revealed that food was generally prepared on time except in rare circumstances where there were challenges or school arrangements to serve the food later.

On the issue of the recipe book, learners seem to have responded objectively. A large proportion of learner respondents 46 (42.6%) were not aware of the availability of a menu or recipe books since they were not involved in food preparation. Thirty-six learners (33.3%) were affirmative on the presence of a recipe book, while 24 (22.2%) indicated the absence of a recipe book and the rest 2 (1.9%) were of the view that the recipe books were never available. A recipe book is important in the preparation of the right quantities of food and also in guiding the preparartion of a particular meal.

In the learners' responses on availability of sufficient equipment to prepare meals, 51 (47.2) agreed that there was sufficient equipment to use in meal preparation while 35 (32.4%) were not sure of the availability of such equipment. A smaller proportion 19 (17.6%) were on the negative side on the availability of sufficient support material on food preparation while a small proportion {3 (2.8%)} did not respond to that question item. Learners' responses indicated that many schools had enough equipment to assist them in meal preparation while some schools did not have sufficient equipment to support them in meal preparation.

Generally, learners were not aware of the urgency of the replacement of broken equipment. In their response on the urgency of replacement of broken equipment, 44 (40.7%) students were not aware of the urgency by which broken equipment were replaced, and 30 (27.8%) indicated that broken equipment were immediately

replaced. Thirty-one (28.7%) of the learners who responded indicated that broken equipment was not immediately replaced. These responses could be representing varying situations in different schools. On a more positive note, 81 (75%) respondents indicated that gas tanks were outside the kitchen while 19 (17.6%) observed the gas tanks inside the kitchens. Six (5.6%) respondents were not aware of the position of gas tanks while 2 (1.9%) did not respond to this question. Gas tanks can be very dangerous when they are kept inside the kitchen as they may catch fire, burst and kill people. Large standard deviations that were between 10.6 and 40.2 showed greater dispersion of learners' responses from the mean value of 21.6.

4.3.3.2 Hygiene around the kitchen environment and food quality

Hygiene plays an important role in preventing the transmission of diseases from one person to another. The learners' responses on issues of hygiene in the kitchen revealed that hygiene was generally good although some improvements were needed in almost all schools. Forty-five respondents (41.7%) agreed that food handlers were always clean while 31 (28.7%) indicated that they were sometimes clean. A large proportion of learners 25 (23.1%) were neutral on the issue of the cleanliness of the food handlers. A small proportion 6 (5.6%) of learner respondents were not happy about the hygiene concerning food handlers. Only one respondent (0.9%) did not respond to this question. Fifteen (13.9%) of the respondents were positive on the facts that the environment around the kitchen was always clean, 34 (31.5%) indicated that the kitchen area was sometimes clean, while 22 (20.4%) were neutral on the cleanliness of the kitchen area. Thirty-five (32.4%) were not happy about the cleanliness of the kitchen environment. The varying responses among respondents was due to the variations in the levels of hygiene in different schools. The levels of hygiene in the kitchen was better in some schools than others. On the issue of cleaning kitchen utensils using soap, most respondents 49 (45.4%) were not aware of how cleaning was done by food handlers. As a result, they were neutral on the issue. A large proportion of learners 50 (46.3%) indicated that cleaning was done using soap. Seven (6.5%) respondents were of the view that cleaning of kitchen utensils was not done using soap. The results generally indicate that cleaning was

done using soap but there could have been instances when soap was sometimes unavailable and cleaning was done with water only.

The study revealed that there were no posters on hand washing. Seventy-five (69.5%) of the learners revealed that there were no posters on hand washing, that were displayed. A small proportion of the learners 16 (14.8%) was aware of the posters, and an equal number was neutral on the availability of such posters.

There were positive reports on the provision of quality meals by 65 (60.2%) of the learners. A fairly large number of respondents 18 (16.7%) revealed that the quality of meals was not good while 23 (21.3%) were neutral on the issue of meal quality. The quality of some of the meals was fairly good while in some schools, improvements were needed to make the meals more appealing to the learners

4.3.3.3 Monitoring of the NSNP

Learners' responses eliciting the involvement of the principals, the departmental officials and the SGB chairpersons on monitoring were largely neutral with 42 (38.9%), 52 (48.1%) and 44 (40.7%) respectively on the neutral position. This is an indication that most learners were not aware of the involvement of such stakeholders in monitoring the school nutrition programme. Fifty learners (46.3%) disagreed that principals were involved in monitoring the programme while 15 (13.9%) agreed that principals were involved in monitoring the nutrition proramme. Thirty-eight (35.2%) disagreed that departmental officials were involved in monitoring the programme while a smaller number 16 (14.8%) was of the view that departmental officials were involved in monitoring the NSNP. A large number of respondents 43 (39.8%) disagreed that the SGB chairpersons were involved in monitoring the programme while 20 (18.5%) indicated that the SGB chairpersons were involved in monitoring the NSNP. A substantial number of learners 79 (73.1%) agreed that the principals or the teacher co-ordinators checked the food delivered by the suppliers while 18 (16.7%) were neutral on that item as they were probably unaware of the issue of the stakeholders involved in checking the delivered food. A very small number of respondents two (1.9%) indicated that the food delivered to the school was rarely

checked while 7 (6.5%) were of the view that the delivered food was never checked at all. Generally, the teacher co-ordinators and the principals monitored the food more often than the SGB chairperson and the department officials because they are mostly in the school premises.

4.3.3.4 Vegetables gardens in schools

The questions on vegetables and fruits in the school gardens indicated high level of consistency in learners' responses. A significantly large proportion of the respondents 101 (93.5%) indicated that most schools in Molweni circuit did not have fruit and vegetables gardens. A very high percentage of respondents reflected that there were no vegetables (91.7%) and fruits (92.6%) grown within the school premises. All the subsequent questions on fruit and vegetable gardens yielded responses that were consistent with the first responses since they were follow up questions on fruit and vegetable gardens.

4.3.3.5 Reasons for learners' dislike of certain meals

Learners were given food in all schools from Monday to Friday. However, some of the learners indicated various reasons for not taking certain meals. Some of the reasons are presented in Table 4.6.

Table 4-6: Reasons for learners' dislike of some meals

Food disliked & reason	Number & (%) of respondents	Food disliked & reasons	Number & (%) of respondents
soya mince		**samp and beans**	
not well prepared	10 (9.3)	not well prepared	6 (5.6)
stomach problems after eating	4 (3.7)	stomach problems after eating	8 (7.4)
bad taste	6 (5.6)	bad taste	5 (4.6)
Allergic	2 (1.9)	Allergic	6 (5.6)
Fish		**Fish**	
not well prepared	18 (16.7)	Cultural	2 (1.9)
stomach problems after eating	8 (7.4)	Do not like fish	3 (2.8)
bad taste	1 (0.9)	bad smell	1 (0.9)
Allergic	6 (5.6)		

Table 4.6 summarises the reasons why learners did not like certain meals. A number of learners complained that some of the meals were not well prepared. Ten (9.3%) of the learners expressed that soya mince was not well prepared, while 6 (5.6%) had the same sentiments for the Wednesday meal which consisted of samp and beans. A relatively higher number of learners 18 (16.7%) shared the view that fish for Monday was not well prepared. Moreover, 6 (5.6%) and 5 (4.6%) students complained about the bad taste of soya mince and the Wednesday meal of samp and beans, respectively. An equal number of learners 8 (7.4%) had stomach problems after eating fish on Monday, and samp and beans on Wednesday; while 4 (3.7%) had the same problem after eating soya mince. A similar number of learners 6 (5.6%) reported to be allergic to samp and beans on Wednesday and fish on Monday. A very small number of learners 2 (1.9%) reported that they did not like fish due to cultural reasons.

4.3.4 Main findings on training, monitoring and support of key role players in the schools nutrition programme

Responses to both qualitative and quantitative data revealed that there was limited in-service training and support given to key role players in the NSNP. The lack of training could have led to meals that were not well prepared as was highlighted by respondents and participants. Lack of knowledge among stakeholders on their roles generally compromised the implementation of NSNP, resulting in some problems such as lack of hygiene. Table 4.7 presents the main findings on training, monitoring and support of key role players in the NSNP derived from quantitative and qualitative data.

Table 4-7: Triangulation table of findings from qualitative and quantitative data

Findings (Qualitative data)	**Findings (Quantitative data)**
There was no pre-service training and in-service training of new	Confirmed by comments: • Bad taste of food revealed by

stakeholders. A number of stakeholders had limited knowledge to perform their duties.	6 (5.6%) of the respondents • Food was sometimes not well cooked as revealed by 18 (16.7%) of the respondents • Students had stomach problems after eating the food as revealed by 8 (7.4%) of respondents.
The teacher co-ordinator was the main monitor of the programme. Principals and departmental officials were rarely involved in monitoring.	Confirmed by a higher number of respondents 79 (73.1%) who indicated that they were involved in monitoring. Confirmed by relatively smaller numbers 15 (13.9%) and {16 (14.8) of principals and department officials respectively, who indicated that they were involved in monitoring.
There was no sufficient support given to stakeholders. Limited hygiene.	Confirmed by a relatively high number of respondents 35 (32.4%) who disagreed that the kitchen area was always clean.
No fruit and vegetable gardens in all schools except one.	Confirmed by a significantly high number of learners 99 (91.7%) who indicated that there were no school gardens.

Table 4.7 shows a summary of both qualitative and quantitative findings on training, monitoring and support of key role players, showing where they converged or diverged.

4.3.5 Interpreting the triangulation table

Qualitative data indicated the absence of pre-service and in-service training among some stakeholders resulting in limited knowledge in performing their duties. The main monitor of the programme was the teacher co-ordinator who was mostly at school while the principals attended meetings and other school demands outside the school premises. The district field officers rarely monitored the programme due to inadequate transport.

Data obtained through the use of the questionnaire confirmed the absence of adequate training and hence, knowledge of food preparation among food handlers. Confirmation was made through the learners who revealed that the food had a bad taste, was sometimes not well cooked; and others who indicated that they had stomach problems after eating the meals. A relatively high number of respondents identified teacher coordinators as monitors of the programme, confirming the involvement of the teacher co-ordinators. Limited support with cleaning materials to some food handlers was partly evidenced by a higher number of respondents who disagreed that the kitchen area was always clean. An exceptionally high proportion of respondents confirmed the lack of the vegetable gardens in most high schools.

4.4 RESULTS ON PROCUREMENT AND PREPARATION OF FOOD SERVED TO LEARNERS IN SCHOOL NUTRITION PROGRAMME

Procurement of food is determined by many factors including financial support and knowledge of policy documents that are in line with food procurement. Preparation of food is partly determined by the presence of necessary ingredients and equipment. Both procurement and food preparation are influenced by training provided to stakeholders. This section presents qualitative and quantitative data on procurement and preparation of the food served to learners in the National School Nutrition Programme, in an effort to answer sub-research question two: How is the procurement and preparation of food accomplished for the food served in the school nutrition programme? The acceptance of food by learners is partly dependent on how well the food is prepared.

4.4.1 Qualitative data based on procurement and preparation of food served to learners in school nutrition programme

The sections below present qualitative data based on how service providers obtained and supplied food to schools and what informed the food handlers to prepare the food for the NSNP. The information obtained from in-depth interviews and document analysis is presented in an effort to answer the sub-research question. The main themes and sub-theme and related issues are presented in Table 4.8.

Table 4-8: Main themes and sub-themes on procurement and preparation of food for the NSNP

Themes	Sub-Themes	Related issues
Procurement	What informs procurement	selection of suppliers, menu, price, season.
	Where and how food is bought	wholesale, supermarkets, fruit & vegetable market. accounts, Cash.
Preparation	What informs preparation	feeding time, menu, handy measures
	Source of preparation information	• Home • Special events • Suppliers • Training workshops

4.4.1.1 Procurement of food

All the participant suppliers revealed that they were selected through a tender system. Most of the food was bought from the fruit and vegetable markets as well as wholesales. Some suppliers were able to get food on accounts while others were getting it on cash. One of the participants reflected that:

We were selected through a tender system. We buy fruits and vegetables from Durban Market and other items from Westmead Cash and Carry or Hammarsdale Cash and Carry. We do not purchase food on account but we buy cash at wholesale price. Curry powder can be purchased from Pele Pele in Pinetown (SG).

Another participant indicated that he/she needed support from farmers. He/She also indicated that when purchasing, he considered the price and quality of food. He/She had this to share:

I replied to a tender that was in the newspaper by filling in forms that I submitted. I am not in partnership with any organisations. I need support from the famers. Wholesales give us quality food. If we could get food on accounts, we would appreciate. I go around checking the prices before I buy the food. I obviously consider the price and quality (SBN).

Although some of the service providers were not able to get food on accounts, others were able to obtain food on accounts:

Westmead cash and carry used to give us food on accounts. We had to pay back as soon as we were paid by the department (SBO).

Another participant expressed that he/she also got food on accounts but from a different wholesale. He/She noted that he got fruits and vegetables from a fruit and vegetable market and could get food on accounts like the former. He/She had this to comment:

I am supplying on behalf of the company of my mother. I am connected to dealers where I can get goods on account and pay later. There is one in Phoenix called Phoenix Cash and Carry. I buy fruits and vegetables from Clairwood Market. I consider quality before purchasing the food (SC).

A participant from a different school confirmed the statements above and added that there was a farmer who was supplying them honeydew milk and that they were able to borrow money from the bank. There were working as a co-operative with included young men and women.

We supply food for four schools as a co-operative with three females and two males. We were given forms and we applied for the tender. We buy at New Germany cash and carry. We buy on cash. We are not sure whether they can give us food on accounts. The school support us as they tell us the type of food to buy. We buy food from New Germany cash and carry. We buy fruits and vegetables from Oxford Supermarket. Honey Dew (Amasi) is supplied by a white farmer who brings it to New Germany where we collect and deliver it to schools. We borrow money from the bank. We pay back to the bank with interest. That reduces our profits (SD).

A member of one cooperative indicated how they contributed the money for procurement of food in the NSNP. They were also not able to get food on accounts making it difficult to continue serving a school with more than one thousand learners for more than three months without payment from the department. They had this to say:

We supply as a co-operative. There are women in the co-operatives. In our case, there were no disabled persons around. So we came together and registered. We don't really contribute the same amount of money on purchasing. We make different contributions. If for instance one contributes R 2 000 and another contributes R 10 000 and get the job done. After payment, the person who contributed R 2 000 gets his R 2000 back and the one who contributed R 10 000 gets his money back and we share the profit equally (SE).

We are not really in partnership with wholesalers and farmers but we are valuable customers. There is Ethekwini Market of vegetable and fruit where there are lots of farmers. There is Westmead Cash and Carry where I buy my maize meal and non-perishables. They cannot give us food on accounts. They only want cash (SE).

Procurement of food was determined by price and quality of food and by various factors including documents from the department, season and payment of suppliers. All of the food suppliers from the five schools where qualitative data was collected

reported that they had a menu that guided them to buy food for the school nutrition programme. One of the participants reflected that:

> *Documents on quantity and quality of food to be supplied are provided at the district office. A menu that showed quantities per learner for each day is available to the food suppliers to assist them when purchasing food. When we purchase, we consider quality, quantity and expiry date (SBO).*

The district officials identified the people who are involved in the selection of stakeholder for the tender:

> *Procurement of food is done by service providers who are selected by the Provincial Evaluation Committee and Awarding Committee through a tender process. We are not sure about how the process is done as we are not part of it. Pinetown district service providers use every wholesale around them to procure goods. In other districts, there are designated areas where they sell fruits and vegetable. Pinetown district suppliers are not restricted. They can buy from and supermarkets or wholesalers (DO).*

Food for the NSNP was procured from fruit and vegetable markets, wholesales and supermarkets by service providers who were selected through *a* tender system. The majority of the service providers could not get food on accounts while a few were able to get food on accounts from selected wholesalers. Others had to borrow money from the banks when their financial resources were exhausted.

4.4.1.2 Preparation of food

This section presents information on preparation of food from the school nutrition programme. The focus is on feeding time, menu availability as well as the availability of handy measures to use when measuring the quantities of food to prepare per day.

The feeding time was variable in different schools ranging from 0945 hours to 1100 hours. The common feeding time was 1100 hours. In school G, the principal, teacher co-ordinator and food handler concurred that the feeding time was 1100 hours. Observations by the researcher also confirmed the time which was contrary to 1000

hours given by the supplier. The same feeding time was confirmed in school B by the teacher co-ordinator, two food handlers and the new supplier. The old supplier for school B gave 1000 hours as the feeding time. School E had 1100 hours as their feeding time from Monday to Wednesday and 1030 hours for Thursday and Friday, according to three food handlers who participated in the study. In school C, the food was observed by the researcher to be served at 1045 hours. This was confirmed by the food handlers and the teacher co-ordinator. The food handlers, teacher coordinator and school principal for school D concurred that food was served at 0945 hours. One of the district officials had this to share in line with the feeding time:

> *Schools are not abiding by the time. Secondary schools are serving the food at 1100 hours due to their curriculum setting. We need not to interfere with curriculum matters, so we can't force them (DO).*

All food handlers from all schools where qualitative data was collected, except in one school, concurred that a menu was available to assist them in food preparation although some of them were not able to use it due to their low literacy level. One of the participants revealed that:

> *Food handlers follow the guidelines on the menu for the recent supplier who is good. Previously, they were depending on the delivery of the food from the supplier who was not consistent. We also had another supplier who was consistent sometime back. I can't say meals are of the same quality. For example, if the butternut is out of season, it will not be nice. It might be nice this Monday and next Monday full of water (PD)*

Due to lack of training highlighted in the earlier section, some food handlers had to use knowledge from their homes to prepare food for the NSNP.

> *There are no other documents to help in food preparation except the menu. We cook using the knowledge from our homes. We clean cutlery using dish washing liquid and cloth only (FB1).*

Some of the participants improved their knowledge of cooking by engaging in some special community events where meals are prepared, like weddings. They indicated

how they tried to improve the quality of food and to keep the surfaces clean and free from bacteria. One of the participants reported that:

> *There is no recipe book. There are papers which indicate the food for each day. We follow the menu. We have knowledge of cooking that we get when we go for special events in the community. We learn from people who do catering in those community events. When we cook, we prepare salad using grated cabbage and carrots so that the food looks good and delicious. Cutting boards are cleaned using sunlight liquid. Sometimes jik is used to clean surfaces (FB2).*

A problem that was mentioned under training is also mentioned in this section because it affects food preparation but arises as a result of lack of training. A participant identified a problem affecting food quality resulting from inadequate knowledge:

> *We were never told how much of each food item needs to be prepared. We are not sure whether what we are doing is correct or wrong because there was no training. We were never told how much of each food item needs to be prepared. We are not sure whether what we are doing is correct or wrong because there was no training (FC).*

One of the participants was of the view that it was the suppliers' duty to familiarise food handlers with quantities of food to prepare. The participant bemoaned that:

> *The eating menu has quantity per child. The problem of food handlers not knowing how to mix quantities in the menu is with the supplier. The supplier is given that information. If it's 40g per child, you multiply by number of learners to get the amount to cook per day. The supplier is supposed to give them handy measures like small buckets that correspond to quantities that is required. He is supposed to guide the food handlers (SC).*

Another service provider felt that giving preparation information to food handlers was not the responsibility of service providers. He had the feeling that all long serving food handlers were familiar with their roles. The participant had this to share:

> *We don't inform food handlers on how they should cook. The food handlers have been doing the job for a long period. There are no new food handlers. The department never told us how the food should be cooked (SD).*

Another service provider reiterated that it was not the service providers' responsibility to inform food handlers about how to prepare food. He felt that food handlers were supposed to be aware of their roles. The participant expressed that:

> *A menu is available (a paper from the department). It does not show how the food must be prepared. I am not aware of how the food should be prepared. The school teacher co-ordinator and food handlers should know (SG).*

One of the participants highlighted the absence of cutting boards and the use of tables for cutting vegetables which were highlighted in the section on support of stakeholders. She also mentioned inconsistence among service providers that might be caused by lack of training or delayed payments. She commented that:

> *There are no cutting boards. They use a table for cutting vegetables and they try to maintain it. Work surfaces are not always clean. Cooking is done using gas which the supplier pays for. The gas is always available, but today it's not available. This problem was not experienced with the previous supplier (TC).*

One of the long serving members of the school nutrition programme commented that:

> *We go for workshops where we are told how we should prepare meals. We follow instructions from these workshops. If the supplier is not giving enough, we tell him what he must provide (FD).*

The next section presents quantitative data based on procurement and preparation of food.

4.4.2 Quantitative data based on procurement and preparation of food served to learners in school nutrition programme

Qualitative data that is based on what informed the procurement and preparation of food in the NSNP was presented in the above section. Corresponding quantitative data of all 108 respondents is presented in the next section to complement the qualitative data. Table 4.9 presents the quantitative results based on procurement and preparation of food for the NSNP.

Table 4-9: Procurement and preparation of food for the school nutrition programme

procurement/preparation procedure	Learners' responses							
	Strongly agree 5	Agree 4	Neither agree nor disagree 3	Disagree 2	Strongly disagree 1	No response 0	Mean	STDEV
Food for the school nutrition programme is bought and supplied by an independent supplier	42 (38.9)	20 (18.5)	41 (38.0)	1 (0.9)	3 (2.8)	1 (0.9)	21.6	19.6
Food for the school nutrition programme is bought and supplied by the school	5 (4.6)	5 (4.6)	39 (36.1)	19 (17.6)	39 (36.1)	1 (0.9)	21.6	17.4
Food for the school nutrition programme is bought from local small holder farmers	1 (0.9)	4 (3.7)	42 (38.9)	23 (21.3)	36 (33.3)	2 (1.9)	21.6	18.9
Food for the school nutrition programme is bought from local supermarkets/wholesaler	5 (4.6)	7 (6.5)	73 (67.6)	7 (6.5)	13 (12.0)	3 (2.8)	21.6	27.2

Soya mince for the school nutrition programme is manufactured by one of the recommended soya manufacturers	5 (4.6)	8 (7.4)	83 (76.9)	6 (5.6)	4 (3.7)	2 (1.9)	21.6	31.9
Food for the school nutrition programme is bought from the fruit and vegetable market	8 (7.4)	15 (13.9)	76 (70.4)	2 (1.9)	4 (3.7)	2 (1.9)	21.6	28.9
Food is prepared in a clean kitchen	34 (31.5)	30 (27.8)	27 (25.0)	5 (4.6)	10 (9.3)	2 (1.9)	21.6	13.9
Cutting boards are always clean	16 (14.8)	16 (14.8)	57 (52.8)	13 (12.0)	6 (5.6)	0 (0.0)	21.6	20.2
Separate cutting boards are used for fresh vegetables and meat	6 (5.6)	10 (9.3)	65 (60.2)	11 (10.2)	16 (14.8)	0 (0.0)	21.6	23.6
Utensils, cutting boards and work surfaces are cleaned with soapy water	18 (16.7)	20 (18.5)	62 (57.4)	3 (2.8)	4 (3.7)	1 (0.9)	21.6	23.0
The floor is swept and mopped daily before leaving	31 (28.7)	15 (13.9)	48 (44.4)	4 (3.7)	9 (8.3)	1 (0.9)	21.6	18.1
Damaged or bruised areas of food are cut away	13 (12.0)	12 (11.1)	71 (67.7)	6 (5.6)	4 (3.7)	2 (1.9)	21.6	26.3
Vegetables are cleaned before cutting and cooking	14 (13.0)	21 (19.4)	60 (55.6)	5 (4.6)	8 (7.4)	0 (0.0)	21.6	21.8
Vegetables are cleaned after cutting	14 (13.0)	16 (14.8)	65 (60.2)	5 (4.6)	5 (4.6)	3 (2.8)	21.6	23.6
Food is prepared using a gas stove	90 (83.3)	14 (13.0)	1 (0.9)	0 (0.0)	3 (2.8)	0 (0.0)	21.6	35.7
Food is prepared using an electric stove	4 (3.7)	1 (0.9)	7 (6.5)	26 (24.1)	69 (63.9)	0 (0.0)	21.6	26.8
Food is prepared by food handlers	69 (63.9)	14 (13.0)	17 (15.7)	3 (2.8)	5 (4.6)	0 (0.0)	21.6	25.8

Food is prepared using Mnandi 4 sure recipe book	5 (4.6)	1 (0.9)	69 (63.9)	8 (7.4)	24 (26)	1 (0.9)	21.6	26.4
Fortified maize meal/bread is used in the school nutrition programme	10 (9.3)	10 (9.3)	54 (50.0)	10 (9.3)	21 (19.4)	3 (2.8)	21.6	18.6

4.4.2.1 Procurement of food

The data confirmed that the food for the NSNP was bought and delivered by an independent service provider. A significantly high proportion of learners 62 (57.4%) generally agreed that food for the NSNP was bought by an independent service provider while a very small proportion of respondents 4 (3.7%) disagreed that food was provided by an independent service provider. Relatively large proportions of respondents neither agreed nor disagreed on whether the food was bought and supplied by an independent service provider 41 (38.0%) or the school 39 (36.1%) and from local smallholder farmers 42 (38.9%). Learners who neither agreed nor disagreed were probably unaware of who was responsible for buying the food and whether some of the food was from local smallholder farmers. A large proportion of respondents 58 (53.7%) disagreed that the food was bought by the school and almost an equal number 59 (54.6%) disagreed that the food was bought from local small holder farmers. Among the respondents who disagreed that food was bought by the school, the majority strongly disagreed 39 (36.1%) on that issue while 36 (33.3%) strongly disagreed on the issue of purchasing from local small holder farmers since there were no small holder farmers nearby.

Learners' responses on whether the food was bought from local supermarkets or wholesalers, whether soya mince was bought from one of the recommended manufacturers, and whether fruits and vegetables were bought from fruits and vegetable markets yielded 73 (67.9%), 83 (76.9) and 76 (70.4%) respectively on neither agree nor disagree section of responses. This was possibly an indication that most of the learners were not aware of where food was bought. Learners were also not aware of whether soya mince was bought from a recommended manufacturer or not, since they were not directly involved in such issues. On the same issues above,

12 (11.1%) noted that food was bought from local supermarket and wholesalers, while 16 (14.8%) disagreed. Thirteen (12.0%) agreed that the soya mince was bought from one of the recommended manufacturers, while 10 (9.3%) disagreed, and 23 (21.3%) agreed that fruits and vegetables were bought from fruits and vegetables market while 6 (5.6%) disagreed. A careful scrutiny of the qualitative data favoured the conclusion that food was bought from wholesalers and supermarkets. The same information can also be used to conclude that vegetables and fruits were obtained from fruit and vegetable markets. Document analysis of the recommended soya mince manufacturers indicated the soya mince was not bought from one of the 2015-2016 recommended soya manufacturers. Large standard deviations between 17.4 and 31.9 indicate a greater dispersion of values from the mean. The majority of the respondents' responses were in one extreme while only a smaller number was in the other extreme. In some instances, the majority of responses were clustered around neither agree nor disagree while very small numbers of respondents had their responses in the two extremes.

4.4.2.2 Preparation of food

Most of the respondents 83 (76.9%) affirmed that food handlers prepared the food in the NSNP while 8 (7.4%) disagreed and 17 (15.7%) neither agreed nor disagreed. There were positive reports by 34 (31.5%) and 30 (27.8%) who strongly agreed and agreed respectively, that food was prepared in a clean kitchen. Twenty-seven (25.0%) were neutral on the issue of cleanliness of the kitchen while 15 (13.9%) were of the view that food was prepared in a clean kitchen. Thirty-two (29.6%) affirmed that cutting boards were always clean, 19 (17.6%) were of the opinion that cutting boards were not always clean, while the rest 57 (52.8%) were neutral on the cleanliness of cutting boards.

A significant number of respondents 38 (35.2%) indicated that kitchen utensils, cutting and work surfaces were cleaned with soapy water, 7 (6.5%) disagreed while the majority 62 (57.4) were neutral on the issue of cleaning surfaces with soapy water.

A large number of respondents 46 (42.6%) were affirmative on the fact that the kitchen floors were swept and mopped daily by food handlers, 48 were neutral on the issue while 13 (12.0%) disagreed. A relatively large number of respondents affirmed that damaged or bruised areas of food were cut away 25 (23.1%), that vegetables were cleaned before cutting and cooking 35 (32.4%), and that vegetables are cleaned after cutting 30 (27.8%). There were fewer learners 10 (9.3%) who disagreed on the issues of cutting away damaged and bruised areas of food and cleaning of vegetable after cutting. A slightly higher number 13 (12.0%) disagreed that vegetables were cleaned before cutting and cleaning.

Almost all respondents 104 (96.3%) confirmed the observation made by the researcher that cooking was done using gas stoves. The follow up question on the use of electric stoves had 95 (88.0%) of respondents disagreeing that electric stoves were used.

The results confirm the researcher's observation and the results from in-depth interviews by a large number of learners 83 (76.9%) who agreed that food handlers were generally, not aware of the use of Mnandi 4 sure recipe book, hence 32 (33.4%) disagreed that the book was used in the programme while the majority 69 (63.9%) were neutral on the use of that recipe book, and 6 (5.5%) agreed that the book was available. Responses on the use of fortified maize meal yielded results with a similar pattern where a relatively high number 31 (28.7%) disagreed that fortified maize meal was used, a smaller number 20 (18.6%) agreed that fortified maize meal was used, and the majority 54 (50.0%) were neutral on the use of fortified maize meal. Learners are not involved in the procurement and preparation of food, hence it was expected that they did not know if the type of maize meal used was fortified or not. Most of the participants, including the service providers, were not aware of the type of maize meal that was expected to be supplied. In this respect, observations were very critical for determining the type of maize meal that was used by the schools involved in the NSNP. Observations in all the five schools confirmed that fortified maize meal was used. Large standard deviations between 13.9 and 35.7 evinced greater dispersion in learners' responses. The majority of responses were clustered in one extreme while only a few gave responses that were in the other extreme.

4.4.2.3 Main findings on procurement and preparation of food

Service providers considered the quality, price and expiry date before purchasing. Very few of the participants seemed to be familiar with the terms fortified and parboiled. However, all the five schools visited were using fortified maize meal and parboiled rice. Some service providers procured food as co-operatives while others supplied as companies. Thirty-five (32.4%) of the respondents indicated that vegetables were cleaned before cutting and cooking. On the contrary, thirty (27.8%) of the respondents indicated that vegetables were cleaned after cutting. Food quality was determined by the knowledge of the food handlers in cooking, season of fruits and vegetables, and availability of cooking ingredients. Some of the long serving food handlers were familiar with the food preparation procedures while food handlers who were recruited in the past three years needed much assistance in food preparation. Table 4.10 presents the main findings on procurement and preparation of food in the NSNP, derived from quantitative and qualitative data.

Table 4-10: Triangulation table of findings from qualitative and quantitative data

Findings (Qualitative data)	Findings (Quantitative data)
Food was procured by service providers who were selected through the tender system. A centralised procurement model was used where all the payments had to be approved by the provincial office for all service providers in the 12 districts of Kwazulu Natal.	Sixty two (57.4%) of the respondents confirmed that food was purchased by service providers.
Food was procured from wholesalers and supermarkets. Some were able to purchase on accounts while others could not use accounts. The majority had to buy food for cash.	This was confirmed by 12 (11.1%) of respondents who agreed that food was procured from wholesalers and supermarkets.
Fruits and vegetables were procured from a fruit and vegetable market.	This was confirmed by 23 (21.3%) of the respondents who agreed that fruits and vegetables were procured from a fruit and vegetable market.

There was no recipe book but only a menu to indicate quantities per child per day.	This was supported by 32 (29.6%) of the respondents who revealed that Mnandi 4 sure recipe book was not available.
Meals were prepared by food handlers.	Eighty three (76.9%) confirmed that food handlers prepared meals.
The kitchen was clean but not very clean.	Confirmed by 64 (59.2%) of respondents who indicated that food was prepared in a clean kitchen.
Cooking was done using gas stoves which were not well maintained.	One hundred and four (96.3%) of the respondents indicated that cooking was done using gas.
Fortified maize meal was used but some participants were not aware that they had to use fortified maize meal.	Confirmed by 20 (18.6%) of the respondents who agreed that the maize meal was fortified.

Table 4.10 shows a summary of both qualitative and quantitative findings on procurement and preparation of food showing where they converged or diverged.

4.4.2.4 Interpretation of the triangulation table

The qualitative data revealed that food was procured by service providers who were selected through the tender system. A centralised procurement model was used where the payments of service providers had to be approved by the provincial head office for all the service providers in the twelve districts of KwaZulu-Natal. Both qualitative and quantitative data revealed that food was procured from wholesalers, supermarkets and fruit and vegetable markets. Two of the participants reflected that they could get food on accounts. Others could only get food for cash. Food handlers prepared food using a menu. The kitchens were not very clean. There was need to improve conditions of hygiene in all kitchen structures where food was prepared. Fortified maize meal was used to prepare *phutu* in the five schools from which qualitative data was collected.

4.5 RESULTS ON THE NUTRITIONAL VALUE OF FOOD SERVED TO LEARNERS IN THE SCHOOL NUTRITION PROGRAMME

It is important to note that the nutrients that we get from food are determined by the type of food that we eat, as well as the amount that one consumes. Therefore, this section presents both quantitative and qualitative data based on the type of food consumed and the nutritional value of the food in an endeavour to answer the sub-research question: What is the nutritional value of the food consumed in the school nutrition programme? Qualitative data is presented first, followed by quantitative data that enables some statistical analysis to be done. Different hypotheses were tested based on the results of the study.

4.5.1 Qualitative data based on the nutritional value of the food served to learners in the school nutrition programme

This section presents the qualitative data which is in line with the nutritional value of the food served in the school nutritional programme. The information obtained from in-depth interviews observations and document analysis is presented in an effort to answer the sub-research question. The main themes and sub-theme and related issues are presented in Table 4.11.

Table 4-11: Main themes and sub-themes on the nutritional value of food for the NSNP

Themes	Sub-Themes	Related issues
Different food groups of the food guide pyramid	Bread, cereal, rice & pasta group.	Food types in each of the groups.
	Meat, poultry, fish, beans, eggs and nuts group.	Nutrient content of the various foods per 100g.
	Milk, yoghurt and cheese group.	Specific nutrient content for the quantities of food items supplied in different schools.
	Vegetable group.	
	Fruit group	
	Fat, oil and sweet group.	

4.5.1.1 Food in various food groups that is provided in the national school nutrition programme

The various foods in the bread, cereal, rice and pasta group that were provided in the NSNP were parboiled rice; which was consumed on Mondays, Tuesdays and Thursdays; samp which was consumed on Wednesdays; and *phutu* which was provided to learners on Fridays. In the meat, poultry, fish, beans, eggs and nuts group, the school nutrition programme provided fish on Mondays, beans on Wednesdays, and soya mince on Tuesdays and Thursdays. Sour milk was the only type of food that belonged to milk, yoghurt and cheese group which was provided to learners on Fridays in the NSNP. Fruits and vegetables were obtained from tomatoes, apples, butternuts, carrots and cabbages. Cooking oil was the only ingredient that belonged to the fat, oil and sweet group which was added to the meals on Mondays, Tuesdays, Wednesdays and Thursdays. To confirm this information, one of the participants noted:

> *On Mondays, we prepare rice, tinned fish, tomatoes; Tuesday, we cook rice, cabbages and soya mince; Wednesday, we cook samp, beans and carrots; Thursday, they eat rice, cabbages, and soya mince, and Friday, there is phutu and amasi (FB1).*

The foods mentioned by the participant food handler FB1 were verified with the information from the second food handler and the supplier and also compared with the NSNP menu quantities formulae schedule which showed the food items and the frequency of item serving per week.

The interviews with participants revealed that the menu of school C had some components which were not exactly the same as those for school B. One of the participants revealed the following as the components of the meals:

> *Monday we cook cabbage, rice and fish; Tuesday: cabbage, soya mince, carrots and rice; Wednesday: samp, butternut and beans; Thursday: rice, soya mince, cabbage and carrots; Friday: phutu and amasi (FC).*

The service providers and the teacher co-ordinators of school C confirmed the above meals as the meals that were provided to learners on different days of the week. The

meals for school D also had some slight variations from the meals for school C. The teacher co-ordinators, service providers and food handlers concurred on the meals that were provided in school D on different school days of the week. One of the participants reported the meals that were provided as follows:

> *Monday: rice, fish, cabbages, tomatoes and cooking oil; Tuesday: rice, soya mince, Cabbages and butternuts; Wednesday: Samp, Beans, Carrots and Cooking oil; Thursday: rice, soya mince and cabbages and Friday phutu and amasi (FD).*

The service provider and the food handlers of school C provided the meal components of the food that was provided to school C. The meal components were not very different from that of other schools. However, the meal components were not exactly the same because the service providers were different. One participant provided the meal components of school C:

> *Monday: rice, fish and cabbages; Tuesday: rice, soya mince, Cabbages: Wednesday: Samp and Beans; Thursday: rice, soya mince and cabbages and Friday, they eat phutu and amasi (FE).*

The meal components for school G also had some slight variations from the meals of other schools. These variations were partly due to the fact that the food was probably purchased from different wholesalers by different suppliers. One participant observed that:

> *Monday they eat fish, rice and tomato; Tuesday: soya, rice, cabbage and carrots; Wednesday: samp, beans, butternut and soup; Thursday: soya, cabbage, rice and carrots and Friday: phutu and amasi (FG).*

To determine the food that was to be consumed on each day, the researcher had to engage with the district field officer. The field officer indicated the guidelines for the food that was to be supplied:

Monday: rice, fish and a green vegetable; Tuesday: rice, soya mince and a yellow vegetable; Wednesday: samp, beans and mixed vegetables; Thursday: rice, soya mince and a green vegetable and Friday: phutu, amasi and a fruit (DO).

All schools complied with almost all of the food items. The major deviation was that fruits were not provided weekly.

4.5.1.1.1 Results from observations to confirm the qualitative data from interviews

This section presents data on food items consumed based on observations made in the schools. The section only presents qualitative data. The observed nutritional value of foods is presented in the quantitative section of the research objective. The food items observed in various schools are shown in Figure 4.1.

Figure 4-1: Some of the observed food items in various schools

Figure 4.1 presents some food items like iodated salt and cooking oil that were rarely mentioned by participants. It also confirms the consumption of some food items that were mentioned by participants during in-depth interviews. The next section categorises the food consumed in various schools into food groups.

The various food items consumed by the learners belonged to different food groups of the food guide pyramid. Table 4.12 shows the food groups of various foods consumed by learners in the schools.

Table 4-12: Main food groups of the food for the NSNP

Food group	NSNP food item in that food group.
Bread, cereal, rice & pasta group.	Rice, samp and phutu.
Meat, poultry, fish, beans, eggs and nuts group.	Fish, soya mince and beans.
Milk, yoghurt and cheese group.	Sour milk *(amasi*).
Vegetable group.	Cabbage, carrots and butternuts.
Fruit group.	Apples.
Fat, oil and sweet group.	Cooking oil.

Table 4.12 shows that the main food sources were rice, samp and *phutu* while proteins were mainly obtained from fish, soya mince, beans and *amasi.* The main sources of mineral salts and vitamins were cabbages, carrots, butternuts and apples. The nutrients from the fat, oil and sweet group, which had to be consumed sparingly, were obtained from cooking oil. The specific and detailed nutritional value of each food item is presented under the quantitative component of data.

4.5.2 Quantitative data based on the nutritional value of the food served to learners in the school nutrition programme

The first section presents the quantitative data obtained from learners which shows the food items consumed on different days. This data is presented in Table 4.13 and

confirms the qualitative data from interviews. The results on this section were based on learners' points of view. The learners are the main beneficiaries of the NSNP.

The second section presents quantitative data based on the information obtained from food handlers. This section presents the nutritional values of various foods in Figures 4.2 to Figure 4.5 and Table 4.14. Subsequently, the average nutrient intakes per learner per school over the five days of the week are also presented. These were subjected to paired sample t-test to test if there was significant difference between the actual nutrient intakes and the expected nutrient intakes. The observed nutrient data set for maize meal was also subjected to a paired sample t-test using expected nutrient data set for maize meal obtained through document analysis.

4.5.2.1 Food items consumed in the school nutrition programme

This section presents the quantitative data which confirmed most of the food items consumed in the school nutrition programme. The quantities of food items consumed enabled the researcher to determine the nutritional value of the food consumed in the school nutritional programme.

Table 4-13: Numbers and percentages of learners who confirmed the presence of the food items and the food items disliked by learners as well as the most liked food items

Meal served	No. & % of learners who confirmed consuming the food item	No. & % of learners who disliked the food item.	No. & % of learners who liked the food item most.
Monday			
Rice	106 (98.1)		
Fish	105 (97.2)	17 (15.7)	48 (44.4)
Tuesday			
Rice	105 (97.2)		
Cabbage	84 (77.8)	38 (35.2)	
Soya mince	37 (34.3)	26 (24.1)	
Wednesday			
Butternut	34 (31.5)		
Samp	104 (96.3)	51 (47.2)	14 (13.0)
Beans	99 (91.7)	25 (23.1)	6 (5.6)
Thursday			

Rice	102 (94.4)		
Cabbage	74 (68.5)		
Soya mince	64 (59.3)		
Friday			
Mealie meal dish (phutu)	93 (86.1)	6 (5.6)	
Sour milk (amasi)	104 (96.3)	6 (5.6)	64 (59.3)

Table 4.13 shows the number of learners who confirmed the consumption of different food items. Almost all learners 106 (98.1%) and 105 (97.2%) confirmed that they consumed rice and fish on Monday respectively. The consumption of rice on Tuesday and Thursday was confirmed by 105 (97.2%) and 102 (94.4%) respectively. Eighty-four learners (77.8%) indicated that cabbage was consumed on Tuesday while 74 (68.5%) confirmed the consumption of cabbage on Thursday. Consumption of soya mince was confirmed by 37 (34.32) on Tuesday and 64 (59.3%) on Thursday. As many as 93 (86.1%) and 104 (96.3%) learners confirmed the consumption of *phutu* and sour milk respectively, on Fridays. Learners were able to mention the main meal components on each day. They hardly mentioned the presence of tomatoes, carrots and butternuts which were provided in small quantities.

A good number of learners 17 (15.7%) disliked fish while 38 (35.2%) disliked cabbage. A significant number of learners 26 (24.1%) disliked soya mince while 51 (47.2%) disliked samp. Twenty-five (23.1%) disliked beans while 6 (5.6%) disliked *phutu* and a similar proportion 6 (5.6%) disliked *amasi*.

Amasi was the most liked food item which was most liked by 64 (59.3%) of the respondents, followed by fish which was most liked by 48(44.4%) of the respondents and samp liked by 14(13.0%) of the respondents. Only 6 (5.6%) of the respondents indicated that beans was one of their most favourite meals.

The next section presents data based on the nutrient value of the various food items of the school nutrition programme.

4.5.2.2 Observed nutritional value of some food items

The observed data on nutrition values that was photographed is shown in figures 4.2 to 4.5. The information in the figures is summarised in Table 4.14 and the text below the summary table analyses the information in the table.

PREMIUM THAI
LONG GRAIN
PARBOILED RICE

TYPICAL NUTRITIONAL INFORMATION #

Composition		Per 100g Serving	Per 140g * Single Serving
Energy	(kJ)	1180	1652
Protein	(g)	8.7	12.2
Glycaemic Carbohydrate	(g)	64	89.6
of which total sugar*	(g)	0	0
Total Fat	(g)	0.4	0.5
of which saturated fat	(g)	0.1	0.1
Trans fat	(g)	0	0
Monounsaturated Fat	(g)	0.2	0.3
Polyunsaturated Fat	(g)	0.1	0.1
Cholesterol	(mg)	<0.1	<0.1
Dietary Fibre**	(g)	1.1	1.5
Total Sodium	(mg)	5	7

Information for product as packed and uncooked.
* Method of analysis AOAC 906.03
** Method of analysis AOAC 985.29

Figure 4-2: Observed nutritional value of rice in school D

Figure 4.2 indicates that parboiled rice was served. All the five schools where in-depth interviews were conducted had parboiled rice which is the type of rice prescribed by the guidelines, although some participants did not seem to be familiar with the term ‘parboiled’.

Observed nutritional value of maize meal in school C

Observed nutritional value of sour milk in school D.

Figure 4-3: Observed nutritional value of maize meal in school C and sour milk (amasi) in school D

Figure 4.3 shows the nutritional value of fortified maize which was observed in all the five schools with increased amounts of vitamin A, iron and zinc. Full cream amasi milk was also common in the schools.

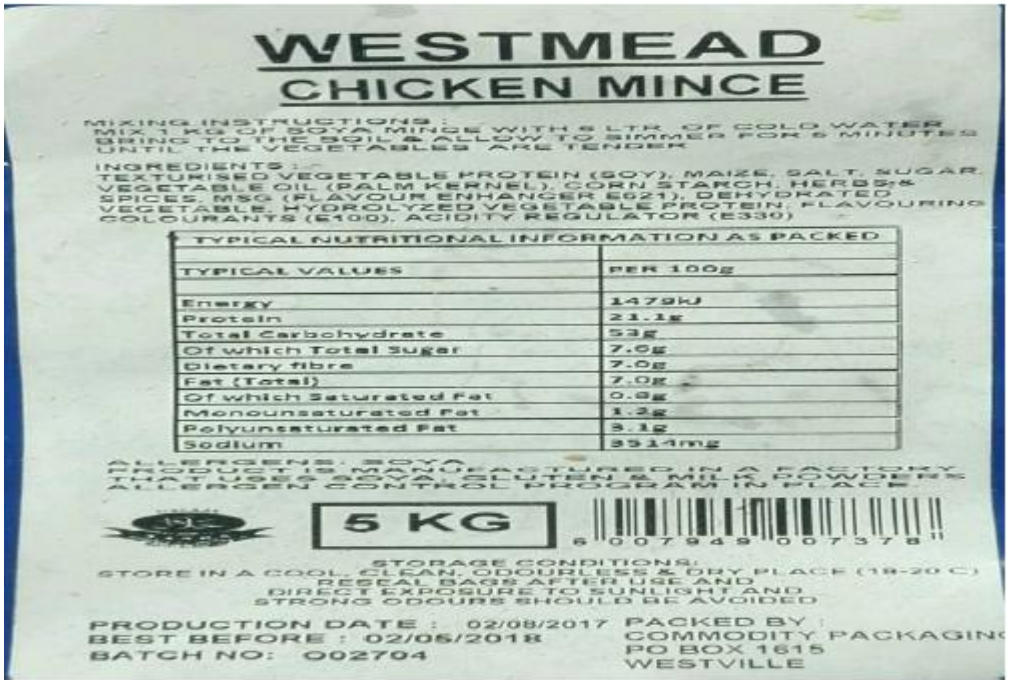

Figure 4-4: Observed nutritional value of beef and chicken soya mince in school G

Figure 4.4 shows top economy soya mince which was manufactured by one of the recommended soya mince manufacturers-IMANA Foods (SA) (Pty) Ltd. However, Westmead chicken soya mince was not manufactured by the recommended manufacturers according to the information obtained for the 2015/2016 financial year.

Figure 4-5: Observed nutritional value of Pilchards Fish in school C

The same type of fish Pilchards fish was served in all schools on Mondays. It contains 1625mg of omega-3-fatty acids.

4.5.2.3 Summary of the nutritional value of food in the NSNP

Table 4.14 shows the nutritional values of various food items in 100g of the food component. The information was obtained using food composition tables as well as nutritional values observed on food labels. The information was then used to determine the specific nutrient content of various foods quantities in 5 different schools shown in Table 4.15.

Table 4-14: Food item and nutrient component of various foods served in the NSNP

		Food item and nutrient component per 100g												
Nutrient Component	Tomato	Apple fruit	Carrots	Cabbage	Butternut	mixed vegetables	Rice	Top white maize meal	Samp	Beef soya mince	Chicken soya mince	Fish	Sour milk (maas)	Beans
Energy (Kcal)	18	52	41	25	45	37	282.0	334.1	358.0	332.46	353.5	104.7	59.8	346.6
Carbohydrates (g)	3.9	13.81	9.58	5.8	11.69	7.3	64	72.5	79.2	52.0	53	2	4.0	65.6
Protein (g)	0.9	0.26	0.93	1.3	1.0	1.4	8.7	6.3	7.1	15.5	21.1	17	3.0	16.9
Total Fat (g)	0.2	0.17	0.24	0.1	0.1	0.2	0.4	0.9	0.8	5.2	7.0	5.1	3.3	1.3
Cholesterol (mg)	0		0	0	0	0	<0.1	<1				68	9	

Dietary Fiber (g)	1.2	2.4	2.8	2.50	2	3.1	1.1	3.1	6.2	5.7	7.0	2.3	0.2	19.4
Vitamins														
Folates (µg)	15	3	19	53	27	18	70	200						
Niacin (mg)	0.594	0.091	0.983	0.234	1200	0.5	5.1		1.1					
Pyridoxine (mg)	0.080	0.041	0.138	0.124	0.154			0.4						
Thiamin (mg)	0.037	0.017	0.066	0.061	0.100	0.0	0.2	0.3	0.1					
Vitamin A (IU)	833	54	16706	98	10630	11650	0.0	695						
Vitamin C (mg)	13	4.6	5.9	36.6	21	3.8	0.0							
Vitamin E (mg)	0.54	0.18		0.2	1.44	0.3								
Vitamin K (µg)	7.9	2.2	13.2	76		18.2	0.1							
Minerals														
Sodium (mg)	5	1	69	18	4	26	5	<6	4			270	47	35
Potassium (mg)	237	107	320	170	352	138	187							
Calcium (mg)	10	6	33	40	48	21	55					267	116	
Iron (mg)	0.3	0.12	0.3		0.70	0.7	0.7	2.7						
Magnesium (mg)	11	5	12	0.47	34	15	27							
Manganese (mg)	0.15		0.143	0.160	0.202		1.1		25					
Phosphorus (mg)	24	11	35	26	33	37	156		75					
Zinc (mg)	0.17	0.04	0.24	0.18	0.14	0.5	1.0	1.9						
Phyto-nutrients														
Carotene-ß (µg)	449	27	3427	33	834									
Carotene-α (µg)	3428	11	8285	42	4226									
Lutein-zeaxanthin (µg)	123	27	256	30										
Lycopene (µg)	2573				3471									

(Rudrappa, 2009-2017; South African Food Data System, 2015; CONDE NAST 2014)

Table 4.14 reflects that rice, maize meal, samp, soya mince and beans were the major sources of energy with rice providing 282.0 kilocalories of energy and samp 358.0 kilocalories per 100g of food item, while maize meal, soya mince and beans had energy values in between the values for rice and samp. The foods with high energy values had high corresponding carbohydrate content with rice providing 64.0g of carbohydrates per 100g of food component and samp having the highest value of 79.2g of carbohydrates per 100g of food component. Proteins were abundant in beef (15.5g), chicken soya mince (21.1g), fish (17g) and beans (16.9 g) per 100 grams of food item. Chicken and beef soya mince, fish and sour milk (maas) had relatively high fat content (7.0g, 5.2g, 5.1g and 3,3g respectively) compared to other foods in the NSNP. The highest amount of fat was obtained from sunflower

cooking oil where one tablespoon (15ml) contained 13.6g of fat and 120 kilocalories of energy. Dietary fibre was relatively high in samp (6.2g/100g), beef mince (5.7g/100g), chicken mince (6.0g/100g) and beans having the highest content of 19.4g per 100g of beans. Carbohydrates, fats, proteins and fibre were generally abundant in rice, samp, *phutu,* soya mince, fish, sour milk and beans.

Vitamins and mineral elements were also provided by the food in the school nutrition programme. Top white maize meal supplied the highest amount of folate (200µg/100g) with rice, cabbage and butternut providing 70g, 53g and 27g per 100g, respectively. Butternut provided a distinctively high amount of niacin (1200mg/100g) compared to all other foods in the table which provided quantities that were less than 5.2mg per 100g. The highest amounts of pyridoxine (0.4mg/100g) and thiamine (0.3mg/100g) were contained in top white maize meal. Fruits and vegetables were the major sources of vitamin A with carrots containing 1670IU, mixed vegetables 11650IU, butternut 1063IU, tomato 833IU, top white maize meal 695IU, and cabbage 98IU per 100 grams of the food item. Vitamin C was richly supplied by cabbage (36.6mg), butternut (21mg), tomatoes (13mg) and apple fruit and carrots containing between 4mg and 6mg per 100g of the food component. Butternut contained the highest amount of vitamin E (1.44mg) while cabbage contained the highest amount of vitamin K (76µg) per 100 grams. Sodium was more abundant in fish (270mg), carrots (69mg) and sour milk (47mg) while potassium was generally abundant in all fruits and vegetables, as well as in rice; with nutrient content values between 100mg and 360mg per 100g. Calcium was rich in fish (267mg) and milk (116mg) with moderate amounts in vegetables between 30mg and 60mg per 100g. Top white maize meal, mixed vegetables, rice and butternut had relatively large amounts of iron with 2.7mg in maize meal and 0.7mg per 100g in each of the three successive food items. Magnesium was mostly supplied by butternut (34mg) and rice (27mg) while manganese was rich in samp (25mg). All fruits and vegetables had phosphorous amounts between 10mg and 40mg and the foods with the most abundant phosphorous were rice (156mg) and samp (75mg). Maize meal and rice had the highest quantities of zinc which were 1.9mg and 1.0mg per 100g respectively. Carotene was generally abundant in fruits and vegetables with carrots and butternuts being the richest sources. Fruits and vegetables were the major sources of vitamins and mineral salts with fortified maize meal supplying reasonable

amounts of zinc and iron. Iodated salt which was used in all schools but has not been included in the table was the major source of iodine. The nutritional value information which was observed on various food labels in the schools visited and food composition tables from various sources, assisted the researcher in determining the nutritional value of various food items.

Table 4.14 shows the general nutrient contents of the various food items that were consumed in the school nutrition programme. The specific nutrient values for the quantities of food supplied in various schools are shown in Table 4.15. To come up with the specific nutrient values that were consumed by a learner per day, the total amount of each food item supplied to the school per week was calculated using information that was collected from food handlers. This information was confirmed by the suppliers and the food handlers who were asked the same information twice by different interviewers on different days. The NSNP standard delivery note for each school was used to further verify the information that was provided. The total amount of each food item in grams was divided by the school enrolment to determine the amount in grams that an individual consumed per week from that particular food item. The nutrient content of the calculated specific masses of food items in each school was calculated using the information in Table 4.14 which shows the nutrient content in 100g of each food item. Simple proportion was used to determine the nutrient content in different masses of food items. The total nutrient content consumed by an individual per week was obtained for each of the various nutrients using the sum formulae in Microsoft office excel. The sum was then divided by 5 days of the week to come up with an average nutrient consumption per individual per day.

Table 4-15: The nutrient intakes per child per school and the % RDA for each nutrient for adolescents (14-18 years)

	Nutrient RDA value	School B Mean Nutrient intake/learner	 % RDA	School C Mean Nutrient intake/learner	 % RDA	School D Mean Nutrient intake/learner	 % RDA	School E Mean Nutrient intake/learner	 % RDA	School G Mean Nutrient intake/learner	 % RDA	Mean nutrient Intake for 5 schools	%RDA	Standard deviation	Expected nutrient intake values	P-values For t-test
Energy (Kcal)	2000	277.2	13.9	158.6	7.9	237.7	11.9	227.3	11.4	268.2	13.4	218.8	10.9	46.8	316.6	0.017
Carbohydrates (g)	130	55.7	42.8	32.1	24.7	46.3	35.6	45.5	35.0	53.3	41.0	43.7	33.6	9.8	53.3	0.311
Protein (g)	49	9.7	19.8	5.4	11.0	9.0	18.4	7.7	15.7	9.8	20.0	7.7	15.7	1.8	12.2	0.009
Total Fat (g)	64	2.2	3.4	1.2	1.9	2.3	3.6	1.8	2.8	2.4	3.8	1.8	2.8	0.5	3.6	0.002
Cholesterol (mg)		7.7		4.4		8.6		7.3		8.8		6.9		1.8	11.5	0.006
Dietary Fiber (g)	32	4.1	12.8	2.3	7.2	4.0	12.5	3.1	9.7	4.7	14.7	3.2	10.0	0.8	5.4	0.014
Vitamins																
Folates (µg)	400	67.3	16.8	34.1	8.5	51.5	12.9	54.2	13.6	71.4	17.9	51.1	12.8	14.7	65.8	0.200
Niacin (mg)	15	2.6	17.3	1.4	9.3	2.1	14.0	1.8	12.0	2.3	15.3	1.9	12.7	0.5	1.9	0.535
Pyridoxine (mg)		0.1		0.0		0.1		0.1		0.1		0.1		0.0	0.1	0.374
Thiamin (mg)	1.1	0.1	9.1	0.1	9.1	0.1	9.1	0.1	9.1	0.2	18.2	0.1	9.1	0.0	0.1	0.374
Vitamin A (IU)	32000	2798.4	8.7	1399.9	4.4	2900.5	9.1	782.2	2.4	3385.1	10.6	1727.8	5.4	1105.6	1309.4	0.129
Vitamin C (mg)	70	6.9	9.9	3.7	5.3	6.9	9.9	2.4	3.4	16.0	22.9	5.4	7.7	5.3	14.3	0.040
Vitamin E (mg)	15	0.2	1.3	0.1	0.7	0.2	1.3	0.0	0.0	0.2	1.3	0.1	0.7	0.1	0.2	0.208
Vitamin K (µg)		7.3		5.1		10.2		4.6		25.7		7.1		8.7	24.5	0.024

Minerals																
Sodium (mg)		46.6		27.7		50.2		40.0		56.5		40.1		11.0	62.5	0.020
Potassium (mg)		175.8		90.3		151.3		85.6		218.7		120.5		56.9	175.3	0.290
Calcium (mg)	1300	92.4	7.1	52.5	4.0	95.8	7.4	71.8	5.5	103.3	7.9	75.3	5.8	20.7	120.7	0.405
Iron (mg)																
Iron (mg)	13	0.8	6.2	0.4	3.1	0.6	4.6	0.6	4.6	0.7	5.4	0.6	4.6	0.1	0.6	0.770
Magnesium (mg)	385	17.5	4.5	9.2	2.4	15.5	4.0	9.3	2.4	16.6	4.3	11.9	3.1	4.1	13.2	0.828
Manganese (mg)		2.8		2.6		2.4		3.0		3.4		2.8		0.4	3.4	0.031
Phosphorus (mg)	1250	82.7	6.6	49.3	3.9	72.6	5.8	60.6	4.8	81.6	6.5	58.1	4.6	14.3	70.4	0.879
Zinc (mg)	10	0.7	7.0	0.4	4.0	0.6	6.0	0.6	6.0	0.7	7.0	0.6	6.1	0.1	0.6	1.000
Phyto-nutrients																
Carotene-ß (µg)		382.3		159.6		201.1		146.9		504.4		223.8		157.5	116.5	0.083
Carotene-α (µg)		1356.1		550.6		789.2		402.9		1695.2		752.3		548.8	548.2	0.170
Lutein-zeaxanthin (µg)		26.9		11.2		13.4		14.3		43.5		17.7		13.6	17.5	0.512
Lycopene (µg)		623.3		245.1		451.6		54.5		688.1		304.3			432.6	0.873

Table 4.15 shows the average nutrient intake per child per day in the five different schools, as well as the percentage of RDA for that specific nutrient for adolescents between 14 and 18 years old. The table also shows the overall mean nutrient intake per child per day for the five schools. The information for various schools that was used to come up with the values in Table 4.15 is shown in appendices 1 to 6. The RDA values were calculated by adding RDA values for males and females in Table 2.1 and the sum of the two values was divided by two. This was done to come up with a single RDA value since the research data shows the amount of nutrients consumed per child per day and not according to gender. The data could not be separated into nutrient intake for boys and girls. The highest energy intake per child was in school B where the intake was 277.2 kilocalories per day, and the lowest consumption of energy was in school C (158.6 kilocalories per learner per day). All the schools had energy intake above 227 kilocalories per learner per day except school C. The maximum percentage of RDA for energy was 13.9% for school B while the minimum was 7.9% for school C. The mean energy intake for learners in all schools was 218.8 kilocalories (10.9% of RDA value). The standard deviation for energy was 46.8 kilocalories. This indicates that the mean kilocalories intakes per learner per day for the five schools were spread far from the overall mean and the nutrient intake values of the different schools were spread over a wide range of values. The mean kilocalorie intakes per learner per day for different schools were very different from each other, although there were guidelines on the quantities to purchase which corresponded with the number of learners.

The protein content was almost equally high in school B and C where the intake was 9.7g and 9.8 g respectively, corresponding to an equal RDA value of 20%. The mean protein intake was 7.7g (15.7% of RDA). A standard deviation of 9.8g indicates that the mean carbohydrates intake values per learner per day for different schools were more dispersed.

Generally, there was low fat content which was less than 4 percent (2.56g) of the fat RDA value in all five schools with a mean intake per child per day of 3.2g (5% of RDA). The amount of dietary fibre was between 2.3g and 4.7g which corresponded to 7.2% and 14.7% of the fibre RDA value respectively. The folate intake was between 8.5% (34.1µg) and 17.9% (71.4µg) of the folate RDA value with a mean

intake of 51.1µg (12.8%) while thiamin intake was between 9.1% (0.1mg) and 18.2% (0.2mg) of thiamin RDA value with a mean intake of 0.1mg (9.1%). The highest vitamin A intake was 3385.1IU (10.6% of RDA) in school G and the lowest intake was in school E with an intake of 782.2IU (2.4% of vitamin A RDA value). The mean vitamin A intake for all the schools was 1727.8IU (5.4% of RDA). A very large standard deviation of 1105.6IU indicates that the mean vitamin A intakes per school per child were more dispersed.

The consumption of vitamin E was very low in all schools with a mean intake of 0,1mg which is equivalent to 0.7% of the RDA value. A small standard deviation of 0,1mg for vitamin E indicates that the mean intake values for the five different schools were closely clustered around the overall mean intake value for all the schools.

The consumption of calcium was between 52.5 mg (4.0% of RDA) and 95.8mg (7.4% of RDA) with a mean of 75.3mg (5.6% of RDA), while that of iron was between 0.4mg (3.1%) and 0.8mg (6.2%) with an overall mean of 0.6mg (4.6% of RDA). The intake of zinc was between 0.4mg (4.0% of RDA) and 0.7g (7.0% of RDA) with a mean intake of 0.6g (6.0% of RDA) and that of magnesium was between 9.2mg (2.4% of RDA) and 17.5mg (4.5% of RDA value), while that of phosphorous was between 49.3mg (3.9% of RDA) and 82.7mg (6.6% of RDA) with a mean intake of 58.1mg (4.5% of RDA). Standard deviations between 4.0mg and 7.9mg indicate that the mean nutrient intakes for these minerals, among schools, were widely dispersed.

4.5.2.4 Hypothesis testing: T-test

The t-test was used to compare paired data test and to compare one data set from the expected mean. The paired sample t-test and one sample t-test were used to come up with conclusions based on the observed nutrient intakes.

4.5.2.4.1 Paired sample t-test

This test was performed to compare the observed and expected nutrient data sets for maize meal as well as soya mince. The same test was performed to determine if there was any significant difference between the observed average nutrient intake

data set for each school and the expected nutrient intake data set according to the menu quantity schedule.

4.5.2.4.1.1 Paired sample t-test for maize meal

Table 4-16: Observed and expected nutrient of maize meal

	Nutrient value	
Nutrient	Expected	Observed
Energy (Kcal)	334,6	334,1
Carbohydrates(g)	75	72,5
Protein (g)	8	6,3
Fat (g)	1	0,9
Dietary Fibre (g)	3	3,1
Vitamin A	10%	2,30%
Thiamin	10%	25%
Riboflavin	7%	15%
Vitamin B6	10%	24%
Folic acid	25%	50%
Iron	10%	21%
Zinc	8%	17%
	p-value:	0,056395

(Expected values extracted from Department of Basic Education, 2016)

H_0: $U_1 = U_2$. There was no significant difference between the observed nutrient value and the expected nutrient value for maize meal according to the menu quantity schedule.

H_1 :$U_1 \neq U_2$ There was a significant difference between the observed nutrient value and the expected nutrient value for maize meal.

Degrees of freedom: $D_f = 12+12-2 = 22$

α at 5% significant level and 2 tailed test

$$\alpha = {}^{0.05}/_{2} = 0{,}025$$

Critical value 2.074

P value =0,056 >α

There was no statistically significant difference between the observed nutrient values and the expected nutrient values for maize meal. The differences observed were only due to chance. The mealie meal used met the expected nutrient values.

4.5.2.4.1.2 Paired sample t-test for soya mince

This section presents the paired sample t-test for soya mince to check if the nutrient composition of the supplied soya mince is similar to the expected soya mince according to the food specification guidelines.

Table 4-17: Observed and expected nutrient of soya mince

	Nutrient value	
Nutrient	Expected	Observed
Energy (Kcal)	1479	1365
Protein (g)	21,1	24
Dietary Fibre (g)	7	4
	p-value:	0,42253

(Expected values extracted from Department of Basic Education, 2016)

H_0 : $U_1=U_2$ There was no significant difference between the observed nutrient value of soya mince and the expected nutrient values (The nutrient values for the two data sets were similar)

H_1 : $U_1 \neq U_2$ There was a difference between the observed nutrient intake data set and the expected nutrient intake data set for soya mince.

Dfreedom =3+3-2=4

$$\alpha = \frac{0.05}{2} = 0.025$$

Critical value=2,776

P value=o.423>α

There was no statistically significant difference between the two data sets. The soya mince supplied met the expected nutrient requirements.

4.5.2.4.1.3 Paired sample t-test for the observed average nutrient intake data set for each school and the expected nutrient intake data set according to the menu quantity schedule

The average nutrient data sets for schools B, C, D, E and G were compared with average nutrient intake data set according to NSNP menu quantities formula schedule obtained from schools. The data sets that were used to perform the t-test are presented in Table 4.15.

H_0: $U_1=U_2$ There was no significant difference between the observed average nutrient intake data set for each school and the expected nutrient intake data set according to the menu quantity schedule.

$H_{1:}U_1 \neq U_2$ There was a significant difference between the observed nutrient intake data set for each school and the expected nutrient intake data set.

Degrees of freedom=26+26-2=50
critical value=2.009 at 5% significance level and 2 tailed test. $\alpha = \frac{0.05}{2} = 0.025$

All p-values of 0.125 for school B, 0.068 for School C, 0.289 for school D, 0.046 for school E and 0,110 for school G were greater than the α-value of 0.025. Therefore, for all the 5 schools, the average nutrient intakes were in line with quantities specified by the formula schedule. The differences observed between the data set for each school and the expected data set was only by chance. There was no statistically significant differences in nutrient intakes between the paired sample data sets (i.e. school B observed nutrient data set & expected nutrient data set; school C observed nutrient data set & expected nutrient data set; school D observed nutrient data set & expected nutrient data; school E observed nutrient data set & expected nutrient data; school G observed nutrient data set & expected nutrient data).

4.5.2.4.2 One sample t-test to compare the mean nutrient intakes in schools with the expected mean nutrient intake

One sample t-test was also performed to determine whether there was any significant difference between the observed mean nutrient intakes per learner per day in different schools and the expected specific mean nutrient intake per learner per day in each school according to the formulae schedule. For example, the kilocalorie intakes for five schools: 272.2Kcal for school B; 158.6Kcal for school C;

237.7Kcal for school D; 227.3Kcal for school E; and 268.2Kcal for school G, were compared with the expected mean of 326.6Kcal. The t-test was performed for all nutrients in Table 4.15 and the p-values are shown in the same table.

For all the nutrients, the null hypothesis was using the example of kilocalories: H_0: $U_1=U_2$ There was no significant difference between the data set for the observed mean kilocalories intakes per child per day for each of the schools (B, C, D, E and G) and the expected mean kilocalories intake per child per day.

The alternative hypothesis:

$H_{1:}U_1 \neq U_2$ There was a significant difference between the observed mean kilocalorie intake data set for schools and the expected mean kilocalorie intake.

The same null hypothesis and alternative hypothesis were used for all the nutrients shown in Table 4.15.

Using 5 percent significance level and two tailed test: $\alpha = \frac{0.05}{2} = 0.025$

Table 4-18: Extract: P-values for t-test comparing observed and expected intakes

Energy (Kcal)	0,017	Carbohydrates (g)	0,311	Vitamin E (mg)	0,208
Protein (g)	0,009	Folates (µg)	0,200	Phosphorus (mg)	0,879
Total Fat (g)	0,002	Niacin (mg)	0,535	Zinc (mg)	1,000
Cholesterol (mg)	0,006	Pyridoxine (mg)	0,374	Carotene-ß (µg)	0,083
Dietary Fiber (g)	0,014	Thiamin (mg)	0,374	Carotene-α (µg)	0,170
Vitamin K(µg)	0,024	Vitamin A (IU)	0,129	Lutein-zeaxanthin (µg)	0,512
Sodium (mg)	0,020	Vitamin C(mg)	0,040	Lycopene (µg)	0,873
		Manganese (mg)	0,031	Calcium	0.405

		potassium	0.290	Iron	0.778
		magnesium	0.828		

The p-values for energy, protein, total fat, cholesterol, dietary fibre, vitamin K and sodium were less than the α-value of 0.025. There was enough evidence to infer that the observed mean intakes per child per day for energy, protein, total fat, cholesterol, dietary fibre, vitamin K and sodium were significantly different from the expected mean nutrient intakes. The intakes of these nutrients were far less than the expected intakes. For all the other nutrients, the p-values are greater than the α-value of 0.025. Therefore, there was no significant difference between the observed nutrient intakes and the expected nutrient intakes.

4.5.2.5 Main findings on the nutritional value of food

Qualitative and quantitative data revealed the main sources of proteins, energy, vitamins and mineral salts in the school nutrition programme. The nutritional value of the foods was quite variable. There were variations in the nutrient intake among learners in different schools due to unequal intake of food items by learners in different schools.

In the five schools; B, C, D, E and G, the average nutrient intakes per learner per day were 218.8Kcal (10.9% of RDA) for energy, 7.7g (15.7% of RDA) for protein, 3.2g (5% of RDA) for fat, and 3.2mg (10.0% of RDA) for dietary fibre. The main sources for macronutrients were rice, samp, *phutu* and freckled sugar beans.

For the five schools under consideration, the average vitamin intakes per learner per day were 51.1µg (12.8%) and 1.9mg (12.7%) for folate and niacin respectively. For the other vitamins the average intakes were 0.1mg (9.1%) for thiamine, 1727.8IU (5.4% of RDA) vitamin A and 5.4g (7.7% of RDA) for vitamin C. The average mineral intakes were 75.3mg (5.8% of RDA) for calcium, 0.6g (4.6% of RDA) for iron, 58.1mg (4.6% of RDA) for phosphorous and 0.6g (6.1% of RDA) for zinc. The main sources of vitamins and mineral salts were cabbage, carrots, butternuts, tomatoes, *phutu* and in some instances mixed vegetables. The observed mean intakes per child per day

for energy, protein, total fat, cholesterol, dietary fibre, vitamin K and sodium were significantly different from the expected mean nutrient intakes. The observed intakes of all other nutrients were not statistically significantly different from the expected nutrient intakes. Table 4.19 presents main findings on the nutritional value of food derived from both qualitative and quantitative data.

Table 4-19: Triangulation table of findings from qualitative and quantitative data

Findings (Qualitative data)	**Findings (Quantitative data)**
Fish was consumed once per week.	Confirmed by 105 (97.2%) of respondents. Fish was a major source of protein (17g/100g).
Beans was consumed once per week	Confirmed by 99 (91.7%) of respondents. Beans were a good source of energy (46.6Kcal/100g), protein (16.9g/100g), dietary fibre (19.4g/100g) and sodium (35mg/100g).
Soya mince was consumed twice per week.	Confirmed by 37 (34.3%) of the respondents. Soya mince was a rich source of energy (332-354 Kcal/100g), protein (15-22g/100g) and fibre (7.0g/100g)
Sour milk (amasi) was served on Fridays only.	Confirmed by 104 (96.3%) of respondents. A major source of sodium (47mg/100g) and calcium (116mg/100g).
Mealie meal was prepared and consumed in the form of *phutu* once per week.	Confirmed by 93 (86.1%) of respondents. A good source of protein (6.3g/100g), energy (334.1Kcal/100g), fibre (3.1g/100g), folates (200µg/100g), vitamin A (695IU/100g), iron (2.7mg/100g), and zinc (1.9mg/100g).
Rice was consumed 3 times per week.	Confirmed by 106 (98.1%) of respondents. A major source of energy (282.0Kcal/100g).
Samp was consumed once per week.	Confirmed by 104 (96.3%) of respondents. A major source of energy (358.0Kcal/100g).
Cabbage, carrots, butternuts, tomatoes and iodated salt were the main sources of	Confirmed by 74 (68.5%) of respondents for cabbage and 34 (34.3%) of respondents for butternut. Vegetables

vitamins and minerals. Fruit were rarely consumed.	were the main sources of mineral salts and vitamins

4.5.2.6 Interpretation of the triangulation table

Qualitative data revealed that fish, freckled sugar beans, samp, phutu were consumed once in a week. The quantitative data revealed the percentage of learners who consumed each type of food. It appears that some food items were always available as was revealed by large numbers of respondents confirming the availability of such food items. However, other food items were probably not always available as the availability of such food items like butternuts was confirmed by smaller proportions of respondents. The quantitative data further revealed the nutritional values of various food items. The nutritional values of fruits were not included since some learners reported that they consumed fruits once per month while others reported that they consumed fruits once in three months.

4.6 RESULTS ON CHALLENGES ENCOUNTERED IN THE IMPLEMENTATION OF THE SCHOOL NUTRITION PROGRAMME

The previous section confirmed the nutritional value of various food items consumed in the school nutrition programme. Further investigation by the researcher revealed that numerous challenges were encountered by different stakeholders in the implementation of the school nutrition programme. These challenges are presented in the sections below. The first section presents qualitative data which is followed by quantitative data in an effort to answer the sub-research question: What are the challenges encountered in the implementation of the school nutrition programme?

4.6.1 Qualitative results on challenges encountered in the implementation of the school nutrition programme

As highlighted in earlier sections, the qualitative data was gathered through in-depth interviews with various stakeholders of the school nutrition programme. Themes and sub-themes emerged in line with challenges encountered in the implementation of

the school nutrition programme. Table 4.20 presents the main themes and sub-themes which are discussed in detail in the next sections.

Table 4-20: Main themes and sub-themes on challenges encountered in the implementation of the school nutrition programme

Theme	Sub-Theme	Related issues
Challenges in the implementation of the school nutrition programme	Inadequate background information. .	Unavailability of menu or recipe book. Lack of skills. Inability to use the available information.
	Late payment of suppliers, supplier contract forms Limited budget (R3.25/Child/day)	Late contract forms submission. Bureaucratic system. Quality and quantity of food. Unavailability of food. More learners than budgeted for. Extremely low food quantities.
	Delays in supply/serving	Gas quantity estimation problem. Late delivery. Unreliable supplier School timetable change. Change of supplier
	Learners' food preference and culture.	Uninformed food choices. Sickness. Alternative meals.
	Failure to attend workshops	Inaccessibility of venue. Logistic problems. Lack of necessary skills.

4.6.1.1 Challenges of availability of documents and information to assist food handlers

Food handlers are the most critical stakeholders in the school nutrition programme who have been facing many challenges. It has been highlighted in the earlier sections that there were no recipe books to assist them with preparation procedures. Instead, a menu was being used to guide the food handlers on what to prepare for the day. However, the menu was unavailable in some schools. In one of the schools, they did not have an updated menu for 2017. They were still using a menu for 2016. One of the participants had this to say:

> *The menu that we have is not the menu for 2017. It is the menu for 2016. We were verbally told how we should cook by the service provider (SB).*

In addition to lack of updated information, their low literacy level could have contributed to low quality meals since they appeared not to be able to follow preparation instructions on the packages for soya mince and other food items. Preparation procedures were clear but no one assisted them in understanding the information. The observed information on soya mince package which the food handlers never made use of is as shown below:

Figure 4-6: Preparation procedures for soya mince which could have been used by food handlers

If the right proportions for mixing meal ingredients were followed, the food handlers would have prepared better meals. However, the food handlers needed assistance

on the amount of water to mix with a certain amount of soya mince as well as the proportional time for boiling and simmering.

4.6.1.2 Challenges of late payment of service providers, small budget per child per day, suppliers' contract submission

Many of the service providers were affected by late payment. This seems to have a negative impact on the quality of service provided to learners. Although service providers signed contract forms to bind them to provide food every day, quality service could not be guaranteed because of payment delays which could stretch up to 5 months or more. This challenge of late payment was reflected in research objective one where it was indicated that the late payment was mainly due to the bureaucratic procedure which had to be adhered to before payment. The late payment as well as the limited budget had a negative impact on the quality and quantity of food supplied. However, bureaucracy was not the only cause for late payment. There were also delays in the submission of contract forms. One of the participants reflected that:

> *There is problem of submission of contract forms to the department. It's disappointing that we have the contract and it will not have been submitted to the department by the principal. If you submit the invoice to the department, the department indicates that they have not yet received our contract forms. The school must be more supportive. The principals do not take things seriously to do all the necessary administration work to ensure early payment (SB new).*

The delays in payment could result in none supply of food or supply of inadequate quantities of food. Participants concurred that fruits were rarely supplied. Document analysis indicated that fruits were supposed to be supplied once per week. This was probably caused by late payments of suppliers. One of the participants had this to share:

> *In the past, there were days when learners would go without a meal. The food delivered was insufficient and the service providers were not paid and consequently they could not afford to buy food for the school (PE).*

The failure to deliver food was reiterated by another participant. The participant added that the failure to deliver food was sometimes caused by shortage of gas. The participant commented that:

> *Sometimes the supplier does not bring the food. We stay here and then go without cooking. Sometimes it is the problem of unavailability of gas. We do not cook when the gas is not available (FD).*

The failure to supply food was common when there was a change of suppliers. This was reflected by one of the participants who said:

> *The main challenge is when there is a change of suppliers, especially at the beginning of the term when the supplier says my contract has not been renewed. There may be one or two days when the learners are not fed (TC).*

The delivery of insufficient quantities of food was confirmed by a participant from a different school. The participant reflected that:

> *The challenge is with service providers. Sometimes the service provider will say: 'The department has not paid me. I can't provide learners exactly as they should be provided' (PC).*

The problem of insufficient quantities seemed to be more serious in school C. It is possible that the amount to be supplied to the school was not correctly determined according to the available guidelines, or the supplier serviced too many schools making it impossible to provide sufficient quantities in all the five school days. One of the participants in the school commented that:

> *Sometimes there are challenges of quality and quantity of food served in the programme. The problem of small amount of cooking oil exists but has never got a solution from suppliers. The food is not enough for the whole school enrolment in all days. The supplier alleges that he was told to supply the amount being supplied. As I see it, the food is not enough for the whole school. Maybe, it's because of the way the food handlers served food to*

learners. Some learners are served for the second time before others get the food (TC).

The problem of insufficient quantities was further confirmed by the district official. He made it clear that the number of learners in a school could be more than the number budgeted for the school by the school nutrition programme. The official observed that:

There is normally a challenge on quantities of food supplied. The challenge arises because the number of learners that the school will be approved of will be less than the actual number of learners present at the school. They consider the enrolment for the first ten days at the beginning of the year. Any learners who will be enrolled after the first ten days will not be considered for the school budget in the nutrition programme. The learners on the budget may not match with the actual learners in the school and that compromises the quantity of food to be served to each learner (DO).

Some of the food shortages were caused by the inability of the food handlers to estimate the exact number of learners who would be available at the school. This problem was common during end of year examinations when some learners only attended school on days when they would be writing examinations. One of the participants made this comment:

Yeah, I would say the food is sufficient. It's only that at a certain time; for example, sometimes towards the end of the year, there are learners that are not writing examinations on certain days and do not come to school. So they do not cook the exact quantity. Sometimes they will be a shortage but it's not always a problem (PC).

4.6.1.3 Delays in feeding

The problem of gas shortage was due to the supplier's failure to estimate the time that the gas would last. To confirm the problem of gas shortages in schools, a participant noted that:

> *Delays in feeding sometimes occur when food or gas is not supplied on time. The gas can be finished and if the supplier is not told on time, there may be delays. The new supplier delivers a small amount of gas. The old supplier used to deliver the gas that lasted a specific period of time that he knew. The new supplier is still adapting (TC).*

The poor delivery of food had the impact of straining relationships among stakeholders. One of the principals bemoaned that:

> *The supplier is sometimes not reliable. Not the new one, the new one is good. But the former one-uuuh, aaah. I have never seen an unreliable man like that. Challenge faced with food handlers is that of poor delivery of food by the suppliers The teacher coordinator is challenged with the attitude of the food handlers. Sometimes, if there is a problem between the food handlers and the supplier because of poor delivery of the food, the food handlers become angry and overreact to the teacher co-ordinator. That puts pressure on the nutrition coordinator (PD).*

The delays in food supply also affected the proper functioning of the school. Adjustments in school activities had to be made to accommodate the delays in serving the meal. One of the participants bemoaned that:

> *The challenge of the principal is when the food is not delivered on time. It affects the whole school. The timetable has to change to accommodate the feeding time. If the department can allow the school to choose or appoint the service provider that we prefer, that will be much better. If they can allow the SGB to appoint a service provide who will understand the rural area and is*

sensitive to the needs of the learner. That will help to take care of the poor children in the schools (PD).

4.6.1.4 Food preference and culture

There were also challenges of food preferences among schools. A product which may be good for one school may not be liked by another. One participant had this to share:

At some point, there are problems of food preference. When you get to a new school they don't like the same rice that you supply at one school. They may tell you: 'We need to cook this rice for a long time.' Other schools do not have any problem with the same rice (SE).

One of the participants highlighted the importance of culture or background in determining food choices. He commented that:

Some learners enjoy fish and rice, some samp and beans, while others like amasi and phutu. Some hate soya mince. Sometimes the choice of food is determined by their background. If they don't eat soya mince at home, it will be difficult for them to eat it at school. Attitude change on food choices is very difficult. Some like butternuts but hate carrots, which they throw away (DO).

Another participant also hinted on culture as one of the factors that determined food choices. The participant added sickness or allergies as some of the factors that resulted in avoidance of certain food items. The participant said:

Some say they have taken the Zulu medicine and they are not allowed to eat fish. Some say beans makes them sick as they had stomach problems after eating (FB).

Another participant also indicated that some of the food causes sickness to some of the learners. However, the participant did not seem to believe the learners. He asserted that:

Learners don't like samp because they say that it upsets their stomach. But I don't think that it's true (PG).

The food handlers in schools B, C, D, E and G confirmed that some leaners got sick after eating some of the food. They cited the method of food preparation as one of the causes of sickness. The participants said.

> *We don't soak samp. We have to wake up early in the morning to cook samp. If we soak it, then cook later, learners get sick (FD).*

Sometimes learners do not eat food due to their personal preferences. The nutrition programme is meant to benefit learners by eliminating short term hunger and ensuring that they are active during lessons. Such objectives will not be easily achieved if a large number of learners do not eat the meals for whatever reason. This appeared to be the situation in one of the schools as one participant commented:

> *Yes, they are some learners who are choosy. Others are not. When the menu points out on fish, almost all the learners eat. When soya mince is cooked, some of them do not eat. The proportion of learners who do not eat soya mince is about three out of ten (PC).*

It was unfortunate to note that there were no alternative meals as one of the participant reflected that:

> *Learners complained about soya mince and rice on Tuesdays and Thursdays. There were no alternative meals for learners who did not like the standard meals. The most liked meals were samp and beans on Wednesday and amasi and phutu on Friday (SE).*

4.6.1.5 Lack of sufficient training of stakeholders

There was a challenge among food handlers who sometimes failed to attend training workshops. Lack of training was well covered under research objective one. Lack of training was sometimes caused by the time of the workshop which coincided with school food preparation time and lack of money or transport to take them to the workshop venue. Lack of training compromised the quality of food provided to learners. One of the participants commented that:

There is a challenge of workshop attendance. Some stakeholders do not attend at all. Sometimes the venue is not accessible. Some principals do not transport food handlers. Some food handlers do not attend due to logistic problems. This, in turn, results in food handlers lacking cooking techniques while service providers lack business skills. Some of them needed to be familiarised with issues like company registration and income tax (DO).

4.6.1.6 Stipend for food handlers

Although the food handlers were getting a stipend, the money, according to a number of the participants, was too little. One of the participants shared the following:

I don't think food handlers are happy about the stipend. It's not enough because it's less than R 1100. Yes, they prepare one meal per day but R1100 for 21 days is too little. To me it does really make sense. At least R 1600 to R 1800 would be better (SE).

This was supported by another participant who equally felt that the stipend was too low for the food handlers. The participant had this to say:

Yes, there is a challenge in the remuneration of food handlers. The amount of about R1100.00 per month is too low. They should get around R3000.00 per month or at least R100 per day (PG).

Contrary, another participant felt that the stipend for the food handlers was enough considering that they only prepared one meal and payment was in accordance with the policy. The participant commented that:

I would not say that they are happy about the stipend because money has never satisfied anyone. Because it's a policy that they have to get that money, they don't have to complain. To me, I think what they get is fair enough (PC).

4.6.2 Quantitative results on challenges encountered in the implementation of the school nutrition programme

Findings from qualitative data portrayed that there were many challenges associated with implementation of the school nutrition programme. To complement these findings, the researcher saw it necessary to include quantitative data from learners who were the main beneficiaries of the programme. The challenges are presented in Table 4.21 and are elaborated in the subsequent sections.

Table 4-21: Challenges and learners' level of agreement to the associated challenges. (SDEV=standard deviation)

Challenges	**Level of learners' agreement with the challenge**								
Food is of poor quality on the following days	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	No response	**Total**	Mean	SDEV
Monday	21 (19.4)	16 (14.8)	25 (23.1)	20 (18.5)	23 (21.3)	3 (2.8)	108 (100)	21.6	3.4
Tuesday	9 (8.3)	17 (15.7)	30 (27.8)	28 (25.9)	16 (14.8)	8 (7.4)	108 (100)	21.6	8.8
Wednesday	18 (16.7)	26 (24.1)	31 (28.7)	14 (13.0)	13 (12.0)	6 (5.6)	108 (100)	21.6	7.8
Thursday	15 (13.9)	14 (13.0)	35 (32.4)	22 (20.4)	13 (12.0)	9 (8.3)	108 (100)	21.6	9.2
Friday	22 (20.4)	8 (7.4)	28 (25.9)	14 (13,0)	28 (25.9)	8 (7.4)	108 (100)	21.6	8.8
Food is of low quantity on the following days									
Monday	31 (28.7)	8 (7.4)	24 (22.2)	13 (12.0)	24 (22.2)	8 (7.4)	108 (100)	21.6	7.9
Tuesday	11 (10.2)	15 (13.9)	29 (26.9)	21 (19.4)	22 (20.4)	10 (9.3)	108 (100)	21.6	6.9
Wednesday	16 (14.8)	13 (12.0)	30 (27.8)	18 (16.7)	21 (19.4)	10 (9.3)	108 (100)	21.6	6.5
Thursday	20 (18.5)	12 (11.1)	31 (28.7)	22 (20.4)	16 (14.8)	7 (6.5)	108 (100)	21.6	7.2
Friday	20 (18.5)	10 (9.3)	21 (19.4)	16 (14.8)	30 (27.8)	11 (10.2)	108 (100)	21.6	7.3
Food is sometimes not available	26 (24.1)	42 (38.9)	12 (11.1)	13 (12.0)	11 (10.2)	4 (3.7)	108 (100)	21.6	13.8
There are sometimes delays in serving the food	32 (29.6)	44 (40.7)	8 (7.4)	7 (6.5)	14 (13.0)	3 (2.8)	108 (100)	21.6	16.3

A different menu is served than expected	23 (21.3)	26 (24.1)	20 (18.5)	17 (15.7)	22 (20.4)	0 (0.0)	108 (100)	21.6	3.4
I have health problems after eating some of the food.	19 (17.6)	22 (20.4)	16 (14.8)	21 (19.4)	30 (27.8)	0 (0.0)	108 (100)	21.6	5.2
The food served on some days interferes with my culture/beliefs	11 (10.2)	8 (7.4)	27 (25.0)	12 (11.1)	50 (46.3)	0 (0.0)	108 (100)	21.6	17.5
I just don't like the taste of some of the food	44 (40.7)	29 (26.9)	11 (10.2)	15 (13.9)	9 (8.3)	0 (0.0)	108 (100)	21.6	14.8
Nutrition education is taught at secondary school	26 (24.1)	15 (13.9)	26 (24.1)	6 (5.6)	35 (32.4)	0 (0.0)	108 (100)	21.6	11.2
Are you familiar with the food groups of the food guide pyramid?	27 (25.0)	19 (17.6)	27 (25.0)	15 (13.9)	18 (16.7)	2 (1.9)	108 (100)	21.6	9.3
Are you aware of the components to include in your school lunch box?	34 (31.5)	24 (22.2)	28 (25.9)	12 (11.1)	10 (9.3)	0 (0.0)	108 (100)	21.6	10.3
Are you aware of the components to avoid in your school lunch box?	35 (32.4)	22 (20.4)	25 (23.1)	13 (12.0)	11 (10.2)	2 (1.9)	108 (100)	21.6	9.7
Are you aware of a balanced diet?	41 (38.0)	30 (27.8)	9 (8.3)	10 (9.3)	18 (16.7)	0 (0.0)	108 (100)	21.6	13.7
Posters on healthy eating habits are displayed in the school.	11 (10.2)	4 (3.8)	18 (16.7)	15 (13.9)	60 (55.6)	0 (0.0)	108 (100)	21.6	22.1
The school has a vegetable garden.	5 (4.6)	2 (1.9)	7 (6.5)	17 (15.7)	77 (71.3)	0 (0.0)	108 (100)	21.6	22.1
Do you wash your hands with soap before eating?	22 (20.4)	15 (13.9)	8 (7.4)	22 (20.4)	40 (37.0)	1 (0.9)	108 (100)	21.6	11.9
Are you familiar with health risks associated with too much fats?	31 (28.7)	23 (21.3	16 (14.8)	12 (11.1)	23 (21.3	3 (2.8)	108 (100)	21.6	7.3
Are you familiar with health risks associated with too much carbohydrates?	29 (26.9)	26 (24.1)	29 (26.9)	7 (6.5)	14 (13.0)	3 (2.8)	108 (100)	21.6	10.0
Are you aware of the nutritional value of various foods	17 (15.7)	23 (21.3	40 (37.0)	10 (9.3)	18 (16.7)	0 (0.0)	108 (100)	21.6	11.3

provided in the nutrition programme?									
Are you aware of the risks associated with various nutrient deficiencies?	18 (16.7)	19 (17.6)	40 (37.0)	8 (7.4)	22 (20.4)	1 (0.9)	108 (100)	21.6	11.7
Lack of plates & spoons	49 (45.4)	16 (14.8)	4 (3.7)	8 (7.4)	32 (28.7)	0 (0.0)	108 (100)	21.6	18.6
Lack of washing soap	46 (42.6)	13 (12.0)	9 (8.3)	11 (10.2)	27 (25.0)	2 (1.9)	108 (100)	21.6	15.6

4.6.2.1 Quality of Food

Thirty-seven (34.3%) respondents affirmed that the food was of low quality on Mondays, while 43 (39.9%) were of the view that the quality of food was good. Some of the respondents 25 (23.1%) were neutral on the quality of food. The quality could have been average according to the views of respondents who took a neutral position on the issue of food quality. On Tuesdays, a significant proportion of respondents 26 (24.1%) agreed that the quality of food was poor while the majority of respondents 44 (40.7%) were of the opinion that the quality of food was good. A relatively large proportion of respondents 30 (27.8%) were neutral in their response to the quality of food. On Thursdays, the meal was similar to that for Tuesdays in all schools. On Thursdays, 35 (32.4%) respondents confirmed that the quality of food was poor and 35 (32.4%) were neutral on the quality of food. A correlation coefficient of 0.82 indicated good reliability between the learners' responses for Tuesdays and their corresponding responses for Thursdays, where a similar meal was served. For the Wednesday meal of samp and beans, 44 (40.7%) of the respondents affirmed that the meal was of poor quality, 27 (25.0%) were of the opinion that the quality of the Wednesday meal was good, and 31 (28.7%) were neutral on the issue of the meal quality. Thirty (27.8%) affirmed that the Friday meal was of poor quality while 36 (33.3%) were neutral on issue of meal quality on Friday. High standard deviations between 3.4 and 9.2 indicate that the data points were spread out over a wide range of values. The meals could have been of different quality in different schools. This resulted in mixed responses on the same issue of quality of food in different schools.

4.6.2.2 Quantity of food

On the issue of quantity of food on Mondays, 39 (36.1%) felt that the quantity of food was lower than what they expected, while 37 (34.2%) disagreed that the quantity of food was low, and 24 (22.2%) were neutral on the issue of quantity of food. On Wednesdays, 29 (26.8%) agreed that the quantity of food was low and a slightly higher proportion of respondents 39 (36.1%) felt that the quantity of food was enough. Thirty (27.8%) respondents were neutral on the issue of quantity of food on Wednesdays. An equal number of respondents 30 (27.8%) agreed that the quantity of food was low on Fridays while a higher proportion 46 (42.6%) were of the view that the quantity of food was good on Fridays. They felt that the quantity of food was enough. For the Tuesdays and Thursdays meals that were similar, an average of 29 (26.9%) agreed that the meals were of low quantity, and 40 (37.0%) were of the view that the quantity of food was enough while an average of 30 (27.8) were neutral on the issue of quantity of food on Fridays. Standard deviations between 6.5 and 7.9 indicate that the data points were spread out over a wide range of values. This shows unequal distribution of learners' responses on various choices of the likert scale on the view of food quantity.

4.6.2.3 Food delays and availability

A large proportion of respondents 68 (63.0%) observed that the food was sometimes unavailable while a small proportion 12 (11.1%) were neutral on the issue of availability of food. A Significant proportion of respondents 76 (70.4%) agreed that there were sometimes delays in serving the school meals while a small proportion 21(19.5%) disagree that there were challenges of delays in serving the meals. A relatively large proportion of respondents 49 (45.4%) affirmed that a different meal than expected was sometimes served. Thirty nine (36.1%) were of the view that a consistent meal was always served on each school day. Large standard deviations between 13.8 and 16.3 indicate that the data point values were widely spread apart.

4.6.2.4 Health, Culture and food taste.

Forty-one (38.0%) respondents affirmed that they had health problems after consuming some of the school meals, while 51 (47.2%) reported that the meals did not cause any health problems to them. A relatively small number of respondents 19 (17.6%) noted that some of the food served interfered with their culture or beliefs, while the majority 62 (57.4%) were of the view that the food did not interfere with their culture or beliefs. A significant proportion of respondents 73 (67.6%) disliked the taste of some of the food while a smaller number 24 (22.2%) liked the taste of all the food items served. Large standard deviations between 5.2 and 17.5 indicated that the data points were spread out over a wide range of values.

4.6.2.5 Nutrition education

Table 4.18 shows that a larger number of respondents 41 (38.0%) were of the view that nutrition education was not being taught at secondary school, and an equal number were affirmative that nutrition education was being taught. Relatively small proportions of respondents were not familiar with the nutrition education principles. Thirty-three (30.6%) were not familiar with food groups, 22 (20.4%) were not aware of nutritious foods to include in the lunch box, 24 (22.2%) were not aware of what to avoid in the school lunch box, and 28 (26.0%) were not aware of a balanced diet. A significantly high proportion of respondents 75 (69.5%) confirmed that there were no posters on healthy foods while a small proportion 15 (14.0%) agreed that such posters were available. The absence of vegetable gardens in schools was confirmed by 94 (87.0%) of respondents while the absence of soap for hand washing was confirmed by 62 (57.4%) of the respondents. A significant proportion of respondents was not familiar with healthy risks associated with too much fat 35 (32.4%), while 21 (19.5%) were not familiar with health risks associated with too much carbohydrates. Twenty-eight (26.0%) of the learners were not familiar with the nutritional value of various foods and 30 (27.8%) were not familiar with health risks associated with nutrient deficiency diseases. Large standard deviations between 7.3 and 22.1 indicate that the data points were spread out over a wide range of values.

4.6.2.5.1 Learners' familiarity with issues of nutrition

Learners' familiarity with various issues of nutrition was further explored using a different set of questions so as to get a detailed view on learners' understanding of principles of nutrition, and the results are summarized in Table 4.22. A large proportion of respondents 39 (36.1%) expressed that they were either slightly familiar or not familiar with the food guide pyramid. A significant proportion of learners 33 (30.6%) were slightly familiar or not familiar with nutritious foods to include in the school lunch box. Twenty-nine (26.7%) of the respondents were slightly familiar or not familiar with food items to exclude in the school lunch box. A good number of respondents 24 (22.2%) were not familiar with a balanced diet. Very large proportions of respondents; 76 (70.4%) and 55 (50.9%), reflected that there were no posters on healthy catering habits and were not familiar with the growing of vegetables respectively. A relatively large proportion of learners 42 (38.9%) were not familiar with washing of hands with soap before eating. A slightly smaller number of respondents 38 (35.2%) were not familiar with washing plates or lunch boxes with soap after eating.

Table 4-22: Learners' familiarity with issues of nutrition

Key: EF=Extremely familiar; MF= Moderately familiar; SWF= Somewhat familiar; SLF=Slightly familiar; NF=Not familiar at all; SDEV= Standard deviation.

Nutrition issue	**Learners' Familiarity to the nutrition issue**								
	EF	MF	SWF	SLF	NF	No response	**Total**	Mean	SDEV
The food groups of the guide pyramid	24 (22.2)	25 (23.1)	20 (18.5)	10 (9.3)	29 (26.9)	0 (0.0)	108 (100%)	21.6	7.2
Nutritious food to include in your school lunch box.	36 (33.3)	22 (20.4)	15 (13.9)	12 (11.1)	21 (19.4)	2 (1.9)	108 (100%)	21.6	9.3
Food to avoid in your school lunch box.	36 (33.3)	21 (19.4)	19 (17.6)	14 (13.0)	15 (13.9)	3 (2.8)	108 (100%)	21.6	8.9
A balanced diet.	43 (39.8)	22 (20.4)	13 (12.0)	12 (11.1)	12 (11.1)	6 (5.6)	108 (100%)	21.6	13.3

Posters on healthy eating habits displayed in the school	9 (8.3)	6 (5.6)	15 (13.9)	7 (6.5)	69 (63.9)	2 (1.9)	108 (100%)	21.6	26.9
How to grow vegetables	24 (22.2)	16 (14.8)	12 (11.1)	13 (12.0)	42 (38.9)	1 (0.9)	108 (100%)	21.6	12.4
Washing your hands with soap before eating	42 (38.9)	14 (13.0)	10 (9.3)	12 (11.1)	30 (27.8)	0 (0.0)	108 (100%)	21.6	13.9
Washing your plate/lunch box with soap after eating	50 (46.3)	11 (10.2)	8 (7.4)	10 (9.3)	28 (25.9)	1 (0.9)	108 (100%)	21.6	17.9

In general, larger proportions of respondents were familiar with nutritional issues than learners who were not familiar. Learners who were either moderately familiar or extremely familiar with the food guide pyramid were 49 (45.4%) whereas 58 (53.7%) were moderately familiar or extremely familiar with the nutritious food items to include in the school lunch boxes. Almost an equal number 57 (52.8%) of respondents was either moderately familiar or extremely familiar with junk foods to avoid in the school lunch box. A significantly large number of respondents 65 (60.2%) was moderately familiar or extremely familiar with a balanced diet. The availability of posters displayed in the school was confirmed by a very small number of respondents 15 (13.9%), while the familiarity with growing of vegetables was confirmed by 40 (37.0%). Washing of hands with soap and washing of plates with soap were confirmed by 56 (51.9%) and 61 (56.5%) respondents respectively. Standard deviations between 7.2 and 26.9 indicated greater dispersion of data from the mean of 21.6. There were large differences in the frequencies of learners' responses.

4.6.2.5.2 Learners' level of understanding of nutrition principles

A further set of questions was used to further explore understanding of nutrition education principles among learners. Table 4.23 shows the summary of results which are elaborated in the subsequent sections.

Table 4-23: Learners' level of understanding of nutrition principles

Nutrition principle	Level of learners' understanding								
	excellent	Very good	good	Fair	Poor	No response	**Total**	Mean	SDEV
Balanced diet	31 (28.7)	19 (17.6)	26 (24.1)	19 (17.6)	13 (12.0)	0 (0.0)	108 (100%)	21.6	7.0
Components of a balanced diet	16 (14.8)	17 (15.7)	31 (28.7)	32 (29.6)	10 (9.3)	2 (1.9)	108 (100%)	21.6	9.8
Food groups of the food guide pyramid	13 (12.0)	13 (12.0)	22 (20.4)	39 (36.1)	20 (18.5)	1 (0.9)	108 (100%)	21.6	10.6
Recommended dietary allowances or intakes	6 (5.6)	9 (8.3)	28 (25.9)	35 (32.4)	24 (22.2)	6 (5.6)	108 (100%)	21.6	12.5
Over-nutrition	15 (13.9)	13 (12.0)	26 (24.1)	27 (25.0)	25 (23.1)	2 (1.9)	108 (100%)	21.6	6.6
Under-nutrition	12 (11.1)	20 (18.5)	25 (23.1)	27 (25.0)	22 (20.4)	0 (0.0)	108 (100%)	21.6	5.8
Obesity	42 (38.9)	10 (9.3)	16 (14.8)	10 (9.3)	30 (27.8)	0 (0.0)	108 (100%)	21.6	14.0
Causes of obesity	39 (36.1)	18 (16.7)	14 (13.0)	8 (7.4)	26 (24.1)	0 (0.0)	108 (100%)	21.6	12.0
Overweight	45 (41.7)	13 (12.0)	10 (9.3)	12 (11.1)	27 (25.0)	0 (0.0)	108 (100%)	21.6	14.8
Causes of overweight	42 (38.9)	16 (14.8)	14 (13.0)	13 (12.0)	22 (20.4)	0 (0.0)	108 (100%)	21.6	12.0
Marasmus	13 (12.0)	6 (5.6)	10 (9.3)	25 (23.1)	49 (45.4)	0 (0.0)	108 (100%)	21.6	17.0
Causes of marasmus	14 (13.0)	5 (4.6)	10 (9.3)	19 (17.6)	53 (49.1)	0 (0.0)	108 (100%)	21.6	19.0

Hygiene	32 (29.6)	18 (16.7)	17 (15.7)	19 (17.6)	21 (19.4)	0 (0.0)	108 (100%)	21.6	6.1
Importance of menu variety	17 (15.7)	19 (17.6)	21 (19.4)	22 (20.4)	25 (23.1)	0 (0.0)	108 (100%)	21.6	3.0
Food poisoning	31 (28.7)	14 (13.0)	14 (13.0)	15 (13.9)	32 (29.6)	0 (0.0)	108 (100%)	21.6	9.4
Importance of exercise	62 (57.4)	17 (15.7)	10 (9.3)	6 (5.6)	11 (10.2)	0 (0.0)	108 (100%)	21.6	23.1

Table 4.23 shows that a significant number of respondents had low level of understanding various nutrition education principles.

Balanced diet in general was poorly understood by 13 (12.0%), fairly understood by 19 (17.6%), and the rest 76 (70.4%) had between good to excellent knowledge of a balanced diet. On the issue of components of a balanced diet, 10 (9.3%) had poor understanding of a balanced diet, 32 (29.6%) had fair understanding of the components of a balanced diet, while 64 (59.3%) had between good to excellent knowledge on the issue of understanding the components of a balanced diet.

Food groups were poorly understood by 20 (18.5%), fairly understood by 39 (36.1%), while 48 (44.4%) had between good to excellent knowledge of food groups. A good number of respondents 24 (22.2%) had poor understanding of recommended dietary allowances and 35 (32.4%) had a fair understanding of recommended dietary allowances (RDAs). Forty-three (39.8%) had good to excellent understanding of RDA with the majority being just good 28 (25.9%).

Over-nutrition was poorly understood by 25 (23.1%), fairly understood by 27 (25.0%), while the majority 54 (50%) had between good to excellent knowledge on the principle of over-nutrition. Under-nutrition was poorly understood by 22 (20.4%), fairly understood by 27 (25.0%), and 57 (52.8%) had good to excellent understanding of the principle. A correlation coefficient of 0.78 shows acceptable reliability on learners' responses on the principles of over-nutrition and under-nutrition, which were related. Thirty (27.8%) of the learners had poor understanding

of obesity, 10 (9.3%) had fair understanding of the principle, while 68 (63.0%) had at good understanding of the principle of obesity. Causes of obesity were poorly understood by 26 (24.1%), fairly understood by 8 (7.4%), while 71 (65.7%) had at least good understanding of the concept. A correlation coefficient of 0.94 shows excellent reliability in the learner's responses on obesity and causes of obesity.

Overweight was poorly understood by 27 (25.0%) of the respondents, fairly understood by 12 (11.1%) of the respondents, while a significant number 68 (63.0%) had a good to excellent understanding of the principle. Causes of overweight were poorly understood by 22 (20.4%), fairly understood by 13 (12.0%), and 72 (66.7%) had at least good understanding of the issue. A correlation coefficient of 0.98 shows excellent reliability of learners' responses on overweight and causes of overweight.

Marasmus was poorly understood by 49 (45.4%), fairly understood by 25 (23.1%) and at least good understanding of it was reflected by 29 (26.9%) of the respondents. Causes of marasmus was poorly understood by 53 (49.1%), fairly understood by 19 (17.6%) and 29 (26.9%) has at least good understanding of the principle. A correlation coefficient of 0.98 also reflects excellent reliability of learners' responses on marasmus and causes of marasmus. Twenty-five (23.1%) of the respondents had poor understanding of the importance of menu variety while 22 (20.4%) had a fair understanding of the principle, and the rest 57 (53.2%) had at least good understanding of the importance of menu variety. The principle of hygiene was poorly understood by 21 (19.4%), fairly understood by 19 (17.6%), and the majority 67 (62.0%) had at least good understanding of the principle of hygiene. Food poisoning was poorly understood by 32 (29.6%), fairly understood by 15 (13.9%), while the majority 59 (54.6%) had at least good understanding of the principle. A small number of respondents 11 (10.2%) poorly understood the importance of exercise, while 6 (5.6%) had a fair understanding of the principle while 89 (82.4%) had good, very good or excellent understanding of the nutrition principle. Standard deviations between 3.0 and 23.1 showed that learners' responses were spread over a wide range of values and far from the mean value.

A further set of questions was used to further explore the cause of lack of nutrition education principles among learners. Table 4.24 shows the summary of results which are elaborated in the subsequent sections.

Table 4-24: Learners' awareness of nutritional education issues

Nutrition education issue	**Learners' responses**						
Learnt about nutrition	**Yes**		**No**		**not sure**		**No response**
No. & % of learners	52 (48.1)		21 (19.4)		21 (19.4)		14 (13.0)
Grade in which learners were taught Nutrition education issues	**8**	**9**	**10**	**11**	**12**	**Primary school**	
No. & % of learners taught	22 (20.4)	22 (20.4)	19 (17.6)	2 (1.9)	1 (0.9)	56 (51.7)	
Subjects that taught nutrition education	**Life Orientation**		**Nutrition programme**		**Life Sciences**		
No. & % of learners taught in that subject	69 (63.9)		1 (0.9)		35 (32.4)		
Food groups that learners were aware of.	**protein**	**bread/ cereal & pasta**	**Fruits**	**vegetables**	**milk**	**Fats**	**No response**
No. & % of learners aware of that food group	21 (19.4)	19 (17.6)	5 (4.6)	8 (7.4)	1 (0.9)	10 (9.3)	44 (40.7)

The largest proportion of learners 52 (48.1%) indicated that they had learnt about nutrition while a smaller proportion 21 (19.4%) indicated that they had not learnt about nutrition. An equal number 21 (19.4%) were not sure if they had learnt about nutrition or not. The majority of respondents 56 (51.7%) were taught nutrition education at primary school. A very low proportion of respondents were taught nutrition education in grade eight 22 (22.4%), an equal number in grade nine, 19 (17.6%) in grade ten. Insignificant numbers of respondents, 2 (1.9%) and 1 (0.9%), indicated that they were taught nutrition education in grade eleven and twelve

respectively. The majority of respondents 69 (63.9%) and 35 (32.4%) indicated that they were taught nutrition education in Life Orientation and Life Sciences respectively. Only one (0.9%) indicated that he/she was taught nutrition education during the school nutrition programme. It was quite surprising that the majority of respondents in grade twelve were not able to mention the food groups of the food guide pyramid. Only a small proportion 21 (19.4%) were able to mention protein as one of the food groups and 19 (17.6%) were able to mention the bread, cereal and pasta groups. Very small proportion of the respondents were able to mention fruit 5 (4.6%), vegetables 8 (7.4%), milk 1 (0.9%) and fat 10 (9.3%) as the other food groups that are important to provide important nutrients to the body. Generally, there was lack of nutrition education knowledge among learners.

4.6.3 Summary of main findings on challenges encountered in the implementation of the school nutrition programme

Research results in this section show that stakeholders faced many challenges in the school nutrition programme. Presented below, in Table 4.25, is a triangulation presentation of findings generated from qualitative and quantitative data, of the major challenges encountered in the implementation of the school nutrition programme.

Table 4-25: Triangulation table of findings from qualitative and quantitative data

Findings (Qualitative data)	**Findings (Quantitative data)**
No standard cooking procedures. Lack of knowledge and skills among food handlers.	Supported by statements which indicated that food was not well cooked or learners getting sick after eating the meal.
Late payment of service providers. Unavailability of food on some days.	Unavailability of food on some days was reported by 68 (63.0%) of respondents.
Low food quality and quantity.	Confirmed by a large proportion of respondents.
Delays in food/gas supply.	Noted by 76 (70.4%) of the respondents.

Nutrition education not adequately taught at high school.	Confirmed by large number of respondents who lacked the basic knowledge of food groups and nutrition principles.

4.6.3.1 Interpreting the triangulation table

The qualitative data revealed that there were no standardised cooking procedures that were adhered to by food handlers. Furthermore, there was general lack of knowledge and skills among food handlers. Responses by learners that food was not well cooked or had a bad taste confirmed the lack of sufficient knowledge and skills among food handlers. Qualitative data revealed that service providers were sometimes paid after more than three months. Respondents confirmed this assertion by indicating that food was sometimes unavailable. A large number of respondents confirmed the low quality and quantity of food that was reported by participants. Participants highlighted that sometimes there were delays in the supply of food or gas. This was reported by a large proportion of respondents 76 (70.4). Participants also noted that there was no nutrition education that was taught to learners. To confirm this, a large number of respondents were observed to be lacking the basic principles of food groups and various other principles of nutrition that are basic but essential for one to understand.

4.7 RESULTS ON IMPLICATIONS OF ON THE LEARNERS' NUTRITIONAL EDUCATION

Qualitative and quantitative data in the previous sections confirmed that teachers and other stakeholders of the school nutrition programme had a pivotal role in promoting nutrition education in the school environment. Teachers and other stakeholders require adequate nutritional knowledge that they have to impart to the learners to promote good eating habits and a healthy life style. However, it was noted that stakeholders lacked the relevant nutrition knowledge and the environment was not supportive for the learners' attainment of the relevant nutrition knowledge. It is therefore, against this background that the researcher further solicited a way forward guided by the fifth research question: "What are the implications of the school nutritional programme on the learners' nutritional education?" The study

sought to explore how best nutrition education can be taught to learners so that they can have good understanding of basic nutrition principles before they exit school in grade 12. This knowledge is critical as it helps the society to develop good eating habits which are critical in preventing numerous nutritional related disorders, some of which are prevalent in the South African society.

4.7.1 Qualitative results on implications of the school nutrition programme on nutrition education

Data from interviews reflected different views on nutrition education among learners. Some participants indicated that nutrition education was not being taught to learners while others reflected that nutrition education was being taught. All participants concurred that nutrition education was important and most of them recommended that it be taught to all learners in schools. The researcher engaged participants in drawing up implications of the school nutrition programme on learners' nutrition education. The main themes and sub-themes are presented in Table 4.26.

Table 4-26: Main themes and sub-themes on implications of the school nutrition programme on learners' nutrition education

Theme	Sub-Theme	Related issues
Implications for learners' nutritional education	Nutrition education is not taught	Lack of knowledge among stakeholders. Nutrition education not regarded as important. Poor food choices. No supporting documents.
	Nutrition education is taught	Life Sciences, Natural Sciences and Life Orientation. Grades 8 & 9. Learner support agent.

	Recommendations on nutrition education.	Teaching it in all classes. Life Orientation curriculum grade 8 & 9. Teaching nutrition education during Assembly. Stake holders' involvement. Involve nutrition specialists in nutrition education.

4.7.1.1 Nutrition education was not taught to learners

Nutrition education was not being taught to most learners in all the schools which participated in the study. Teachers were too busy to teach nutrition education which was not part of the curriculum in most grades. One of the teacher co-ordinators expressed that:

> *There is a challenge of time in terms of promoting nutrition education amongst the learners because educators wouldn't get much time to train learners on nutrition education because they have other work to do. Hence, there is no provision for nutrition education in the school (PC).*

It is crucial for the stakeholders to have the knowledge of nutrition education. In instances where the stakeholders lack such information, it will be difficult to convince learners to eat food items like soya mince which are not common in their homes. One of the participants highlighted the lack of nutrition knowledge among key role players in the programme. He bemoaned that:

> *Learners don't like chicken soya. I don't know why. They do not give a valid reason. The co-ordinators themselves were not trained and do not know about nutrition education, so nutrition education is not being taught to learners. The school has to decide about how they can teach nutrition education (SG).*

The possibility of inadequate time to promote nutrition education was also highlighted by another participant. The participant felt that nutrition education was not being regarded as important, hence learners who were not taught did not have a valid reason for consuming or not consuming certain foods. One of the participants reflected that:

> *There is possibly inadequate time to promote nutrition education. Maybe lack of knowledge among learners causes them not to eat certain meals. They don't understand why they are given cabbage. In the programme, nutrition education is not being regarded as important. Grade 11 and 12 don't want to eat food. They go and buy junk food like fat cooks and fresh chips. They associate such foods with status (TB).*

Teaching of nutrition education has to be accompanied by supporting materials such as charts and relevant books or videos to assist teachers in imparting nutrition knowledge to learners. Such supporting materials were not available in most of the schools. One of the participants noted that:

> *There are no materials or documents available to support nutrition education among learners. There is no school based support to promote good eating habits (TD).*

The unavailability of materials on nutrition education was also echoed by another participant who indicated that learners' food choice was sometimes determined by the weather conditions. The participant also confirmed that nutrition education was taught in Life Sciences as well as Natural Sciences. The participant had this to share:

> *The challenges of unavailability of posters on healthy eating habits for learners to see that the food provided in the programme is healthy. Even when the posters become available, there are no notice boards to display posters. Sometimes when it's cold, they don't want to eat amasi. Learners are*

not taught besides those who are learning Natural Science and Life Sciences (TB).

For learners to eat a particular type of food, they need to be familiar with that particular food. Alternatively, knowing the value of a particular type of food may be important if one has to take a type of food that is not common in one's diet. Due to absence of nutrition education to most learners, they were unlikely to be familiar with the importance of different food types. One of the participants had this to share:

I don't think learners know the importance of different types of foods provided in the nutrition programme. They might know from primary school where there is emphasis on nutrition education. In GET and FET, there are theories of other issues not nutrition education principles. They have general knowledge of nutrition education (TC).

Learners' lack of knowledge in nutrition education was reiterated by another participant who added that learners in all grades need to be equiped with the nutrition education knowledge. The participant had this to say:

I would give learners 3 out of 10 on their knowledge in terms of the nutrition education. The priority group to teach nutrition education will be grade 8. However, all the learners deserve some form of support in nutrition education. Diet and food guide pyramid are the most important principles. It is important for the stakeholders to participate in promoting nutrition education (PE).

In line with the lack of nutritional knowledge among the learners, one of the participants emphasised the need to teach nutrition education. The participant felt that the nutritional education information would promote a healthy lifestyle. The participant indicated that:

Yes, I think learners need to be taught about nutrition education. Children must eat nutritious food so that they are healthy. They need vegetables. Teachers must teach learners about healthy eating habits. This will help them to avoid fatty foods which can make them sick (FD).

4.7.1.2 Nutrition education was not taught to learners

Some participants felt that nutrition education was being taught at secondary schools in Life Sciences. Schools with many learners who were taking the subject had learners equiped with nutrition education information that would assist them to make informed food choices. However, schools with a small number of learners taking Life Sciences would not easily impart nutrition education information to learners since there were no other programmes through which to provide the information except the Life Sciences curriculum as well as grade 8 and 9 curriculum. One of the participants expressed that:

> *Learners are taught about good nutrition in grade 10 Life Sciences. I can say that Learners' knowledge on nutrition education is about 60%. In the commerce group, there is nothing about food, hence their knowledge on that issue is much limited since they only learn in grade 8 and 9 (PD).*

The acquisition of nutrition education information was further facilitated by a learner support agent who was from the department. This was a great advantage to the school since the learner support agent could address the nutrition education issue to all learners in the school whenever he was afforded the opportunity to do so. One of the participants expressed that:

> *The Department provides a learner support agent. They guide learners on almost everything like social skills and also good eating habits. He has his own specific programme. He plans the specific issue to address to all learners on a specific day including the issue on nutrition. He stays in the school. Stakeholders, especially parents and the teacher coordinator, have to play a very important role in promoting nutrition education (PD).*

4.7.1.3 Participants' recommendations on nutrition education among learners

One of the participants had a feeling that the issue of nutrition education was very important and suggested that a multifaceted approach would enhance better understanding of the nutrition principles among learners. The participant shared the following views:

I think they know why they should eat different foods. There should be subjects that teach them. They should be taught in the school nutrition programme. They should be taught in classes about nutrition. All teachers should be involved (TD).

Teaching of nutrition education in classes was reiterated by another participant who expressed that:

Teachers must teach nutrition education principles in classes to make learners aware of the importance of the food provided in the school nutrition programme, as well as the food they eat away from school. Each morning you can have a topic to talk about such as hygiene and healthy eating. They must emphasise the importance of the food provided and the disadvantages of fatty foods (TC).

Another participant was of the view that all stakeholders should play a role in promoting nutrition education among learners. The participant expressed the view that:

The stakeholders have an important role to play in promoting nutrition education. You can't feed learners with soya mince when they don't understand its importance. They must know that soya mince has proteins. They must know the importance of beans and vegetables (PD).

Another participant felt that it was important to teach nutrition education in grades 8 and 9. She also felt that all stakeholders of the nutrition programme were to play a role in promoting nutrition education. She suggested that some of the information be taught during assembly time when all learners are available. She had this to share:

Learners must be taught nutrition education in grades 8 and 9. They must also be taught during assembly time where they must be given information of

nutritious food items provided in the programme. Stakeholders need to be engaged in promoting nutrition education. Currently, they do not provide any nutrition education (TB).

A different participant had the feeling that nutrition education had to be integrated into grade 8 Life Orientation curriculum covering basic aspects of nutrition. The participant also felt the need to involve nutrition specialists in addressing learners on nutrition issues. The participant commented that:

I think nutrition education should be taught from grade 8. They must be taught the basic knowledge of food groups, eating habits and drinking of water. That nutrition section should be in the Life Orientation curriculum in grade 8. Learners may have education excursions that are well planned so that the presenter will talk about aspects on nutrition. A person from the nutrition sector or a dietician can address learners on nutrition (PD).

Generally, participants felt that no justice was being done to promote nutrition education among learners. They felt that some changes had to be implemented to promote nutrition education among learners.

4.7.2 Quantitative results on implications for learners' nutrition education

Participants revealed that there was no support given to learners to promote nutrition education. Learners were not taught nutrition education, hence; their nutrition knowledge was likely to be limited. The researcher further engaged learners in the quantitative section of the study to draw up implications for learners' nutritional education. Table 4.27 presents the quantitative results that are explained in the sections that follow.

4.7.2.1 Learners' level of acceptance of various nutrition education issues

A significantly high proportion of respondents {97 (89.8%)} agreed that nutrition education should be introduced into the school curriculum. A large number of learners 103 (95.4%) were of the view that learners should be familiarised with same

concepts of nutrition education. A good number of respondents 94 (87.0%) had the feeling that the food guide pyramid was one of the principles of nutrition education that had to be incorporated into the school curriculum. The majority of respondents 102 (94.4%) were of the view that learners had to be familiarised with the food guide pyramid which would assist them to make informed food choices. Most of the learners 98 (95.1%) were for the idea of having regular nutrition education sessions in schools so as to improve the nutritional knowledge that was critical in making informed food choices. A large proportion of learners 101 (93.5%) felt that exposure to Healthy Life Style posters was also critical in improving their knowledge of nutrition. The majority of respondents 98 (95.1%) were also of the view that booklets on healthy eating lifestyle would also assist them in their knowledge of nutrition. The majority of respondents 94 (87.0%) were of the opinion that the school principals and teacher's co-ordinators had to be mandated to regularly teach nutrition education to learners in the school.

Table 4-27: Level of learners' agreement on the suggested principle to promote nutrition education

(SA=s**trongly agree, A=agree; N=neutral; D=disagree; SD=strongly disagree)**

Nutrition principle	**Learners responses**								
	SA 5	A 4	N 3	D 2	SD 1	No response	**Total**	Mean	SDEV
Nutrition education should be integrated into the school curriculum.	80 (74.1)	17 (15.7)	7 (6.5)	0 (0.0)	2 (1.9)	2 (1.9)	108 (100)	21.6	33.5
Learners should be familiarised with some concepts of nutrition	81 (75.0)	22 (20.4)	4 (3.7)	0 (0.0)	1 (0.9)	0 (0.0)	108 (100)	21.6	34.2
The food guide pyramid should be a study component in nutrition education in the school	75 (69.4	19 (17.6)	8 (7.4)	4 (3.7)	1 (0.9)	1 (0.9)	108 (100)	21.6	30.7

Learners should be familiarised with the food guide pyramid for them to make informed food choices	74 (68.5)	28 (25.9)	5 (4.6)	0 (0.0)	1 (0.9)	0 (0.0)	108 (100)	21.6	31.4
Learners should be exposed to healthy life style posters so as to be more informed about food choices.	76 (70.4)	25 (23.1)	2 (1.9)	2 (1.9)	1 (0.9)	2 (1.9)	108 (100)	21.6	32.3
Nutrition education sessions should be regularly conducted at school level to assist learners to make to make good food choices.	65 (60.2)	33 (30.6)	3 (2.8)	3 (2.8)	1 (0.9)	3 (2.8)	108 (100)	21.6	28.0
All learners in a school should be provided with booklets on healthy eating life style	67 (62.0)	31 (28.7)	6 (5.6)	2 (1.9)	1 (0.9)	1 (0.9)	108 (100)	21.6	28.3
Learners' nutrition education should be assessed and evaluated to check where learners need more assistance in nutrition education.	53 (49.1)	39 (36.1)	9 (8.3)	3 (2.8)	3 (2.8)	1 (0.9)	108 (100)	21.6	23.1
There should be compulsory subject in the school curriculum which teaches and assess nutrition education.	55 (50.9)	26 (24.1)	17 (15.7)	2 (1.9)	8 (7.4)	0 (0.0)	108 (100)	21.6	20.8
School nutrition programme stakeholders need to recognise and acknowledge their role in promoting good eating habits.	47 (43.5)	34 (31.5)	20 (18.5)	1 (0.9)	4 (3.7)	2 (1.9)	108 (100)	21.6	19.6
Nutrition education competitions should be organised and conducted at school level to assist learners to make good food choices.	63 (58.3)	32 (29.6)	6 (5.6)	4 (3.7)	2 (1.9)	1 (0.9)	108 (100)	21.6	26.3

Nutrition education competitions should be organised and conducted at cluster level	50 (46.3)	37 (34.3)	13 (12.0)	5 (4.6)	2 (1.9)	1 (0.9)	108 (100)	21.6	21.1
Nutrition education competitions should be organised and conducted at district level.	47 (43.5)	43 (39.9)	13 (12.0)	1 (0.9)	2 (1.9)	2 (1.9)	108 (100)	21.6	22.3
All learners in a school should be provided with booklets on healthy eating life style	67 (62.0)	31 (28.7)	6 (5.6)	2 (1.9)	1 (0.9)	1 (0.9)	108 (100)	21.6	28.3
School principals or teacher co-ordinators should be mandated to regularly teach learners on nutrition education.	56 (51.2)	38 (35.2)	10 (9.3)	2 (1.9)	2 (1.9)	1 (0.9)	108 (100)	21.6	24.3
Learners' nutrition education should be assessed and evaluated to check where learners need more assistance in nutrition education.	53 (49.1)	39 (36.1)	9 (8.3)	3 (2.8)	3 (2.8)	1 (0.9)	108 (100)	21.6	23.1
There should be compulsory subject in the school curriculum which teaches and assess nutrition	55 (50.9)	26 (24.1)	17 (15.7)	2 (1.9)	8 (7.4)	0 (0.0)	108 (100)	21.6	20.8

The majority of respondents 92 (85.2%) were affirmative on the issue of assessing and evaluating learners on nutrition education principles. A large proportion of respondents 81 (75.0%) felt that the assessment and evaluation was to be done in at least one compulsory subject that was offered in the curriculum, such as Life Orientation. Respondents 81 (75.0%) also felt that stakeholders had an important role in promoting good eating habits. The majority of respondents 95 (88.0%) supported the idea of nutrition education competitions in schools to assist learners to better understand principles of nutrition. The idea of nutrition education competitions being held at cluster level was also supported by a large proportion of respondents 87 (80.6%). A significant proportion of respondents were for the idea of being

provided booklets on healthy eating life style. A very large number of respondents 94 (87.0%) were for the idea of involving school principals and teacher co-ordinators in teaching nutrition education to learners. A large number of respondents 92 (85.2%) were affirmative on the issues of assessing and evaluating learners' work to check to check their understanding. Standard deviation values between 19.6 and 34.2 indicate a wide dispersion of data from the mean of 21.6. A large number of respondents were for the view of promoting nutrition education principles in various ways, while only a small number were not supportive of the idea. The next section shows learners' priority levels on various nutrition education principles when they are offered the opportunity to be taught.

4.7.2.2 Learners priority levels on nutrition education principles

Table 4.28 presents learners' priority levels on nutrition education principles. The successive sections elaborate the information in the table.

The responses by learners revealed that the majority 100 (92.6%) had between medium and essential priority on their need to be taught about balanced diet. Almost a similar number of learners 99 (91.6%) had similar responses between medium and essential priority on their need to be taught about components of a balanced diet. A correction coefficient of 0.99 showed excellent reliability in learners' responses on the two related issues - balanced diet and components of a balanced diet.

The number of respondents who indicated priority levels above the medium level were 99 (91.7%) and 86 (79.6%) for being taught food groups and recommended dietary allowances (RDAs) respectively. Larger numbers of respondents also had priority levels that ranged from medium to essential for being taught over-nutrition and under-nutrition principles. The number of respondents who showed great desire to be taught over-nutrition was 78 (72.2%) while 77 (72.0%) preferred to be equipped with knowledge about under-nutrition. Learners also showed great desire to be taught principles of obesity and overweight that were prevalent in the South African population. Seventy-one (65.7%) respondents had priority level to be taught obesity between medium and essential priority while 73 (67.6) had priority levels in the same

range for the desire to be taught the causes of obesity. The correlation coefficient for the learners' responses on over-nutrition and under-nutrition was 0.97, indicating excellent reliability in the learners' responses. A similar correlation coefficient was also obtained for the other two related principles - obesity and causes of obesity.

Table 4-28: Learners priority levels on nutrition education principles

Nutrition education Principle	**Priority level to be taught the principle**								
	Essential priority	High Priority	Medium Priority	Low Priority	Not Priority	No Response	Total (No & %)	Mean	SDEV
	5	4	3	2	1	0			
Balanced diet	55 (50.9)	27 (25.0)	19 (17.6)	4 (3.7)	2 (1.9)	1 (0.9)	108 (100%)	21.6	21.5
Components of a balanced diet	48 (44.4)	29 (26.9)	22 (20.4)	5 (4.6)	1 (0.9)	3 (2.8)	108 (100%)	21.6	19.0
Food groups of the food guide pyramid	48 (44.4)	19 (17.6)	23 (21.3)	7 (6.5)	5 (4.6)	6 (5.6)	108 (100%)	21.6	17.2
Recommended dietary allowances or intakes	40 (37.0)	22 (20.4)	24 (22.2)	8 (7.4)	10 (9.3)	4 (3.7)	108 (100%)	21.6	12.9
Over-nutrition	32 (29.2)	26 (24.1)	20 (18.5)	10 (9.3)	15 (13.9)	5 (4.6)	108 (100%)	21.6	8.7
Under-nutrition	30 (27.8)	25 (23.1)	22 (20.4)	9 (8.3)	18 (16.7)	4 (3.7)	108 (100%)	21.6	7.9

Obesity	32 (29.2)	26 (24.1)	13 (12.0)	12 (11.1)	23 (21.3)	2 (1.9)	108 (100%)	21.6	8.6
Causes of obesity	34 (31.5)	24 (22.2)	15 (13.9)	11 (10.2)	21 (19.4)	3 (2.8)	108 (100%)	21.6	8.9

The number of respondents who showed priority levels between medium and essential on the need to be taught overweight and causes of overweight were 72 (66.7%) and 77 (71.3%) respectively. Excellent reliability on learners' responses was shown on these two related issues by a correlation coefficient of 0.99. Great desire for learners to be taught marasmus and causes of marasmus was also reflected by large numbers of respondents, with 74 (68.5%) and 75 (69.4%) respectively indicating priority levels between medium and essential in the two nutrition principles.

The majority of the respondents: 87 (80.6%) for importance of menu variety, 106 (98.1%) for the importance of hygiene and 95 (89.6%) on the principle of how to stop the spread of disease causing micro-organisms, had at least medium priority level on their desire to be taught each of these nutrition principles. Most of the respondents, 83 (76.9%) and 88 (81.5%) also indicated their willingness to be taught the need to wash hands and how to grow vegetables respectively. This was reflected by the high priority levels which they selected in the responses. On the contrary, only small numbers of respondents between 6 (5.6%) and 32 (29.6%) indicated that each of the principles mentioned above was either not a priority or had low priority to be taught to learners. Large standard deviations between 7.9 and 21.5 indicate wide dispersion of data from the mean with large numbers of respondents having high priority to be taught nutrition education principles while very small numbers had low priority to be taught the principles

4.7.3 Summary of main findings on implications on the learners' nutrition education

There was generally lack of nutrition education among learners. Nutrition education was not regarded as important, and there were no efforts to support nutrition education. There were poor food choices among learners due to lack of knowledge on nutrition education. Teaching nutrition education in grades 8 and 9 Life

Orientation and grade 10 Life Sciences did not ensure that all learners exit grade 12 with sufficient nutrition knowledge. Presented below, in Table 4.29, are the major findings on implications of the school nutrition programme on learners' nutrition education.

Table 4-29: Triangulation table of findings from qualitative and quantitative data

Findings (Qualitative data)	**Findings (Quantitative data)**
Recommended teaching nutrition education in all classes	Majority 97 (89.8%) recommended that nutrition education be introduced into the school curriculum
Recommended incorporating nutrition education into the Life Orientation Curriculum	Majority recommended that booklets and posters on healthy eating life style be provided to assist learners to understand nutrition education
Recommended teaching nutrition education during assembly	The majority 98 (95.1%) recommended regular nutrition education sessions in the school. Majority recommended that all basic nutrition principles must be taught.
Recommended teaching nutrition education by all stakeholders. Recommended teaching nutrition education by nutrition specialists	Majority of respondents 94 (87.0%) recommended that the teacher coordinator and the principal be mandated to teach nutrition education to learners.

4.7.3.1 Interpreting the triangulation table

Results from qualitative data recommended that nutrition education be taught in all classes. This was supported by quantitative data from learners where the majority was of the view that nutrition education should be introduced into the school curriculum. In the qualitative component of the study, participants recommended the introduction of nutrition education principles in the Life Orientation curriculum. This was supported by the quantitative data from learners who recommended the use of booklets and posters on healthy life style to assist them in understanding nutrition

education principles. These booklets and posters could be used in Life Orientation. Participants in the qualitative component of the study recommended that learners be taught nutrition education during assembly times. Respondents supported this view in the qualitative component of the study where they agreed that regular sessions on nutrition education were important to support learners in the school. The majority of the respondents were of the view that all the basic nutrition principles must be taught. Participants in the qualitative section of the study suggested that stakeholders and nutrition specialists could be used in promoting nutrition education among learners. This was supported by 94 (87.0%) of the respondents who felt that the teacher co-ordinators and the principal be mandated to teach nutrition education.

4.8 DISCUSSION OF RESEARCH FINDINGS THEMATICALLY

The study aimed at examining the implementation of the school nutrition programme in selected high schools in KwaZulu-Natal. In this section, research findings are discussed in light of themes drawn from the sub-research questions that guided the study. The discussion focuses on findings generated from descriptive statistics (frequencies, means and standard deviations), inferential statistics (t-tests) and qualitative data from interviews. The discussion is done with reference to literature in local as well as international settings.

4.8.1 Training monitoring and support provided to key role players.

The first sub-research question sought to ascertain the training, monitoring and support provided to key role players in the school nutrition programme. It is likely that stakeholders' training, monitoring and support has a bearing on their sound knowledge and understanding of their roles and ultimately implementation of the programme. Stakeholders' understanding of their roles and objectives of the nutrition programme were the basis upon which all other areas of this study's concerns were derived.

4.8.1.1 Stakeholders' understanding of the purpose of the NSNP

It emerged from the study that stakeholders' understanding of the purpose of the school nutrition programme was limited. The qualitative data revealed that participants were aware that the programme assists learners in poor communities to get food and learn well at school. These were some of the objectives of the National School Nutrition Programme in South Africa that were highlighted by Kallman (2005), Lacey (2012) and the Department of Basic Education (South Africa) (2016). However, addressing poverty and improving learners' alertness in class were not the only objectives of the NSNP. Participants did not seem to be aware of some of the objectives of the NSNP, such as addressing inequality that was highlighted by Kallman (2005). Participants also did not seem to be aware of the objectives of addressing micronutrient deficiencies as well as promoting the establishment of school gardens and nutrition education that were highlighted by the Department of Basic Education (2016) and Lacey (2012). Participants' ignorance of such objectives had the effect of compromising the programme implementation process as it is difficult to achieve an objective that one is not aware of. This finding was confirmed by food handlers, service providers, teacher co-ordinators and principals from various schools who participated in in-depth interviews in the study.

4.8.1.2 Training of stakeholders

Research findings indicated that some of the food handlers were not trained. Langsford's (2012) study in Gauteng Province also revealed that food handlers were not trained in cooking and basic hygiene. Hence, some of food handlers were not aware of how to perform their duties effectively. Results from in-depth interviews indicated that some of the food handlers were not aware of the quantities of food items to cook for a particular number of learners although the quantities to prepare for each food item per learner per day were indicated in the menu, and the menu quantity schedule were provided to schools by the district office. The food handlers were unable to use the menu which specified the quantities for each food item to be prepared per learner per day to determine the quantities required by the school per day due to low literacy level. Teacher co-ordinators or principals could have assisted them if they had revealed this lack of understanding of quantities. It was evident and

worrisome that food handlers were not exposed to Mnandi 4 sure recipe book which indicated the quantities of food, items to be prepared for a certain number of learners as well as how to prepare the food like soya mince, which they were not familiar with (Department of Basic Education, 2016).

The problem of lack of training was not limited to only newly appointed food handlers. It extended to food handlers who were in the programme for more than two years. Furthermore, it was disappointing to note that there were also food suppliers, teacher co-ordinators and principals who were not trained in the programme. This was contrary to the assertion that was made by the Department of Basic Education (2009), that workshops were conducted with stakeholdlers of the National School Nutrition Programme. Although some of the stakeholders indicated that they had attended workshops, there was generally lack of knowledge among stakeholders related to performing their roles. This assertion was confirmed by both quantitative and qualitative data sets. The research findings concurred with the findings in the studies by Kwatubana and Makhalamele (2015) and Quila and Tyilo (2014) who also indicated that stakeholders of the National School Nutrition Programme in South Africa were not trained and had problems associated with execution of their duties.

Generally, there were complains by various participants about low standards of hygiene among food handlers. This could partly be attributed to lack of training. According to the Department of Basic of Education (2009), food handlers were to be trained in food preparation, hygiene and food safety. The lack of training was possibly the cause for poor quality of meals reported by the respondent learners in the self administered questionnaire. Some of the respondent learners pointed out that the food was not well cooked. Although the food handlers cooked in their homes, they needed training on how to best cook in large pots as well as how to mix different ingredients to make the meals appealing and tasty. Contrary to the findings of this study, findings in the study by Kwatubana and Makhalamele (2015) in South Africa singled out food handlers whom they indicated that they were well trained and were performing their duties effectively. The dissatisfaction with the food among learners affirmed Dei's (2014) observation about learners' disliking the NSNP food that was served at one of the Primary schools in KwaZulu Natal.

According to the Department of Basic Education (2014), schools were supposed to get various forms of support to ensure effective implementation of the National School Nutrition Programme. The various forms of support such as horticulture manuals for schools, compact discs, equipment and utensil guidelines, food specification guidelines, food preparation rules, NSNP guidelines for tuck-shop operators, NSNP healthy life style posters, NSNP lunch box and brochures specified by DBE (2014), were not available in schools, to provide additional information to various stakeholders.

4.8.1.3 Monitoring of the programme

Both qualitative and quantitative data revealed that monitoring of the national school nutrition programme was mainly done by the teacher co-ordinators. Principals were too busy with other school activities while SGB chairpersons were mostly at their workplaces during school hours and were unable to monitor the programme. Contrary to the findings of this study, Dei's (2014) case study in one of the primary schools in Ugu District reveled that, delivered goods were inspected by the principal and the school governing body for quantity and quality. The department officials were rarely seen monitoring the programme due to lack of transport, which they highlighted as their major draw-back in monitoring the programme. Lack of transport for district officials to travel to various schools to monitor the NSNP was affirmed in Rendall-Mkosi, Wenhold and Sibanda's (2013) study in South Africa. The major aspects monitored were expiry dates of food items, quantities of food items supplied, and hygiene.

Although the quantity of food was checked, it was checked to verify with the quantity on the invoice that the supplier claimed for, not with the expected quantity for the school for the specified number of days. The menu quantities schedule, which some of the teacher co-ordinators had, were not used to verify if the quantities supplied were sufficient for the period that learners had to receive food. The department officials could have calculated the daily quantities for each food item and given the information to the teacher co-ordinator for them to use in checking the adequacy of food items supplied instead of relying on service providers. Generally, here was inefficiency in monitoring the programme. Contrary, the study by Rendall-Mkosi,

Wenhold and Sibanda (2013) in Eastern Cape Province in South Africa revealed that district monitors visited schools more often than the number of visits reported by participants in this study. In addition, provincial programme co-ordinators were reported to be involved in monitoring the NSNP in schools in Eastern Cape Province. Monitoring by provincial programme co-ordinators was not evident in this study. Even the school that was facing challenges of food shortages had only one visit by district field officers in a period of 10 months in the year 2017, according to the observed monitoring report and participant interviewees. It was also observed in Rendall-Mkosi, Wenhold and Sibanda's (2013) study in Mpumalanga Province, that there were monitoring tools that were completed by the nutrition co-ordinators on monthly basis. Such monitoring tools were not observed in this study. However, similar to the findings of this study, findings by Rendall-Mkosi, Wenhold and Sibanda (2013) in Mpumalanga Province of South Africa revealed that there was no mechanism in place to monitor the quantity and quality of food prepared and served to individual learners each day at each school.

Frequent monitoring, similar to what is done in Nigeria by principals and teacher co-ordinators who monitored food quality and portion sizes daily, as well as the local government area council that verified the information by collecting feeding allowance reports twice per month, is important if quality and quality are to be maintained (Bundy et al., 2016). The daily feeding monitoring tool, according to Laar (2016), is also used in Ghana to capture information on meals prepared and portions of meals given to each child. Monitoring visits by the district and provincial officials, according to Fernades et al. (2016), are important in identifying specific training needs of stakeholders. Monitoring may also help to identify successful schools, which can, according to Langsford's (2012) study in Gauteng Province in South Africa, be used as model schools from which unsuccessful schools can emulate.

4.8.1.4 Support for the programme

Both qualitative and quantitative data sets reflect that there were no kitchens built specifically for the NSNP. In some schools, classrooms were converted into kitchens. Such classrooms were observed containing old computers and other materials that were, in some cases, conglomerated and dusty and were difficult to

clean. Studies by Bundy et al. (2016), Hochfeld et al. (2015) and Rendall-Mkosi, Wenhold and Sibanda (2013), affirmed the absence of proper kitchens in most schools in South Africa. These observations contradict the assertion made by Langsford (2012) that large organisations were supplying mobile kitchens across the country. The kitchens were probably supplied to schools in Gauteng Province only. Studies by Sulemana, Ngah and Majid (2013) and Okae – Adjei, Akuffo and Amartei (2016) revealed that some schools in Ghana had to cook under the tree due to the absence of infrastructure. The absence of infrastructure compromises hygiene of the food and may lead to contamination of food and various forms of infections. Hygiene was further compromised by the lack of cleaning materials, lack of sinks and taps around the kitchen, as well as poor maintenance of gas stoves. Both qualitative and quantitative data sets concurred that hygiene in and around the kitchen was lacking. Kwatubana and Makhalamele's (2015) study in South Africa affirmed the lack of maintenance of gas stoves as well as lack of cleaning materials. The lack of maintenance plans for cooking equipment was further affirmed in a different study by Rendall-Mkosi, Wenhold and Sibanda (2013). Findings from qualitative data with participant food handlers revealed that the smoke from gas stoves darkened the kitchen walls with soot making them unhygienic and unhealthy. Due to lack of cleaning materials, the food handlers could not easily clean the walls. Unavailability of taps around the kitchen made it impossible for some learners to clean their hands before eating as the learners could not easily visit taps which were far from the kitchens. Installing taps and sinks close to the kitchen could significantly improve the standard of hygiene in the kitchen area and among learners.

Although the Department of Basic Education (2009) asserts that food handlers were trained in hygiene, it was difficult for them to maintain hygiene if they were not adequately supported. The observations by the researcher during the data collection process indicate that most of the food handlers did not have uniforms and muslin caps, unlike food handlers observed in Rendall-Mkosi, Wenhold and Sibanda's (2013) studies in Eastern Cape and Mpumalanga where all food handlers had uniforms. It is important to ensure that all food handlers have uniforms to help improve hygiene.

The study's observation that safety standards were not adhered to as the gas tanks and gas stoves in some schools were in the same room and lacked maintenance, was similar to the observations made by Randall-Mkosi, Wenhold and Sibanda (2013) and Langsford (2012) in South Africa. This was a violation of the gas safety guidelines for the NSNP, which stipulate that gas cylinders must be stored outside the kitchen in a locked steel cage (Department of Basic Education, 2016). Adhering to the guidelines was important to avoid possibilities of gas leaks, fires, explosions and carbon monoxide poisoning (Department of Basic Education, 2016).

The data from the questionnaires and the data from participant interviewees concurred on the issue that there were no fruit and vegetable gardens in participating schools. This was depriving learners the chance to learn self reliant skills on gardening. On the issue of unavailability or vegetable gardens, the research findings contradicted the observations by Langsford (2012) in Gauteng, Msila (2013) in Eastern Cape and Rendall-Mkosi, Wenhold and Sibanda (2013) in Eastern Cape and Mpumalanga Provinces of South Africa, where schools had vegetable gardens. Msila's (2013) observations indicated that school garden projects were increasing. This observation could have been true for schools in Eastern Cape and other provinces. In all of the schools except one school, there was adequate space and water was always available. Only the horticultural manuals, seeds, garden tools and suitable gardeners were not available to initiate the gardening projects. Such projects are important in developing responsible citizens who do not only wait for free handouts from the government. Engaging learners in vegetable production is important as it equips learners with life skills that can help them to be self sufficient later in life.

4.8.2 Procurement and preparation of food

The discussion in this section focuses on procurement and preparation of food for the national school nutrition programme.

4.8.2.1 Procurement of food

Qualitative data indicates that service providers were selected through a tender based system by the provincial department of education. This affirmed Rendall-Mkosi, Wenhold and Sibanda's (2013) assertion that KwaZulu-Natal used a centralised procurement model. According to the findings from qualitative data, tenders were awarded in line with tender regulations and the Preferential Procurement Policy Framework Act number 5 of 2000, as some of the cooperatives consisted of the disadvantaged members of the community such as women, the disabled, and youth (Rendall-Mkosi, Wenhold and Sibanda, 2013). This is different from the tender system observed by Bundy et al. (2016) and Rendall-Mkosi, Wenhold and Sibanda (2013) in Mpumalanga Province and Mtapuri, Kekana and Thabethe (2015) in Limpopo Province where the tender based system was benefitting large companies instead of uplifting the poor according to the Preferential Procurement Policy Framework Act. According to Mtapuri, Kekana and Thabethe (2015), the tender system, unlike the decentralised model, has the advantage of creating jobs, developing business minds and empowering small business entities. Mtapuri, Kekana and Thabethe (2015) further argue that the centralised procurement model eliminates the risk of financial mismanagement in schools as well as presents the burden of managing extra funds. The research findings indicate that the tenders in KwaZulu-Natal are awarded on a one-year basis unlike Rendall-Mkosi, Wenhold and Sibanda's observation in Mpumalanga where tenders were awarded on a 3 year basis. A short term tender provides the opportunities to other members of the community who were not considered in the previous tender to also benefit from the programme. However, frequent changes of service providers call for more frequent training and demand more financial resources. In the absence of adequate financial resources, the new service providers are not well oriented into the programme. This results in numerous problems such as non-supply of food on some days, shortage of gas and running out of financial resources to purchase food for learners or non-payment of food handlers. Although a long tender period will benefit fewer members of the society than a short tender period, it has the advantage of maintaining experienced members who will have adapted to the demands of the programmes by building ties with important structures such as wholesalers. They may be able to obtain food on accounts which becomes a great advantage in cases where the

department delays the payment of the service providers. In addition, experienced service providers can easily estimate the period that a certain quantity of gas can last within a school, with a specified enrolment. Correct quantities of food as well as quality of food can be assured if the tender holders were well trained at the beginning of the programme.

The centralised model observed in this study differs from the centralised model used in Brazil where, according to Bundy et al. (2016), the municipality purchased food, prepared meals and distributed the food to all schools. This had the advantage of maintaining the quantity and quality of meals distributed to all schools. However, this model is only possible where the schools are not scattered and transport is readily available to carry the food to schools.

The research findings indicated that service providers purchased food from wholesalers, supermarkets and fruit and vegetable markets. Sometimes they had to compare prices. When purchasing vegetables, they had to purchase vegetables that were in season. Quantities to purchase were determined by the menu quantities formula schedule. Although the menu quantities formula schedule was available to guide in the purchase of food items, research findings indicated that some service providers did not comply with the quantities on the schedule probably due to late payment by the department. However, in wholesales where some of them could purchase food on accounts, service providers had to collect food and distribute to schools without much consideration of the price since they sometimes ran out of cash when the department delayed their payments. Purchasing on accounts, however, had the disadvantage of paying higher prices for food items than buying cash. Availability of credit accounts was very important because some service providers could run out of cash, especially when the department delayed the payment for a long period of time.

4.8.2.2 Preparation of food

Food was prepared in kitchens which most participants felt needed improvement in terms of hygiene. The researcher's observations on some of the floors indicated that tiling the floors would greatly improve the level of hygiene since tiles are easier to

clean than cement floors. All schools visited by the researcher used gas for cooking. In a similar study by Rendall-Mkosi, Wenhold and Sibanda (2013) in Eastern Cape, schools used gas for cooking some meals while firewood was used when cooking samp and beans which had to be cooked over a long period of time. Use of firewood was intended to save the gas. However, the researcher felt that the use of firewood would promote deforestation. In Mpumalanga Province in South Africa, Rendall-Mkosi, Wenhold and Sibanda (2013) noted the use of gas in some schools, while most farm schools used firewood. Findings from interviews with participants, as well as observations by the researcher, indicated that some schools used wooden desks as cutting boards. The schools did not have proper cutting boards. This reduced the level of hygiene of the food because wooden desks are generally not easy to clean. It was worrisome to observe schools without proper cutting boards yet cutting boards are cheap and readily available in shops. There were no posters on hygiene maintenance in and around the kitchen. The in-depth interviews with food handlers confirmed the non availability of posters on hygiene maintenance. This was contrary to the assertion by the Department of Basic Education in South Africa (2014) that there would be posters on food preparation rules which were intended to emphasise hygiene maintenance throughout the programme. The posters could play a very important role in educating food handlers who were according to Buhl (2010) similar to the cooks in Ghana who lacked training in hygiene and sanitation.

Data from in-depth interviews revealed that the preparation of food was guided by a menu from the district offices. According to the Department of Basic Education in South Africa (2014), Mnandi 4 sure recipe book was available in each school to assist food handlers in food preparation. It was surprising to note that all participant food handlers were not aware of the Mnandi 4 sure recipe book. In cases where the menu was not updated, research findings indicated that food handlers relied on the information from service providers on the food items and the quantity of food items to prepare. Although the menu indicated quantities to be consumed per child per day, food handlers were unable to calculate the exact quantities to prepare for some food items due to their low literacy levels. It was revealed during in-depth interviews with food handlers that some of them needed help on quantities to prepare per day as they were not sure of what they were doing due to lack of training that most of the

participant food handlers reported in the study. Moreover, some of the schools did not have small containers or scales to use for measurement of quantities of food items to prepare each day.

The level of understanding of food preparation procedures was quite variable. According to the Department of Basic Education (2016), the knowledge of food preparation was to be acquired from training workshops. Due to non availability of such workshops over a long period of time, some food handlers used the knowledge they acquired in their homes while others indicated that they acquired the knowledge from special community events such as weddings where they could learn from their friends and relatives. Other food handlers got some of the information from the service providers who had learnt them from various sources. Other suppliers would only provide information on quantities of food items to prepare per day since they were not trained in cooking. Only a few long serving food handlers had attended training workshops on food preparation. Due to various sources of information for food preparation among food handlers, the quality of meals in different schools could not be similar despite using similar food items. According to Rendall-Mkosi, Wenhold and Sibanda (2013), volunteer food handlers in Mpumalanga Province were not rotating annually as per policy, since schools were reluctant to terminate experienced and reliable food handlers who were familiar with their roles. Findings in this study indicated that most of the food handlers were rotated. This had the effect of compromising the meal quality since the new food handlers were never trained. Assumptions that the new food handlers would learn from the old food handlers were not evident because most of the non-trained food handlers were not confident in performing their duties. Qualitative data from participant interviewees revealed that food handlers and other participants felt that the stipend was too low. The feeling of food handlers that the stipend was too low was confirmed in a study in Mpumalanga by Rendal-Mkosi, Wenhold and Sibanda (2013).

The meal was served at 1100 hours in most of the schools except one school that served the meal at 0945 hours. According to the Department of Basic Education (2016), meals were to be served at 1000 hours. Serving the meals at 1000 hours would be a great advantage to learners who come to school without having

breakfast. This would enable them to concentrate over a longer period of time. The feeding time was different from that observed by Rendal-Mkosi, Wenhold and Sibanda (2013) in Mpumalanga where most schools served the meals between 0930 hours and 1000 hours. Similar to Langsford's (2012) observations in the study in Gauteng Province, and Rendal-Mkosi, Wenhold and Sibanda's (2013) study in Mpumalanga, all of the seven schools that were involved in the study did not have dining halls. Learners had to queue for food in the kitchen and ate, either in the playgrounds or in their classrooms. There is need to build dining halls in all schools.

4.8.3 Nutritional value of food

This section focuses on the nutritional value of food. This will be discussed under the basic food groups of the food guide pyramid, with special attention given to food items in the particular food group supplied in the school nutrition programme.

4.8.3.1 Bread, cereal, rice and pasta group

Research findings from both quantitative and quantitative data revealed that the menu for KwaZulu-Natal secondary schools consisted of parboiled rice, samp and *phuthu* from maize meal, as the main energy sources. Parboiled rice was served three times per week, while samp and *phuthu* from maize meal were each served once per week. The three types of food items were the only food items served from the bread cereals and pasta group, and this was in line with the guidelines set according to the Department of Education (2016). The guidelines suggested serving samp once per week and this was adhered to in the schools that participated in the study. However, the guidelines suggested serving rice twice per week and not three times as was observed in the study. Furthermore, the guidelines suggested that *phuthu* was to be served twice, yet it was served once in all schools that participated in the study. As Dei (2014) observed at one of the schools in Kwazulu-Natal, increasing the frequency of rice at the expense of *phuthu* had the effect of increasing the protein content since 100g of rice contains more protein than 100g of *phuthu*. Increasing parboiled rice intake would also increase the intake of B vitamins – niacin and riboflavin which help in the convention of carbohydrates into enegy (Steele, 2017). Parboiling allows the water soluble vitamins to transfer from the hulls to the

grains making parboiled rice a richer source of vitamins than white and brown rice. Although the schools were using parboiled rice, findings from participants revealed that they were not aware of the advantages of using parboiled rice. *Phuthu* from maize meal contains more folates, vitamin A, iron and zinc (CONDE NAST, 2014 & Rudrappa, 2017). According to Rendall-Mkosi, Wenhold and Sibanda (2013) and Altman, Hart and Jacobs (2009), vitamin A and iron were among the critical nutrient deficiencies in South Africa. According to Bundy et al. (2009) and guidelines by the Department of Basic Education South Africa (2009), eating more *phuthu* from fortified maize meal would help to address micronutrient deficiencies since maize meal used to prepare *phuthu* was fortified with vitamin A and iron, whereas rice was only parboiled and not fortified.

The percentage energy (kilocalories) intake in the five schools from which qualitative data was collected was between 7.9% and 13.9% of the recommended dietary allowance (RDA). According to the menu quantities schedule, the expected energy intake was 316.6 kilocalories, which was 15.8% of the RDA. In the one sample t-test to compare the observed energy intake and expected energy intake, a p-value of 0.017 revealed that there was a significant difference between the observed mean kilocalories intake data set for schools and the expected mean kilocalories intake according to menu quantities schedule. The mean energy intake needs to be increased so as to achieve the required energy intake. This can be done by increasing the quantities of rice, maize meal and samp that are used, especially in the schools that are supplying less than the required quantities. According to the Department of Basic Education South Africa (2009), the energy intake was expected to be at least 30% of the RDA. It was worrisome to note that the expected energy intake of 15.8% of the RDA was far below the 30% value recommended by the Departments of Basic Education (2009).

Aliyar, Gelli and Hamdani's (2015) study of the nutritional guidelines and menu compositions for school feeding programmes in 12 countries revealed expected energy (kilocalories) intakes of 30%, 40% and 45% of the RDA for England, France

and USA respectively. The same study further revealed expected energy intakes of 30% of RDA for Brazil and Ghana and 32% of RDA for Kenya, as well as 33% of the RDA for Mali. All the expected values for high income, middle income and low income countries were far above all the observed intake values for all the five schools in KwaZulu-Natal in South Africa, which is a middle income country. However, Aliyar, Gelli and Hamdani's (2015) study relied only on documented data on nutritional guidelines and menu composition and not the actual data obtained from schools as in this study. The actual intake values in the schools in these countries could have been less than the expected intake according to documents. Furthermore, it was disappointing that the expected energy intake, according to the menu quantities schedule, was also below all the percentage RDA intake values for the high income countries, middle income as well as low income countries, according to Aliyar Gelli and Hamdani (2015). Learners in low and middle income countries generally need more energy as they sometimes travel over long distances to schools. Hence, there is need to increase energy intakes to match international standards.

Although there were significant differences between the expected energy intake and the actual energy intake in schools, the paired sample t-tests p-values that compared the nutrient intake data sets for each school and the expected nutrient intake data set, indicated that there was no significant difference between the expected nutrient intake data set and observed intake data sets in all schools. This meant that most of the schools were supplying quantities of food items that were close to the expected quantity as prescribed by the menu quantities schedule. However, it is disappointing that these expected standards are lower than the standards set by low income countries.

According to the Department of Education (2016), the maize meal to be supplied in schools was to be fortified and the minimum expected nutritional value was outlined in the food specification guidelines. When a paired sample t-test was performed, the p-value obtained revealed that the nutritional value of the maize meal supplied to the schools was not significantly different from the nutritional value specified in the food specification guidelines. This means that the maize meal that was supplied to the schools was in line with the food specification guidelines of the NSNP.

4.8.3.2 Meat, poultry, fish, beans, eggs and nuts groups

Findings from both qualitative and quantitative data revealed that food items in the meat, poultry, fish, beans, eggs and nuts group that were provided to learners were fish, soya mince and beans. Research findings from respondents as well as in-depth interviews concurred with the secondary school menu guidelines for KwaZulu-Natal which recommended, according to the Department of Basic Education (2016), the consumption of pilchard stew once per week. Consumption of pilchard stew once per week was affirmed in Del's (2014) study in KwaZulu-Natal. However, the menu guidelines for KwaZulu-Natal recommended the consumption of soya mince once per week, whereas the study findings from participants and respondents indicated that soya mince relish was consumed twice per week. Furthermore, the same menu guidelines for KwaZulu-Natal recommended the consumption of sugar beans-stew twice per week whereas findings from participants and respondent learners revealed that sugar beans stew was consumed once per week. Replacing sugar beans stew with smaller quantities of soya mince relish had the effect of reducing nutrient intakes specifically, the intake of energy and dietary fibre. Considering the same masses (g), sugar beans stew contains more of these nutrients than soya mince relish.

Alters and Schiff (2009) assert that dried beans, soy products and fish are rich sources of protein. This was confimed by the South African Food Data System (2015) and Rudrappa (2017). In terms of nutritional value, it was a great advantage for learners to eat sugar beans stew twice per week and reduce the soya mince relish to once per week. However, beans require more cooking time and would consume more gas than the soya mince relish. Dei's (2014) case study in one primary school in the south coast of KwaZulu-Natal revealed the possibility of having beans twice per week as the primary school learners were provided with sugar beans stew three times per week and lentil curry once per week. Lentils are a very good source of protein which are easier to prepare and more nutrient dense than beef. Lentils provide vitamins, minerals and dietary fibre and they contain less fat.

Findings from quantitative data revealed that the percentage of protein intake in the five schools from which both qualitative and quantitative data were collected was between 11.0% (school C) and 20.0% (school G) of the recommended dietary allowance, with an average protein intake of 7.7g (15.7% the RDA) which is lower than the expected protein intake of 12.2g (24.9%). A one sample t-test performed to compare the observed protein intake values in the five schools and the expected protein intake yielded a p-value of 0.009. This low p-value for the t-test shows enough evidence to infer that the observed mean protein intake per child per day of 7.7g was significantly lower than the expected mean nutrient intake of 12.2g per child per day. If the budget allows, schools should increase the intake of soya mince, fish and beans so as to meet the expected protein intake according to the menu quantities schedule. It was also worrisome to note that the expected protein intake determined using the menu quantities schedule was below the minimum amount of 30% of the RDA which was recommended by the Department of Basic Education (South Africa) (2009). This was probably limited by a small budget of R 3.25 per learner per day. Documented information on menu composition and nutritional guidelines, according to Aliyar, Gelli and Hamdani's (2015) study, revealed protein intake 30% of RDA for England, 15% of RDA for France, 20% of RDA for USA, 40% RDA for Brazil and above 30% of RDA intake for Ghana, Kenya and Mali. Some countries could be affording such higher intakes due to higher budgets for their nutrition programmes. Aliyar Gell and Hamdani's (2015) study revealed a budget per learner per day of US$0.32 (almost R 4.16) for Ghana US$ 0.59 (almost R7.67) for Mali US$1.55 (almost R20.15) for USA and US$2.58 (almost R 33.54) for England. Such high budgets could make it possible to meet the expected protein and other nutrient needs for the learners.

The nutritional value of soya mince from the food specification guidelines by the Department of Basic Education (2016) was compared with the observed nutritional value of soya mince that was used in schools. This was done by the use of a paired sample t-test which compared the observed nutrient data set and the expected nutrient data set of soya mince. A p-value of 0.423 revealed that the expected nutrient data set of soya mince was not statistically significantly different from the

observed nutrient data set of soya mince. The soya mince that was used in the schools met the recommended nutritional standards according to food specification guidelines by the Department of Basic Education (2016).

Soya mince, beans and fish contain significant amounts of energy. Sugar beans also contain a large amount of dietary fibre (South Africa Food Data System, 2015). Pilchard fish are also very rich in omega-3 fatty acids, vitamin A, B, C, D and E, as well as minerals such as iron, calcium, magnesium and phosphorous (Watson & Preedy, 2013) Fish intake, according Watson and preedy (2013), help to maintain good cholesterol levels which is important in sustaining good heart health and reducing the risk of stroke and cardiovascular diseases. Vitamin $B_{12,}$ also found in fish, protects the walls of the arteries and promotes cardiovascular health (Watson & Preedy, 2013).

4.8.3.3 Fruit and vegetable group

Findings from in-depth interviews as well as the questionnaires by grade 12 learners indicated that carrots, butternut, cabbage and tomatoes were the fruits and vegetables that were mostly consumed in the school nutrition programme. Fruits such as apples and bananas were expected to be consumed once per week, according to the Department of Basic Education (2016), and be the menu that was available in schools. However, findings from the study revealed that, in almost all schools that participated in the study, fruits were supplied once in two or three months. Cabbages were provided twice per week in some schools while others served cabbages three times per week. Carrots were supplied once per week in some schools while others supplied carrots twice per week. Butternuts were supplied once per week in a few of the schools. The menu quantities schedule recommended the provision of a green vegetable twice per week, a yellow vegetable, fruit and tomatoes once per week each. The recommendations from the menu quantities schedule were similar to the guidelines suggested in the KwaZulu-Natal menu for secondary school.

However, instead of providing cabbage twice, the guidelines recommended the provision of cabbage as well as spinach once per week. Dei's (2014) case study at a school in KwaZulu-Natal confirmed the consumption of butternuts, carrots, cabbages and fruits. However, in thIs study, fruits were rarely supplied. Fruits were to be supplied on a Friday when the learners were served with *phutu*. According to Aliyar, Gelli and Hamdani (2015), Vitamin C, some of which learners were expected to obtain from fruits facilitates the absorption of iron which is rich in phutu prepared with maize meal fortified with iron and other minerals elements. However, research findings from both qualitative and quantitative data revealed that fruits were rarely consumed. They were consumed once in two or three months, depriving learners of essential nutrients. Berdanier, Dwyer and Heber (2014) emphasise on the consumption of variety of foods from each of the food group. Consumption of cabbage and spinach in the same week was important in ensuring this variety. According to Eldestein (2014), the concentration of vitamins and minerals vary in different vegetables. Hence, consumption of different types of vegetables was important to obtain the required quantities of vitamins and mineral. Craig (1978) and Joshi (2012) assert that dark green vegetables like spinach and yellow vegetables like carrots and butternuts are rich in vitamin A, while vegetables like cabbages and tomatoes are rich in vitamin C. Craig (1978), Hou (2010) and USDA (2017) highlight that a diet rich in fruits and vegetables reduces cancer, heart diseases and stroke.

One sample t-tests performed to compare if there were significant differences between the data sets for each mineral and vitamin intake in different schools and the expected intake, revealed that all the observed data sets for vitamins and minerals intakes were not statistically significantly different from the expected intake values. This was reflected by large p-values which were greater than the α-value of 0.025. However, the average intake of vitamins K and sodium were significantly different from the expected value. The intake of sodium could probably have been high if the quantity of salt (sodium chloride) intake was included in the determination of nutrient intake. The intake of sodium chloride could not be considered since the food handlers were unable to specify the quantities of sodium chloride added in each meal. The vitamin K intake could be increased by increasing the intake of cabbage, carrots and mixed vegetables which are rich in vitamin K. The average intakes of vitamins were below 13% of the RDA while that of minerals was below 10% of the

recommended dietary allowances. Such intake levels, according to Aliyar, Gelli and Hamdani's (2015) analysis of documents on menu composition and nutritional guideline on 12 countries, were lower than the intake levels obtained in high income, middle income as well as low income countries. Even the expected intakes, according to the menu quantities schedule, were equally lower than intake values in low and middle income countries. More research needs to be conducted to establish why the intake values were set at such low levels. The values determined from the menu quantities schedule are much lower than the 30% of RDA values suggested by the Department of Basic Education (2016). Increasing the consumption of vitamin A-rich carrots & butternuts as well as vitamin C-rich tomatoes and cabbage increases the vitamins as well as mineral intake. The intake of vitamin A and iron that were found to be deficient in the South Africa population, according to Altman, Hart and Jacobs, (2009); Buhl (2010) and Rendall-Mkosi, Wenhold and Sibanda (2013), were also found to be low in this study.

4.8.3.4 Milk, yoghurt and cheese group and fat oil and sweets group

Participants and respondents revealed that the only food item consumed in the milk, yoghurt and cheese group was sour milk (amasi), which, according to Craig (1978) and Gibson (1993) and Hou (2010), is rich in calcium and riboflavin and also provides protein, carbohydrates, phosphorus, thiamine, vitamin A and vitamin D. Sour milk was served once per week, was in line with the menu quantities schedule as well as recommendations for KwaZulu-Natal secondary school menu (Department of Basic Education, 2016).

Dei's (2014) study observations as well as Zwane's (2014) study observations in KwaZulu-Natal indicated that, unlike in this study, the school menu did not include sour milk. Inclusion of sour milk which was served with *phuthu* was a good development since the study observations indicated that phuthu and sour milk (amasi) was one of the learners' most favourite meals.

Participant food handlers revealed that cooking oil was consumed in small quantities which were in line with Craig (1978) and Gibson's (1993) observation that small quantities of oil should be consumed to avoid diabetes, high blood pressure and

cancer which results from excess lipids in the body. According to Bundy et.al. (2016), the South African school menu was similar to the Nigerian school menu which contained energy rich foods, protein rich foods and vegetable and fruits rich in vitamins and minerals every day. However, fruits were not consumed even once per week and the reason for that needs to be established as this compromises the variety of foods in the school menu.

4.8.4 Challenges encountered in the national school nutrition programme

There were many challenges encountered in the national school nutrition programme. Some of the challenges like lack of training of the stakeholders, inadequate skills related to stakeholder roles, lack of monitoring and unavailability of transport for district officials, were discussed in the previous sections. Challenges associated with poor estimation of gas and gas shortage, lack of service for gas stoves and limited hygiene, as well as cleaning materials were also discussed in the previous sections. Non-adherence to safety standards associated with storage of gas tanks were also among the issues that were discussed in the previous sections. The next section discusses issues related to late payment of service providers, poor food quality and poor hygiene.

4.8.4.1 Late payment of service providers, poor food quality and poor sanitation

Research findings from participants revealed that some of the service providers were supplying food to three or more schools with enrolments of not less than 500 learners in each. If the service providers were disadvantaged members of the community who had formed co-operatives, the co-operatives could hardly supply food without receiving payment for five months unless they were backed by some prominent business persons or they had access to food on credit from wholesalers. The bureaucratic system leading to late payments seemed to be crippling the programme as was observed in Langsford's (2012) study. Langsford (2012) describes the bureaucratic system as a chain that hinders itself from achieving its aims. The researcher would want to describe it as self suicidal as it severely compromises the efficiency of the programme. The researcher strongly believes that

there are better ways of preventing corruption and ensuring that the programme runs smoothly than delaying payments of service providers. Delays in payment have serions negative impact on the programme implementation. It may result in non-delivery of food items as was reported by some participants and respondents in the study, and affirmed in Kwatubana and Makhalamele's (2015) study in South Africa. The schools lose confidence in the supplier as was reported by participants in this study and observed in the study by Kwatubana and makhalamele (2015) where service providers were reported to be unreliable. Late payment of service providers could also result in delays in serving meals as was reported by participants and respondents in this study and affirmed in Del's (2014) study in South Africa. The delays may interrupt the school timetable. Late payment of service providers has the impact of compromising the quality and quantity of food as was reported by respondents and participants in this study. This was affirmed in Lacey's (2012) study and Quila and Tyilo's (2014) study where lack of funding resulted in irregular food supply, lack of variety, and absence of fruits and vegetables. Kwatubana and Makhalamele's (2015) and Overy's (2010) study further affirmed the problems associated with non-payment and poor monitoring as they revealed that food was sometimes insufficient and vegetables were not always fresh. Non-fresh vegetables are cheaper than the fresh vegetables because prices of perishable commodities decrease as they lose their freshness. If service providers are not paid on time, they may opt for cheaper vegetables which are not fresh, in an effort to meet the programme demands.

Findings from respondents and participants revealed that some learners chose not to eat school meals on some of the days as was also observed in the study by Rendall-Mkosi, Wenhold and Sibanda (2013). This abstinence from eating the school meals was probably due to low quality of meals. A number of respondents reported that meals were not well cooked and they sometimes had stomach problems after eating the meals. This possibly emanated from low quality of food or shortage of cleaning materials reported in this study, which compromised the standard of hygiene. The issue of stomach problems needs to be investigated so as to ensure that learners totally benefit from the programme. Stomach problems often result in diarrhoea and the loss of nutrients from the body. The objectives of eliminating short term hunger, enhancing learners' alertness in class and addressing the issue of micronutrient

deficiency, according to the Department of Education (2016) and Lacey (2012), will not be achieved due to illnesses that results after eating the school meals. It is crucial that an alternative meal of the same value as the main meal, be set aside to accommodate learners who cannot eat the main meal due to allergies, other illnesses or other special reasons. Training of food handlers to ensure maximum hygiene as well as provision of the adequate cleaning materials can help to improve the conditions of the meals. Installing sinks and taps in kitchens, as well as providing protective clothing might be a step towards achieving maximum hygiene in the school meals and preventing food contamination which could result in illnesses. Poor sanitation in the school nutrition programmes was generally observed to be a challenge as was observed by Medeiros, Lima, de Almeida Maffi et al. (2015) in Brazil, as well as Maijers and Nalla (2014) and Okae-Adjei, Akuffo and Amartei (2016) in Ghana.

4.8.5 Nutrition education

Findings from participants and respondents revealed that learners in grade 12 lacked the basic knowledge of nutrition education. This was because nutrition education was only taught to learners taking Life Sciences and Natural Sciences. The responses from learners also revealed that even the learners who were taking Life Sciences seemed to have very little content on the basic nutrition principles such as food groups as more than ninety percent of the respondents failed to state in the questionnaire. Either the teachers could be failing to cover the content well or learners did not understand or forget the concepts or the nutrition education principles were too limited. This was contrary to Hochfeld et al. (2015) study observations where learners were being taught about good eating habits in life skills lessons and were able to list healthy food groups and unhealthy groups such as fats and sugars. The Department of Health and the Department of Basic Education (2012) and Nguyen, De Villiers, Fourie, Bourne and Hendricks's (2013) study among teachers, principals and curriculum advisors, proposed the integration of nutrition education into the school curriculum. This seemed to have been effected in the primary school curriculum as recent studies by Hill, Draper, De Villiers, Fourie, Mohamed, Parker and Steyn (2015) revealed that Curriculum Assessment and

Policy Statement (CAPS) now allocates three hours of instructional time to health and environmental studies. Hill et al. (2013) further indicate that the grade 4 curriculum now includes dietary habits of children while the grade five and six curriculum now covers healthy eating for children and food hygiene respectively. The South African Food Based Dietary Guidelines was also included in the grade five curriculum. This new development was affirmed in Kupolati, Gericke, and MacIntyre's (2015) study observations in Bronkhorstspruit District that nutrition is taught in Life Skills, Natural Sciences and Technology where topics like dietary habits, healthy eating, nutrients in food, food processing and hygiene, were included. This was a great improvement on nutrition education in the primary school curriculum. If such developments can be seen through the secondary school curriculum, learners' knowledge will greatly improve. Wang, Steward, Chang and Shi's (2015) study observations in China affirm that teaching nutrition education to adolescents improves their knowledge and attitude towards food.

Findings from qualitative data revealed that participants did not have adequate time to teach nutrition education since they were loaded with various subjects and grades that they had to teach. Kupolati, Gericke, and MacIntyre's (2015) study observations in Bronkhorstspruit District in South Africa confirm time constraints among teachers and lack of resources for teaching nutrition education as constraining factors. This reflects that nutrition education cannot be taught if it is not part of the curriculum and if it is not being assessed. Lack of nutrition education is a great disadvantage to the economy in countries like South Africa where, according to Mushapi et al. (2015), Prince and Laar (2014) and Temple and Steyn (2016), there is a prevalence of malnutrition (undernutrition and over-nutrition) and micronutrient deficiency.

According to the Department of Basic Education (2016), nutrition education has to be accompanied by supporting materials such as charts and relevant books and videos to assist teachers in imparting nutrition knowledge to learners. It was worrisome to note that such supporting materials were not available in the schools visited. This limited the acquisition of nutrition knowledge among learners. This was contrary to

the study observations by Rendall-Mkosi, Wenhold and Sibanda (2013) in Eastern Cape and Mpumalanga, where posters on nutrition education were observed in school kitchens and classrooms. Furthermore, the research findings are different from Fernandes et al.s' (2016) study observations in Ghana School Feeding Programme, where nutrition education was partly achieved through the use of posters and songs promoting healthy diet. The Department of Health and the Department of Basic Education (2012) assert that quality support materials may not be made available in schools unless nutrition education is integrated into the school curriculum. The two departments concur with recommendations from participants in the study, that nutrition education should be incorporated into the Life Orientation curriculum, which is done by all learners in each school. Limiting nutrition education to Life Sciences curriculum only as was reported by some participants in the study to be disadvantaging all learners who do not take Life Sciences.

Participants felt that nutrition education should be taught in Life Orientation from grade 8 while respondent learners were strongly for the view that nutrition education should be integrated into the secondary school curriculum. Research findings from participants also reflected that the teacher coordinators, principals and food handlers had limited knowledge on nutrition education, hence, it was not easy to teach nutrition education among learners. This was affirmed in Oldewage-Theron and Egal's (2012) study observation in public schools in South Africa, that Life Orientation teachers lacked the relevant nutrition education knowledge. It is necessary to equip Life Orientation teachers with the relevant knowledge and skills, especially as they train as teachers in various institutions. Nutrition education intervention programmes, according to Oldewage-Theron and Egal's (2012) study observations, may be necessary in improving the nutrition knowledge of servicing teachers. According to Mushapi, Dannhauser, Walsh, Mbhenyane and van Rooyen (2015), nutrition education intervention programme in South Africa should be based on South African food-based dietary guidelines, and should address issues of variety of foods in each food group, hygiene and sanitation, starchy foods, and eating plenty of vegetables and fruits every day, as the bases of meals. Nguyen et al. (2013) and Oldewage-Theron and Egal (2012) observe that nutrition education knowledge can

be improved through training and engagement in healthy life style projects such as the school nutrition programme and gardening projects which were not available in the schools that participated in the study. The lack of school gardens that engaged learners and teachers, further limited the nutrition knowledge among stakeholders. Participants felt that teachers had an important role to play in promoting nutrition education. According to Kupolati, Gericke and MacIntyre's (2015), teachers play an important role in modelling healthy eating behaviours for learners and adapting nutrition education topics to the specific needs and environment of learners. The Food and Agricultural Organisation (2005) highlights that the success of the school nutrition education intervention cannot be guaranteed without the support of the school environment and authority. The department and the school authority have to source the relevant materials which should be maintained by teachers, learners and everyone in the school environment.

According to Kupolati, Gericke and MacIntyre's (2015), the school nutrition education has the potential to reduce nutrition related diseases like diabetes, that can undermine prospects of sustained economic growth in the emerging economies like South Africa. Nutrition education in schools could contribute in reducing of the country's gross domestic product.

4.9 CHAPTER SUMMARY

Stake holders of the school nutrition prtogramme lacked adequate skills due to lack of training. Service providers procured food from supermarkets, wholesales and fruit and vegetable markets. The school meal consumed by learners had less than 30% of RDA values for all the nutrients that were assessed in the study. There were challenges of non-service of gas stoves and shortage of cleaning materials which compromised hygiene around the kitchen. Learners in grade 12 lacked basic knowledge of nutrition education. Chapter four presented, analysed and discussed the findings from both qualitative and quantitative data. Questionnaires were administered to learners and in-depth interviews were conducted with principals, teacher co-ordinators, service providers, food handlers and departmental officials. The data on quantities of food items prepared each day was obtained from food handlers and service providers and the standardised delivery notes were used to

verify some of the information. Observations were made in various schools and documents were analysed. The discussion of the findings was in the context of the sub-research questions in the first chapter, and in relation to local and international literature, as well as the theory of the study. The next chapter presents the summary, conclusions and recommendations.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter four presented, interpreted and discussed the findings of this study with regards to current literature practice and the theoretical framework informing the study. Chapter five presents a summary of findings, recommendations and suggestions for further studies. The chapter begins with a restatement of research objectives and sub-research questions. This is followed by a summary of key findings based on both qualitative and quantitative responses. The summary of key findings is followed by the conclusions that were drawn from the presentation and discussion of the findings.

5.2 RESTATEMENT OF RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

The existence of malnutrition (under nutrition and over nutrition) is an international crisis. Worldwide, schools have come up with school food programmes to eradicate the nutritional problems. This seems to be difficult to achieve according to several studies that were conducted. This study sought to examine how the school nutritional programme was implemented in selected high schools in KwaZulu-Natal Province.

5.2.1 Research aims and objectives

Literature reviewed (Dei, 2014; Kwatubana and Makhalamele, 2015; Langsford, 2012; Quila and Tyilo, 2014; Rendall-Mkosi, Wenhold and Sibanda, 2013 & Altman, Hart and Jacobs, 2009) revealed that the school nutrition programme is plagued with many problems some of which may hinder the attainment of the intended objectives. It is against this background that the study wanted to examine how the school nutritional programme was implemented. The school nutrition programme had the objectives of reducing short-term hunger, addressing certain micronutrient deficiencies, improving attendance and alertness among learners in class, as well as promoting the establishment of school food gardens and nutrition education among

learners and the community (Department of Basic Education, 2016 & Lacey, 2012). The main objective of the study was to examine how the school nutritional programme was implemented. The assumption was that all stakeholders were trained and had sound knowledge on how to perform their roles. The study also sought to establish how training, monitoring and support were provided to key role players in the school nutrition programme. The key role players were teacher coordinators, food handlers, principals, service providers and district officials. Furthermore, the study sought to ascertain the strategies employed in the procurement and preparation of food in the school nutrition programme. This was done by investigating who was involved in the procurement and preparation of food, where the food was bought, and how the food was prepared. The study also sought to determine the nutritional value of the food served and to identify the challenges encountered in the implementation of the nutrition programme. It was assumed that there were numerous factors that hindered the effective implementation of the nutrition programme. Lastly, the study aimed to evaluate the implications of the school nutrition programme on learners' nutrition education.

5.2.2 Main research question, sub-research questions and research hypothesis

The main research question for this study was: How is the school nutrition programme implemented in selected high schools in KwaZulu-Natal Province? This was guided by five sub-research questions. The first sub-research question was: How is training, monitoring and support provided to key role players in the school nutrition programme? It was meant to establish the type of pre-service and in-service training and support given to food handlers, service providers, principals and teacher coordinators to enable them to perform their duties efficiently. The second sub-research question focused on procurement and preparation of food. This was meant to establish how service providers procured food, how food handlers prepared food, and what guided them in the preparation of food. The third sub-research was to identify the nutritional value of the food provided in the school nutrition. This was to establish whether the set standards were being met and whether the issue of micronutrients (vitamin A, Iron and iodine) that were found to be deficient in the South African population were being addressed. The fourth sub-research question

was to examine the challenges encountered in the national school nutrition programme. Challenges could be due to poor implementation or financial constraints. The last sub-research question was to evaluate the implications of the school nutrition programme on learners' nutrition education.

The first null hypothesis was: There was no significant difference between the observed nutrient value and the expected nutrient value for maize meal according to the menu quantity schedule. The corresponding alternative hypothesis was: There was a significant difference between the observed nutrient value and the expected nutrient value for maize meal. The second null hypothesis was: There was a difference between the observed nutrient intake data set and the expected nutrient intake data set for soya mince. The corresponding alternative hypothesis was: There was no statistically significant difference between the two data sets. The third null hypothesis was: There was no significant difference between the observed average nutrient intake data set for each school and the expected nutrient intake data set according to the menu quantity schedule. The corresponding alternative hypothesis was: There was a significant difference between the observed nutrient intake data set for each school and the expected nutrient intake data set. The fourth null hypothesis was: There was no significant difference between the data set for the observed mean kilocalories intakes per child per day for each of the schools (B, C, D, E and G) and the expected mean kilocalories intake per child per day. The corresponding alternative hypothesis was: There was a significant difference between the observed mean kilocalorie intake data set for schools and the expected mean kilocalorie intake. The same null hypothesis and alternative hypothesis were used for various nutrients.

5.3 SUMMARY OF FINDINGS

This section presents the summary of study findings. The summary focuses on training, monitoring and support given to key role players in the implementation of the school nutrition programme. The summary also focuses on procurement and preparation of food and the nutritional value of food. A summary is also given on

challenges encountered in the nutrition programme and implications of the programme on learners' nutrition education.

5.3.1 Training, monitoring and support

Responses to both qualitative and quantitative data revealed that there was limited in-service training and support given to key role players in the NSNP. The lack of training led to limited knowledge among stakeholders in performing their duties, resulting in meals that were not well prepared as was highlighted by respondents and participants. Lack of knowledge among stakeholders on their roles generally compromised the implementation of NSNP resulting in lack of hygiene, among other challenges. The teacher co-ordinator is the main monitor of the programme and principals and departmental officials were rarely involved in monitoring. There was no sufficient support given to stakeholders and this could have contributed to the unavailability of fruit and vegetable gardens in all schools, except one.

5.3.2 Procurement and preparation of food

Food was procured by service providers who were selected through the tender system. A centralised procurement model was used where all the payments had to be approved by the provincial office for all service providers in the 12 districts of KwaZulu-Natal. Food was procured from wholesalers and supermarkets. Some were able to purchase on accounts while others had to pay cash. Fruits and vegetables were procured from a fruit and vegetable market. Service providers considered the quality, price and expiry date before purchasing. Very few of the participants seemed to be familiar with the terms fortified and parboiled. However, all the five schools visited were using fortified maize meal and parboiled rice. Some service providers procured food as cooperatives while others supplied as companies.

Meals were prepared by food handlers. There was no recipe book but only a menu to indicated quantities per child per day. The kitchen was clean but not very clean. Cooking was done using gas stoves which were not well maintained. Some respondents indicated that vegetables were cleaned before cutting and cooking,

while others indicated that vegetables were cleaned after cutting. Food quality was determined by the knowledge of the food handlers in cooking, season of fruits and vegetables and availability of cooking ingredients. Some of the long serving food handlers were familiar with the food preparation procedures while food handlers who were recruited in the past three years needed much assistance in food preparation.

5.3.3 Nutritional value of food

Qualitative and quantitative data revealed the main sources of proteins, energy, vitamins and mineral salts in the school nutrition programme. The nutritional value of the foods was quite variable. There were variations in the nutrient intake among learners in different schools due to unequal intake of food items by learners and to different quantities supplied per learner in the schools.

Fish, sour milk (amasi) and beans were each consumed once per week. Soya mince was consumed twice per week as was *phutu* prepared from mealie meal. Rice was consumed 3 times per week. Samp was consumed once per week. Cabbage, carrots, butternuts, tomatoes and iodated salt were the main sources of vitamins and minerals. Fruits were rarely consumed.

In the five schools B, C, D, E and G, the average nutrient intakes per learner per day for energy, total protein, fat and dietary fibre were less than 30% of the RDA. The main sources for macronutrients were rice, samp, *phutu* and freckled sugar beans and soya mince.

For the five schools under consideration, the average vitamin intakes per learner per day were 51.1µg (12.8%) and 1.9mg (12.7%) for folate and niacin respectively. For the other vitamins the average intakes were 0.1mg (9.1%) for thiamine, 1727.8IU (5.4% of RDA) for vitamin A and 5.4g (7.7% of RDA) for vitamin C. The average mineral intakes were 75.3mg (5.8% of RDA) for calcium, 0.6g (4.6% of RDA) for iron, 58.1mg (4.6% of RDA) for phosphorous and 0.6g (6.1% of RDA) for zinc. The main sources of vitamins and mineral salts were iodated salt, cabbage, carrots, butternuts, tomatoes, *phutu* and, in some instances, mixed vegetables.

The observed mean intakes per child per day for energy, protein, total fat, cholesterol, dietary fibre, vitamin K and sodium were significantly different from the expected mean nutrient intakes. The observed intakes of all other nutrients were not statistically significantly different from the expected nutrient intakes. Qualitative and quantitative data revealed the main sources of proteins, energy, vitamins and mineral salts in the school nutrition programme. The nutritional value of the foods was quite variable. There were variations in the nutrient intake among learners in different schools due to unequal intake of food items.

5.3.4 Challenges encountered in the implementation of the programme

The qualitative data revealed that there were no standardised cooking procedures that were adhered to by food handlers. Furthermore, there was general lack of knowledge and skills among food handlers. Responses by learners indicating that food was not well cooked or had a bad taste confirmed the lack of sufficient knowledge and skills among food handlers. Respondents confirmed this assertion by indicating that food was sometimes unavailable. A large number of respondents confirmed the low quality and quantity of food that was reported by participants. Participants highlighted that there were sometimes delays in the supply of food or gas. This was reported by a large proportion of respondents 76 (70.4%). Participants and respondents also noted that there was no nutrition education that was taught to learners who were not aware of the basic principles of food groups and various other principles of nutrition that were basic but essential for one to understand.

5.3.5 Implications on the learners' nutrition education

There was generally lack of nutrition education among learners. Nutrition education was not regarded as important and no efforts were made to support nutrition education. There were poor food choices among learners due to lack of knowledge on nutrition education. Teaching nutrition education in grades 8 and 9 Life Orientation and grade 10 Life Sciences did not ensure that all learners exit grade 12 with sufficient nutrition knowledge.

Results from qualitative and quantitative data recommended that nutrition education be introduced into the school curriculum. In the qualitative component of the study, participants recommended the introduction of nutrition education principles in the Life Orientation curriculum. This was supported by the quantitative data from learners who recommended the use of booklets and posters on healthy life style to assist them in understanding nutrition education principles. These booklets and posters could be used in Life Orientation. Participants in the qualitative component of the study recommended that learners be taught nutrition education during school assembly times. Respondents supported this view in the qualitative component of the study where they agreed that regular sessions on nutrition education were important to support learners in the school. The majority of the respondents were of the view that all the basic nutrition principles must be taught. Participants in the qualitative section of the study suggested that stakeholders and nutrition specialists could be used in promoting nutrition education among learners. This was supported by 94 (87.0%) of the respondents who felt that the teacher coordinators and the principal should be mandated to teach nutrition education.

5.4 CONCLUSIONS OF THE STUDY

The study sought to explore the implementation of the school nutrition programme in secondary schools. It has been observed, through research, that the school nutrition programme has many challenges. Stakeholders seem to be paralysed by lack of training and adequate support in the programme. The study identified challenges which include late payment of service providers, low quality and quantity of food and low standards of hygiene. The conclusions of this study were drawn from the findings obtained from answers to the sub-research questions.

5.4.1 Training, monitoring and support

Lack of pre-service as well as in-service training among food handlers compromised the quality of meals, especially in schools where food handlers were not exposed to cooking experience in community activities. However, food handlers who had cooking experience during community activities were less affected by lack of training. Service providers who were appointed for the first time also had serious problems in

procuring or sourcing food since there was no proper orientations of important issues like where to buy food items. In some schools, monitoring was mainly done by teacher coordinators who were untrained. They could also have serious problems on quantities since they were only given a schedule to use to calculate quantities for the schools that they were supplying. It was very unlikely that the teacher co-ordinators knew the expected quantities of food since the co-ordinators only had the menu quantities schedules and were not supplied with specific quantities for their schools. The researcher wondered if they took time to calculate the exact quantities to be supplied since they considered the school nutritional programme as an extra duty which did not increase their monthly salaries. Lack of adequate support such as unavailability of cleaning materials and sinks in kitchens, far away taps and non-servicing of gas stoves which produced too much smoke, significantly compromised the level of hygiene in the kitchen.

5.4.2 Procurement and preparation

The centralised procurement model, where payments for all service providers in the twelve districts of KwaZulu-Natal were delayed as they had to be approved by head office, paralysed the programme implementation process, especially in schools where service providers were new and had no reliable sources of income, as their co-operatives were just starting. It was a great advantage for service providers to buy food from wholesalers since they could get food at lower prices. It was very likely that service providers who could get food on accounts were able to supply constant quantities of food of the same quality. However, service providers who had to get food on cash were likely to supply variable quantities and quality food items. Sometimes they stopped supplying items like fruits since they would have run out of cash as the department took too long to pay them.

The absence of a recipe book accompanied by lack of training could also have resulted in meals that were of low quality in some schools as some of the food handlers reported that they did not know the quantities to mix and they needed training in the preparation of food. Cleaning of vegetables before cutting maintained the nutritional value of the vegetables while cleaning of vegetables after cutting reduced the nutritional value of the vegetables. The water soluble vitamins would be

easily washed away by water. Lack of training could result in food handlers putting too much water in vegetables and throwing away some of the water after cooking. This could result in loss of nutrients. Lack of training could also result in overcooking some of the vegetables and destroying some important nutrients.

5.4.3 Nutritional value of food

It emerged from the study that, in the five schools B, C, D, E and G, the average nutrient intakes per learner per day were 218.8Kcal (10.9% of RDA) for energy, 7.7g (15.7% of RDA) for total protein, 3.2g (5% of RDA) for fat and 3.2mg (10.0% of RDA) for dietary fibre. Respondents and participants confirmed that the main sources for macronutrients were rice, samp, *phutu* and freckled sugar beans and soya mince.

It also emerged from the study that, for the five schools under consideration, the average vitamin intakes per learner per day were 51.1µg (12.8%) and 1.9mg (12.7%) for folate and niacin respectively. For the other vitamins, the average intakes were 0.1mg (9.1%) for thiamine, 1727.8IU (5.4% of RDA) for vitamin A, and 5.4g (7.7% of RDA) for vitamin C. The average mineral intakes were 75.3mg (5.8% of RDA) for calcium, 0.6g (4.6% of RDA) for iron, 58.1mg (4.6% of RDA) for phosphorous, and 0.6g (6.1% of RDA) for zinc. Study findings revealed that the main sources of vitamins and mineral salts were iodated salt, cabbage, carrots, butternuts, tomatoes, *phutu* and, in some instances, mixed vegetables.

The t-tests results revealed that the observed mean intakes per child per day for energy, protein, total fat, cholesterol, dietary fibre, vitamin K and sodium were significantly different from the expected mean nutrient intakes. The t-tests also indicated that the observed intakes of all other nutrients were not statistically significantly different from the expected nutrient intakes. The nutritional value of the foods was quite variable. There were variations in the nutrient intake among learners in different schools due to unequal intake of food items by learners in different schools. The intakes of all nutrients were below the minimum of 30% of RDA which was recommended by the Department of Basic Education.

5.4.4 Challenges encountered in the programme implementation

Stakeholders confirmed experiencing challenges in the implementation of the school nutrition programme. They complained of having inadequate knowledge in the implementation of the school nutrition programme. Lack of training limited the knowledge of food handlers resulting in meals that were sometimes not well cooked and had a bad taste. There were no standardised cooking procedures due to the fact that food handlers were not trained. Service providers who had no reliable sources of income had serious problems in procuring food for learners because the department took too long to make payments. Such service providers were unlikely to pay food handlers on time. Late payment of service providers significantly affected the quantity and quality of food served to learners. The delays in serving food due to late food delivery or unavailability of gas interfered with the school curriculum.

5.4.5 Implications on learners' nutrition education

Learners' knowledge on nutrition education was very limited. The researcher feels that there was no detailed content of nutrition education in Life Orientation or Life Sciences since most of the respondent learners were unable to mention the simple basic food groups. Aspects of nutrition education were unlikely to be learnt by learners in the commerce class where, in most schools, all their subjects did not include any principles of nutrition. The few principles in Life Orientation in grade 8 & 9 did not equip learners well with nutrition education knowledge. The grade 12 learners who were to exit the system in about 4 months had very limited knowledge on nutrition principles. This was a great disadvantage to them since they were likely to make poor food choices in life, leading to malnutrition and related diseases to them as well as their families. Research informants concurred on the need to integrate nutrition education in the school curriculum. The stakeholders realised that they had an important role to play in promoting nutrition education. There emerged the suggestion that nutrition education be taught to all learners from grade 8.

5.5 RECOMMENDATIONS EMANATING FROM THE STUDY

In light of the research findings and conclusions drawn, the following recommendations are made to enhance the efficient implementation of the school nutrition programme:

- In order to ensure relative uniformity and high standards in stakeholders' roles in the implementation of the school nutrition programme within their heterogeneous school systems, there is need to familiarise and capacitate stakeholders on their roles and objectives of the school nutrition programme. Stakeholders' pre-service and in-service training programmes should integrate their roles as well as objectives of the school nutrition programme to ensure effective programme implementation and maximum benefit to the learner and the community.
- Where it is possible, the SGB members may identify community members who are talented in food preparation. The district may improve their skills and use them in training food handlers within their schools in the cluster.

- To ensure shared vision and increased understanding of the implementation of the school nutrition programme, the district officials should ensure that all stakeholders have access to guidelines and related policy circulars. There is need for stakeholders to be fully aware of the provisions of these guidelines and circulars and what is expected of them in regard to learner rights, interests, and needs. It is important for the district nutrition department officials to ensure that all stakeholders understand the policies and guidelines so that they can be implemented correctly.
- In their effort to promote the school nutrition programme, stakeholders should be offered relevant support by key players like district officials, SGB members, school administrators, colleagues, parents, and learners. There is need for concerted effort from these stakeholders. Thorough monitoring and evaluation of the programme must be done to identify and solve problems in the programme.

- Food handlers must be offered sufficient support in cleaning the kitchen, cleaning the environment around, as well as cleaning the cooking utensils. They should be supplied with uniforms and caps.
- All schools should ensure that they install taps and sinks inside and outside the kitchen to assist in ensuring hygiene in and around the kitchen, and among the learners as they come to collect their food.

- For the purpose of teachers having a shared understanding of the programme implementation process, school principals, teacher co-ordinators, food handlers and service providers should take it upon themselves to regularly meet and induct new stakeholders on the programme implementation process, especially new food handlers and service providers.
- Where possible, new service providers should be offered the opportunity to attend NSNP related workshops at district level, organised by the nutrition department. This is likely to create a platform where service providers interact with each other and offer them a chance to share experiences, success stories and challenges related to the NSNP.
- Teacher co-ordinators and principals must be familiarised with quantities of food items to be used per day and should be friendly to food handlers who may need assistance on quantities to prepare, especially on days when the number of learners is lower than expected.

- Handy measures should be provided to food handlers and clear instruction on quantities to prepare each day must be given to food handlers. The instructions on quantities for each day must be on the notice board or wall in the kitchen for food handlers to use, as well as for external monitors to check against the standards.

- There is need to partially decentralise the payment system of service providers to district level and ensure that payments of service providers is done after every two weeks. This will ensure consistent supply of the correct quantity and quality of food and fruits to all schools every week.

- Teacher co-ordinator must forward a delivery report to the district through email on the day of delivery for fast processing of payment. The report should

highlight differences between the quantities of food delivered from the expected quantities if any. The teacher co-ordinator should get a remuneration of at least R1500.00 per term to promote efficiency in the extra duty that she does.

- Nutrition education must be taught in Life Orientation grades 8 to 12 to reduce prevalent diseases like overweight, obesity and diabetes in the South African society. This must be supported by relevant materials in the classrooms and kitchen area such as healthy foods and hygiene.

5.5.1 Measures to enhance the implementation of the school nutrition programme

Stakeholders were expected to promote efficient implementation of NSNP. However, due to challenges encountered by stakeholders in different schools, the desired goals were difficult to achieve. It is therefore, against this background that the researcher proposes a framework illustrated in figure 5.1, to assist stakeholders in enhancing the efficient implementation of the programme. The design of the framework was influenced by insights gained from findings from the data analysed as well as reviewed literature.

5.5.1.1 Comprehensive framework for the implementation of the school nutrition programme

The framework consists of one main pillar which supports three interrelated pillars to uphold a healthy lifestyle, cognitive development, maximum attention in class and attainment of educational goals. The model is not limited to the school environment, but involves all stakeholders in the school, as well as district officials and community members. The framework guides and directs stakeholders through viable and sustainable strategies in the implementation of the school nutrition programme. Implementation of this framework supports learners to realise a healthy lifestyle which has a positive bearing on both their wellness and academic attainment. The succeeding subsections are a discussing of the major provisions of each of the proposed framework components.

5.5.1.1.1 Training, partnering with key stakeholders and community involvement

Training teacher co-ordinators and principals in all aspects of the programme can help in ensuring uniformity in the programme implementation process. The teacher co-ordinators and the principal will then assist new food handlers as well as service providers when they need assistance. Research informants indicated that some food handlers were not sure of the quantities to use and how to cook the food items well. Equipping the principals and the teacher co-ordinators, who are permanently employed, with most of the fine details required by the food handlers, would ensure that food handlers have adequate support for their roles. Continuous in-service staff development meetings involving stakeholders may help to eradicate some weaknesses which compromise the programme implementation process. Identifying and involving community members who have expertise in food preparation, and nutrition education may be beneficial in improving the efficiency of the programme at a low cost. The community members may assist food handlers in schools with food preparation techniques. Nutritionists may also be involved. Development of positive rapport and trust among stakeholders is a step towards ensuring efficiency in the programme.

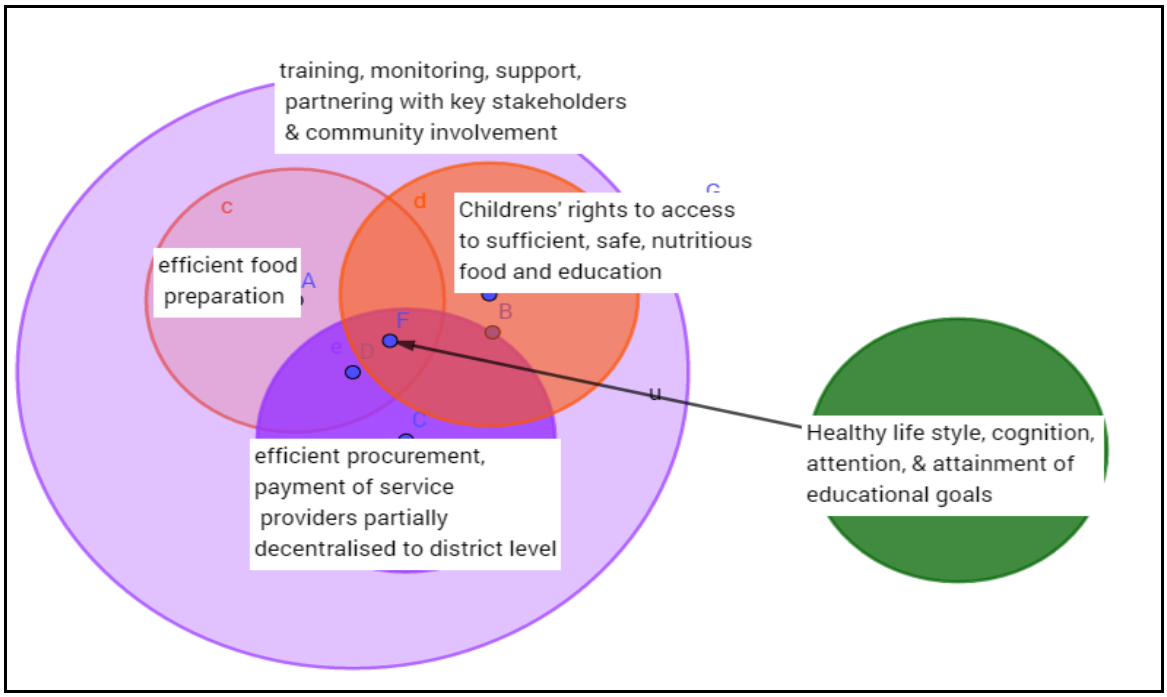

Figure 5-1: Proposed Mafugu comprehensive framework of the implementation of the school nutrition programme

5.5.1.1.2 Efficient food procurement

Research participants suggest that early payment of service providers eliminates all problems in the programme. The model suggests that partial decentralisation would alleviate the challenges leading to failure to supply the requisite quality and quantity of food by the suppliers. According to the model, the head office should only approve the first payment of service providers. Other payments have to be approved at district level. However, these payments will have to be within a narrow range of the values approved at head office in the first payment. Should the value to be approved fall outside the accepted range, then the payment will again have to be approved at the head office. This is important to ensure that the programme is free from corruption. The model suggests that there should be monitoring at school level by the teacher co-ordinator who should get a termly allowance to enhance sending of relevant information to the district office. The district officials also need to get support to enable them to frequently visit schools to ensure that the expected standards are being met. However, if the teacher co-ordinator is well trained and sends daily reports on deviations through phone messages, or email, it becomes easy for departmental officials to identify schools which need urgent attention.

5.5.1.1.3 Efficient food preparation

According to the model, food handlers must be well trained, supplied with good quality food of the correct quantities, and a well serviced gas stove to prepare food well. The food handlers should get extra support from the teacher co-ordinators and sometimes principals, as well as community members who may get an incentive for the period that they train food handlers in schools.

5.5.1.1.4 Children's rights to access to sufficient, safe, nutritious food and education

The fourth pillar ensures that stakeholders meet children's rights of access to sufficient, safe and nutritious food through the curriculum and NSNP support, as well as nutrition education in schools in its various forms. This includes books, videos, charts or even hymns to create positive attitude towards healthy foods and negative attitudes towards unhealthy foods. This will ensure that learners eat the nutritious food provided by the school. However, the school through the service provider, must

find alternative meals for learners who may be affected by the main meal of the day. This ensures that the all children's rights of access to sufficient, safe and nutritious food are met.

5.5.1.1.5 Healthy lifestyle, cognition, attention and attainment of educational goals

The four pillars will ensure that learners make good food choices at school as well as in the community, leading to a healthy lifestyle. The nutritious food fortified with micronutrients will enhance learners' cognitive development, and increase their attention in class leading to attainment of educational goals.

5.6 ACHIEVEMENT OF RESEARCH OBJECTIVES

The following sub-sections present a discussion on the extent to which the study met the intended objectives. The discussion covers training, monitoring and support of stakeholders, procurement and preparation of food, nutritional value of food, challenges encountered in the implementation, and implication of the school nutrition programme on learners' nutritional education.

5.6.1 Training, monitoring and support given to key role players

The study objective was to examine training, monitoring and support given to key role players in the implementation of the school nutrition programme. Food handlers, teacher co-ordinators and principals who joined the programme in the past two years were not trained. Stakeholders from different schools confirmed the lack of training and indicated that they were not certain if what they were doing was right. However, it was encouraging to note that some of the stakeholders had gained skills by involving themselves in community activities. Monitoring was done by the teacher co-ordinator and there was limited support on cleaning materials in the kitchen and in gas stove maintenance.

5.6.2 Procurement and preparation of food

The study also wanted to establish what informed the procurement and preparation of food served to learners in the NSNP. Procurement was done by service providers using the menu quantities schedule from the district office. Food was procured from wholesalers, supermarkets and fruit and vegetable markets. Food handlers prepared meals using a menu and the knowledge which some got from their homes, community activities and from training workshops for the few who had the opportunity to attend training workshops some years ago.

5.6.3 Nutritional value of food

It was also the study's intention to identify the nutritional value of the food served in the NSNP. The t-tests results revealed that the observed mean intakes per child per day for energy, protein, total fat, cholesterol, dietary fibre, vitamin K and sodium were significantly different from the expected mean nutrient intakes. The t-tests also indicated that the observed intakes of all other nutrients were not statistically significantly different from the expected nutrient intakes. The nutritional value of the foods was quite variable. There were variations in the nutrient intake among learners in different schools due to unequal intake of food items by learners in different schools. The intakes of all nutrients were below the minimum of 30% of RDA which is recommended by the Department of Basic Education.

5.6.4 Challenges encountered in the implementation of the programme

The other study objective was to identify challenges encountered in the implementation of the NSNP. The study established that there was an array of challenges which hindered effective implementation of the NSNP which included; lack of understanding, lack of knowledge, inadequate resources, inadequate support from stakeholders, poor hygiene, late payment of service providers, and inadequate quantities of food.

5.6.5 Implications on learners' nutrition education

The last intention of this study was to evaluate the implication of the school nutritional programme on learners' nutrition education. It emerged that learners in grade 12 lacked the basic nutrition education principles. The FET curriculum needs to integrate nutrition education principles to ensure that learners are adequately equipped with the principles before they leave grade 12. Research informants affirmed the need to integrate nutrition education principles into the school curriculum to enhance students' understanding of nutrition issues.

5.7 LIMITATIONS OF THE STUDY

The researcher would want to acknowledge that the examination of how the school nutrition programme was implemented using a mixed method approach was subject to some limitations. The mixed method approach required the researchers' skills in both qualitative and quantitative approaches which was an overload for the researcher in the current study. The researcher is a Life Science teacher in one of the schools where the school nutrition programme is being implemented. His observation in his current school could potentially have influenced his knowledge, attitudes, beliefs and values about the problem under the study which could have impacted on data collection and interpretations. To minimize bias the researcher had collect data from several respondents and participants in different schools. Moreover, the data for some participants were collected by a research assistant in the presence of the researcher. The interpretations were based on data from observations, in-depth interviews, questionnaires and document analysis.

The study was also limited in the sense that it involved only seven secondary schools in one circuit of a district in KwaZulu-Natal province with twelve districts and thus the results could hardly be generalised to other schools in other districts. The researcher considered schools that were in different quintiles as well as schools that were close to main service centres and some that were far from the main service centres.

Despite the limitation, the researcher is hopeful that the results of the study adequately answered all the research questions of the study. It is also hoped that the

research findings will contribute to policy and curriculum implementation and the process of implementation of the NSNP.

The current problems of the late payments of service providers, non uniform meals which are sometimes inadequate, among others; are likely to continue until the payment system improves, stakeholders are well trained, and nutrition education becomes part of the high school curriculum.

5.8 RECOMMENDATION FOR FURTHER STUDY

This study intended investigated how the school nutrition programme was implemented, focusing on secondary schools in one circuit of a district in KwaZulu-Natal province, South Africa. Further research may explore the same issue on a wider scale in schools in more than one circuit of a district or circuits in different districts to engage in a comparative study and come up with generalisable results.

Further studies should also be carried out to determine the iodine intake from iodated salt which was added into the meals. This is one of the nutrients which were, according to literature reviewed, found to be deficient in the SA population. Estimations of quantities of iodated salt added to different meals in the NSNP could not be established in this study.

Problems of stomach ache after the meals were cited by some learners. Further research needs to be carried out to establish the cause of the stomach problems among some learners after eating some of the school meals.

5.9 CHAPTER SUMMARY

This chapter presented a summary of findings, conclusions of the study and recommendations which included a proposed framework for the implementation of the school nutrition programme.

The study first examined training, monitoring and support given to key role players. It emerged that there was no pre-service and in-service training of stakeholders who had limited knowledge and skills in implementation of the programme. The nutritional value of the food for NSNP was below 30% of RDA for all nutrients that were examined by the researcher. There were many challenges that were encountered in the implementation of the school nutrition programme. Nutrition education principles were not adequately taught at high school. To enhance efficient implementation of the NSNP, a framework was proposed which the department may adopt to ensure maximum benefits for the learner. Due to many challenges that were identified, the study recommended the integration of nutrition education into the high school Life Orientation curriculum. It also recommended proper training of stakeholders as well as monitoring and evaluation of the school nutrition programme to identify and improve weaknesses of the programme. The chapter ended with recommendations for further research.

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LIST OF APPENDICES

APPENDIX 1: THE NUTRITIONAL VALUE OF THE FOOD PROVIDED TO LEARNERS IN SCHOOL B (430 LEARNERS).

		Tomato	Carrots	Cabbage	Butternut	rice	maize meal	samp	beef soya mince	Chicken soya mince	fish	amasi	Beans	Total intake per 5 days	Mean intake per day	% RDA
	sum of food per week (g)	12000	15000	16848	30000	90000	30000	20000	5000	5000	14400	72000	15000			
Nutrient Component	Quantity per child per week(g)	27.9	34.9	39.2	69.8	209.3	69.8	46.5	11.6	11.6	33.5	167.4	34.9	756.4		
Energy (Kcal)		4.9	14.3	9.8	31.4	590.2	233.1	166.5	38.7	41.1	35.1	100.1	120.9	1386.1	277.2	13.9
Carbohydrates (g)		1.1	3.3	2.3	8.2	134.0	50.6	36.8	6.0	6.2	0.7	6.7	22.9	278.7	55.7	42.8
Protein (g)		0.2	0.3	0.5	0.7	18.2	4.4	3.3	1.8	2.5	5.7	5.0	5.9	48.5	9.7	19.8
Total Fat (g)		0.1	0.1	0.0	0.1	0.8	0.6	0.4	0.6	0.8	1.7	5.5	0.5	11.2	2.2	3.4
Cholesterol (mg)		0.0	0.0	0.0	0.0	0.2	0.7	0.0	0.0	0.0	22.8	15.1	0.0	38.7	7.7	
Dietary Fiber (g)		0.3	1.0	1.0	1.4	2.3	2.2	2.9	0.7	0.8	0.8	0.3	6.8	20.4	4.1	12.8
Folates (µg)		4.1	6.6	20.8	18.8	146.5	139.5							336.3	67.3	16.8
Niacin (mg)		0.2	0.3	0.1	0.5	10.7	0.0	0.5						13.0	2.6	17.3
Pyridoxine (mg)					0.1	0.0	0.3							0.4	0.1	
Thiamin (mg)					0.1	0.4	0.2							0.7	0.1	9.1
Vitamin A (IU)		224.9	5827.7	38.4	7416.3	0.0	484.9							13992.1	2798.4	8.7

Vitamin C (mg)		3.5	2.1	14.3	14.7					1.3				34.6	6.9	9.9
Vitamin E (mg)		0.1	0.0	0.0	1.0									1.2	0.2	
Vitamin K (µg)		2.1	4.6	29.8	0.0	0.2	0.0							36.7	7.3	
Sodium (mg)		1.4	24.1	7.1	2.8	10.5	4.2	1.9			90.4	78.7	12.2	233.1	46.6	
Potassium (mg)		64.0	111.6	66.6	245.6	391.4								879.2	175.8	
Minerals																
Calcium (mg)		2.7	11.5	15.7	33.5	115.1					89.4	194.2	0.0	462.1	92.4	7.1
Iron (mg)		0.1	0.1	0.0	0.5	1.5	1.9	0.0						4.0	0.8	6.2
Magnesium (mg)		3.0	4.2	0.2	23.7	56.5	0.0	0.0						87.6	17.5	4.5
Manganese (mg)		0.0	0.0	0.1	0.1	2.3	0.0	11.6						14.2	2.8	
Phosphorus (mg)		6.5	12.2	10.2	23.0	326.5	0.0	34.9						413.3	82.7	6.6
Zinc (mg)		0.0	0.1	0.1	0.1	2.1	1.3	0.0						3.7	0.7	7.0
Phyto-nutrients																
Carotene-ß (µg)		121.2	1195.5	12.9	581.9									1911.5	382.3	
Carotene-α (µg)		925.6	2890.1	16.5	2948.4									6780.5	1356.1	
Lutein-zeaxanthin (µg)		33.2	89.3	11.8	0.0									134.3	26.9	
Lycopene (µg)		694.7	0.0	0.0	2421.6									3116.3	623.3	

APPENDIX 2: NUTRIENT VALUE OF THE FOOD CONSUMED IN SCHOOL C (1015 LEARNERS).

		Tomato	Carrots	Cabbage	Butternut	Mixed vegetables	Rice	Maize meal	Samp	beef soya mince	Chicken soya mince	Fish	Amasi	Beans	Total intake per 5 days	Mean intake per day	% RDA
	Sum of food per week(g)	7800	15000	28410	30000	9470	120000	30000	47000	5000	5000	19200	100000	15000			
Nutrient Component	Quantity/child Per week(g)	7.7	14.8	28.0	29.6	9.3	118.2	29.6	46.3	4.9	4.9	18.9	98.5	14.8	1015.0		
Energy (Kcal)		1.4	6.1	7.0	13.3	3.4	333.3	98.9	165.8	16.3	17.3	19.8	58.9	51.3	792.8	158.6	7,9
Carbohydrates (g)		0.3	1.4	1.6	3.5	0.7	75.6	21.5	36.7	2.5	2.6	0.4	3.9	9.7	160.4	32.1	24,7
Protein (g)		0.1	0.1	0.4	0.3	0.1	10.3	1.9	3.3	0.8	1.0	3.2	3.0	2.5	26.9	5.4	11,0
Total Fat (g)		0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.4	0.3	0.3	1.0	3.3	0.2	6.2	1.2	1,9
Cholesterol (mg)		0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	12.9	8.9	0.0	22.1	4.4	
Dietary Fiber (g)		0.1	0.4	0.7	0.6	0.3	1.3	0.9	2.9	0.3	0.3	0.4	0.2	2.9	11.3	2.3	7,2
Vitamins		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0				
Folates (µg)		1.2	2.8	14.8	8.0	1.7	82.7	59.2	0.0	0.0		0.0	0.0		170.4	34.1	8,5
Niacin (mg)		0.0	0.1	0.1	0.4	0.0	6.0	0.0	0.5	0.0		0.0	0.0		7.2	1.4	9,3
Pyridoxine (mg)		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0		0.0	0.0		0.2	0.0	
Thiamin (mg)		0.0	0.0	0.0	0.0		0.2	0.1	0.0	0.0		0.0	0.0		0.4	0.1	9,1
Vitamin A (IU)		64.1	2472.5	27.4	3146.5	1083.5	0.0	205.7	0.0	0.0		0.0	0.0		6999.7	1399.9	4,4

APPENDIX 2-continued

Vitamin C (mg)		1.0	0.9	10.2	6.2	0.4	0.0	0.0	0.0	0.0		0.0	0.0		18.7	3.7	5,3
Vitamin E (mg)		0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.5	0.1	0,7
Vitamin K (µg)		0.6	2.0	21.3	0.0	1.7	0.1	0.0	0.0	0.0		0.0	0.0		25.7	5.1	
Minerals																	
Sodium (mg)		0.4	10.2	5.0	1.2	2.4	5.9	1.8	1.9	0.0		51.0	46.3	12.2	138.3	27.7	
Potassium (mg)		18.2	47.4	47.6	104.2	12.8	221.0	0.0	0.0	0.0		0.0	0.0		451.3	90.3	
Calcium (mg)		0.8	4.9	11.2	14.2	2.0	65.0	0.0	0.0	0.0		50.5	114.3	0.0	262.7	52.5	4,0
Iron (mg)		0.0	0.0	0.0	0.2	0.1	0.8	0.8	0.0	0.0		0.0	0.0		2.0	0.4	3,1
Magnesium (mg)		0.8	1.8	0.1	10.1	1.4	31.9	0.0	0.0	0.0		0.0	0.0		46.1	9.2	2,4
Manganese (mg)		0.0	0.0	0.0	0.1	0.0	1.3	0.0	11.6	0.0		0.0	0.0		13.0	2.6	
Phosphorus (mg)		1.8	5.2	7.3	9.8	3.4	184.4	0.0	34.7	0.0		0.0	0.0		246.6	49.3	3,9
Zinc (mg)		0.0	0.0	0.1	0.0	0.0	1.2	0.6	0.0	0.0		0.0	0.0		1.9	0.4	4,0
Phyto-nutrients		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0				
Carotene-ß (µg)		34.6	507.2	9.2	246.9	0.0	0.0	0.0	0.0	0.0		0.0	0.0		797.9	159.6	
Carotene-α (µg)		264.0	1226.2	11.8	1250.9	0.0	0.0	0.0	0.0	0.0		0.0	0.0		2752.8	550.6	
Lutein-zeaxanthin (µg)		9.5	37.9	8.4	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		55.8	11.2	
Lycopene (µg)		198.1	0.0	0.0	1027.4	0.0	0.0	0.0	0.0	0.0		0.0	0.0		1225.5	245.1	

APPENDIX 3: NUTRIENT VALUE OF THE FOOD CONSUMED IN SCHOOL D (510 LEARNERS).

		Tomato	Carrots	Cabbage	Butternut	Mixed vegetables	Rice	Maize meal	Samp	beef soya mince	Chicken soya mince	Fish	Amasi	Beans	Total intake per 5 days	Mean intake per day	% RDA
	Sum of food per week(g)	7000	7000	26000	28000	26000	90000	20000	20000	5000	5000	19200	96000	20000			
Nutrient Component	Quantity/ Child per week (g)	13.7	13.7	51.0	54.9	51.0	176.5	39.2	39.2	9.8	9.8	37.6	188.2	39.2	1015.0		
Energy (Kcal)		2.5	5.6	12.8	24.7	18.9	497.7	131.0	140.3	32.6	34.6	39.4	112.5	135.9	1188.4	237.7	11.9
Carbohydrates (g)		0.5	1.3	3.0	6.4	3.7	113.0	28.4	31.0	5.1	5.2	0.8	7.5	25.7	231.7	46.3	35.6
Protein (g)		0.1	0.1	0.7	0.5	0.7	15.4	2.5	2.8	1.5	2.1	6.4	5.6	6.6	45.0	9.0	18.4
Total Fat (g)		0.0	0.0	0.1	0.1	0.1	0.7	0.4	0.3	0.5	0.7	1.9	6.2	0.5	11.5	2.3	3.6
Cholesterol (mg)		0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0	0.0	25.6	16.9	0.0	43.1	8.6	
Dietary Fiber (g)		0.2	0.4	1.3	1.1	1.6	1.9	1.2	2.4	0.6	0.7	0.9	0.4	7.6	20.2	4.0	12.5
Vitamins		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Folates (µg)		2.1	2.6	27.0	14.8	9.2	123.6	78.4	0.0	0.0	0.0	0.0	0.0	0.0	257.6	51.5	12.9
Niacin (mg)		0.1	0.1	0.1	0.7	0.3	9.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	10.7	2.1	14.0
Pyridoxine (mg)		0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	
Thiamin (mg)		0.0	0.0	0.0	0.1	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1	9.1
Vitamin A (IU)		114.1	2288.7	50.0	5835.9	5941.5	0.0	272.4	0.0	0.0	0.0	0.0	0.0	0.0	14502.6	2900.5	9.1
Vitamin C (mg)		1.8	0.8	18.7	11.5	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.7	6.9	9.9

APPENDIX 3: continued

Vitamin E (mg)		0.1	0.0	0.0	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.2	1.3
Vitamin K (µg)		1.1	1.8	38.8	0.0	9.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.1	10.2	
Minerals																	
Sodium (mg)		0.7	9.5	9.2	2.2	13.3	8.8	2.4	1.6	0.0	0.0	101.5	88.5	13.7	251.2	50.2	
Potassium (mg)		32.5	43.8	86.7	193.2	70.4	330.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	756.7	151.3	
Calcium (mg)		1.4	4.5	20.4	26.4	10.7	97.1	0.0	0.0	0.0	0.0	100.4	218.3	0.0	479.1	95.8	7,4
Iron (mg)		0.0	0.0	0.0	0.4	0.4	1.2	1.1	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.6	4,6
Magnesium (mg)		1.5	1.6	0.2	18.7	7.7	47.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.4	15.5	4,0
Manganese (mg)		0.0	0.0	0.1	0.1	0.0	1.9	0.0	9.8	0.0	0.0	0.0	0.0	0.0	12.0	2.4	
Phosphorus (mg)		3.3	4.8	13.3	18.1	18.9	275.3	0.0	29.4	0.0	0.0	0.0	0.0	0.0	363.1	72.6	5,8
Zinc (mg)		0.0	0.0	0.1	0.1	0.3	1.8	0.7	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.6	6,0
Phyto-nutrients		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Carotene-ß (µg)		61.5	469.5	16.8	457.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1005.7	201.1	
Carotene-α (µg)		469.6	1135.0	21.4	2320.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3946.2	789.2	
Lutein-zeaxanthin		16.9	35.1	15.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.2	13.4	
Lycopene (µg)		352.5	0.0	0.0	1905.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2258.1	451.6	

APPENDIX 4: THE NUTRITIONAL VALUE OF FOOD PROVIDED TO LEARNERS IN SCHOOL E (1135 LEARNERS).

	Food item	Tomato	Carrots	Cabbage	Rice	Maize meal	Samp	beef soya mince	Fish	Amasi	Beans	Total intake per 5 days	Mean intake/learner per day	%RDA
	Sum of food per week(g)	12000	22500	28800	180000	80000	60000	12500	38400	160000	30000			
Nutrient Component	quantity/child per week(g)	10.6	19.8	25.4	158.6	70.5	52.9	11.0	33.8	141.0	26.4	1015.0		
Energy (Kcal)		1.9	8.1	6.4	447.3	235.5	189.4	36.6	35.4	84.3	91.5	1136.3	227.3	13,9
Carbohydrates (g)		0.4	1.9	1.5	101.5	51.1	41.9	5.7	0.7	5.6	17.3	227.7	45.5	35,0
Protein (g)		0.1	0.2	0.3	13.8	4.4	3.8	1.7	5.7	4.2	4.5	38.7	7.7	15.71
Total Fat (g)		0.0	0.0	0.0	0.6	0.6	0.4	0.6	1.7	4.7	0.3	9.1	1.8	2,8
Cholesterol (mg)		0.0	0.0	0.0	0.2	0.7	0.0	0.0	23.0	12.7	0.0	36.5	7.3	
Dietary Fiber (g)		0.1	0.6	0.6	1.7	2.2	3.3	0.6	0.8	0.3	5.1	15.3	3.1	9,7
Folates (µg)		1.6	3.8	13.5	111.0	141.0	0.0					270.8	54.2	13,6
Niacin (mg)		0.1	0.2	0.1	8.1	0.0	0.6					9.0	1.8	12,0
Pyridoxine (mg)		0.0	0.0	0.0	0.0	0.3	0.0					0.3	0.1	
Thiamin (mg)		0.0	0.0	0.0	0.3	0.2	0.1					0.6	0.1	9,1
Vitamin A (IU)		88.3	3307.8	24.9	0.0	490.0	0.0					3911.0	782.2	2,4
Vitamin C (mg)		1.4	1.2	9.3	0.0							11.8	2.4	3,4
Vitamin E (mg)		0.1	0.0	0.0	0.0							0.1	0.0	0,0
Vitamin K (µg)		0.8	2.6	19.3	0.2							22.9	4.6	

APPENDIX 4: continued

Minerals														
Sodium (mg)		0.5	13.7	4.6	7.9	4.2	2.1	0.0	91.3	66.3	9.2	199.8	40.0	
Potassium (mg)		25.1	63.4	43.2	296.6	0.0	0.0	0.0	0.0	0.0	0.0	428.2	85.6	
Calcium (mg)		1.1	6.5	10.2	87.2	0.0	0.0	0.0	90.2	163.6	0.0	358.8	71.8	5,5
Iron (mg)		0.0	0.1	0.0	1.1	1.9	0.0					3.1	0.6	4,6
Magnesium (mg)		1.2	2.4	0.1	42.8	0.0	0.0					46.5	9.3	2,4
Manganese (mg)		0.0	0.0	0.0	1.7	0.0	13.2					15.1	3.0	
Phosphorus (mg)		2.5	6.9	6.6	247.4	0.0	39.7					303.2	60.6	4,8
Zinc (mg)		0.0	0.0	0.0	1.6	1.3	0.0					3.0	0.6	6,0
Phyto-nutrients														
Carotene-ß (µg)		47.6	678.5	8.4								734.5	146.9	
Carotene-α (µg)		363.4	1640.4	10.7								2014.5	402.9	
Lutein-zeaxanthin (µg)		13.0	50.7	7.6								71.3	14.3	
Lycopene (µg)		272.7	0.0	0.0								272.7	54.5	

APPENDIX 5: THE NUTRITIONAL VALUE OF FOOD PROVIDED TO LEARNERS IN SCHOOL G (342 LEARNERS)

		Tomato	Carrots	Cabbage	Butternut	rice	maize meal	samp	beef soya mince	Chicken soya mince	fish	amasi	Beans	Total intake per 5 days	Mean intake per day	% RDA
	sum of food per week(g)	12000	17000	53500	25000	60000	20000	20000	5000	5000	14400	56000	10000			
Nutrient Component	Quantity per child per week(g)	35.1	49.7	156.4	73.1	175.4	58.5	58.5	14.6	14.6	42.1	163.7	29.2	871.1		
Energy (Kcal)		6.3	20.4	39.1	32.9	494.6	195.4	209.1	48.5	51.6	44.1	97.9	101.2	1341.2	268.2	13,41
Carbohydrates (g)		1.4	4.8	9.1	8.5	112.3	42.4	46.3	7.6	7.7	0.8	6.5	19.2	266.5	53.3	41,0
Protein (g)		0.3	0.5	2.0	0.7	15.3	3.7	4.1	2.3	3.1	7.2	4.9	4.9	49.0	9.8	20,0
Total Fat (g)		0.1	0.1	0.2	0.1	0.7	0.5	0.5	0.8	1.0	2.1	5.4	0.4	11.8	2.4	3,8
Cholesterol (mg)		0.0	0.0	0.0	0.0	0.2	0.6	0.0	0.0	0.0	28.6	14.7	0.0	44.1	8.8	
Dietary Fiber (g)		0.4	1.4	3.9	1.5	1.9	1.8	3.6	0.8	1.0	1.0	0.3	5.7	23.4	4.7	14,7
Folates (µg)		5.3	9.4	82.9	19.7	122.8	117.0	0.0			0.0	0.0	0.0	357.1	71.4	17,9
Niacin (mg)		0.2	0.5	0.4	0.9	8.9	0.0	0.6			0.0	0.0	0.0	11.5	2.3	15,3
Pyridoxine (mg)		0.0	0.1	0.2	0.1	0.0	0.2	0.0			0.0	0.0	0.0	0.6	0.1	
Thiamin (mg)		0.0	0.0	0.1	0.1	0.4	0.2	0.1			0.0	0.0	0.0	0.8	0.2	18,2
Vitamin A (IU)		292.4	8302.9	153.3	7770.5	0.0	406.6	0.0			0.0	0.0	0.0	16925.6	3385.1	10,6
Vitamin C (mg)		4.6	2.9	57.2	15.4	0.0	0.0	0.0			0.0	0.0	0.0	80.1	16.0	22,9

APPENDIX 5: continued

		Tomato	Carrots	Cabbage	Butternut	rice	maize meal	samp	beef soya mince	Chicken soya mince	fish	amasi	Beans	Total intake per 5 days	Mean intake per day	% RDA
Vitamin E (mg)		0.2	0.0	0.0	1.1	0.0	0.0	0.0			0.0	0.0	0.0	1.2	0.2	
Vitamin K (µg)		2.8	6.6	118.9	0.0	0.2	0.0	0.0			0.0	0.0	0.0	128.4	25.7	
Minerals																
Sodium (mg)		1.8	34.3	28.2	2.9	8.8	3.5	2.3			113.7	76.9	10.2	282.6	56.5	
Potassium (mg)		83.2	159.0	265.9	257.3	328.0	0.0	0.0			0.0	0.0	0.0	1093.4	218.7	
Calcium (mg)		3.5	16.4	62.6	35.1	96.5	0.0	0.0			112.4	189.9	0.0	516.3	103.3	7.9
Iron (mg)		0.1	0.1	0.0	0.5	1.2	1.6	0.0			0.0			3.6	0.7	5,4
Magnesium (mg)		3.9	6.0	0.7	24.9	47.4	0.0	0.0			0.0			82.8	16.6	4,3
Manganese (mg)		0.1	0.1	0.3	0.1	1.9	0.0	14.6			0.0			17.1	3.4	
Phosphorus (mg)		8.4	17.4	40.7	24.1	273.6	0.0	43.8			0.0			408.0	81.6	6,5
Zinc (mg)		0.1	0.1	0.3	0.1	1.8	1.1	0.0			0.0			3.4	0.7	7,0
Phyto-nutrients																
Carotene-ß (µg)		157.6	1703.2	51.6	609.7						0.0			2522.1	504.4	
Carotene-α (µg)		1203.2	4117.6	65.7	3089.2						0.0			8475.8	1695.2	
Lutein-zeaxanthin (µg)		43.2	127.2	46.9	0.0									217.3	43.5	
Lycopene (µg)		903.1	0.0	0.0	2537.3									3440.4	688.1	

APPENDIX 6: EXPECTED NUTRITIONAL VALUES OF FOOD ITEMS TO BE PROVIDED TO SCHOOLS.

		tomato	apple fruit	cabbage	butternut	rice	top white maize meal	samp	beef soya mince	chicken soya mince	fish	amasi	beans	Total intake per 5 days	Mean intake per day	standard deviation
Nutrient Component	Quantity/child(g)	10.0	100.0	160.0	80.0	150.0	60.0	60.0	40.0	40.0	50.0	250.0	40.0	1015.0		
Energy (Kcal)		1.8	52	40.0	36.0	423.0	200.5	214.8	133.0	141.4	52.4	149.5	138.6	1582.9	316.6	114.4
Carbohydrates (g)		0.4	13.81	9.3	6.4	96.0	43.5	47.5	20.8	21.2	1.0	10.0	26.2	282.3	56.5	28.1
Protein (g)		0.1	0.26	2.1	0.5	13.1	3.8	4.3	6.2	8.4	8.5	7.5	6.8	61.2	12.2	3.9
Total Fat (g)		0.0	0.17	0.2	0.1	0.6	0.5	0.5	2.1	2.8	2.6	8.3	0.5	18.1	3.6	2.4
Cholesterol (mg)		0.0		0.0	0.0	0.2	0.6	0.0	0.0	0.0	34.0	22.5	0.0	57.3	11.5	11.7
Dietary Fiber (g)		0.1	2.4	4.0	1.1	1.7	1.9	3.7	2.3	2.8	1.2	0.5	7.8	26.9	5.4	2.1
Folates (µg)		1.5	3	84.8	14.8	105.0	120.0	0.0	0.0	0.0	0.0	0.0	0.0	329.1	65.8	46.5
Niacin (mg)		0.1	0.091	0.4	0.7	7.7	0.0	0.7	0.0	0.0	0.0	0.0	0.0	9.4	1.9	2.3
Pyridoxine (mg)		0.0	0.041	0.2	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.1
Thiamin (mg)		0.0	0.017	0.1	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.7	0.1	0.1
Vitamin A (IU)		83.3	54	156.8	5835.9	0.0	417.0	0.0	0.0	0.0	0.0	0.0	0.0	6547.0	1309.4	1670.4
Vitamin C (mg)		1.3	4.6	58.6	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.4	14.3	17.6

Vitamin E (mg)		0.1	0.18	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.2	0.2
Vitamin K (µg)		0.8	2.2	121.6	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	122.5	24.5	36.6
Sodium (mg)		0.5	1	28.8	2.2	7.5	3.6	2.4	0.0	0.0	135.0	117.5	14.0	312.5	62.5	47.7
Potassium (mg)		23.7	107	272.0	193.2	280.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	876.4	175.3	112.0
Calcium (mg)		1.0	6	64.0	26.4	82.5	0.0	0.0	0.0	0.0	133.5	290.0	0.0	603.4	120.7	87.0
Iron (mg)		0.0	0.12	0.0	0.4	1.1	1.6	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.6	0.5
Magnesium (mg)		1.1	5	0.8	18.7	40.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.0	13.2	12.3
Manganese (mg)		0.0		0.3	0.1	1.7	0.0	15.0	0.0	0.0	0.0	0.0	0.0	17.0	3.4	4.5
Phosphorus (mg)		2.4	11	41.6	18.1	234.0	0.0	45.0	0.0	0.0	0.0	0.0	0.0	352.1	70.4	66.5
Zinc (mg)		0.0	0.04	0.3	0.1	1.5	1.1	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.6	0.5
Carotene-ß (µg)		44.9	27	52.8	457.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	582.6	116.5	130.3
Carotene-α (µg)		342.8	11	67.2	2320.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2741.1	548.2	666.0
Lutein-zeaxanthin (µg)		12.3	27	48.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.3	17.5	15.2
Lycopene (µg)		257.3		0.0	1905.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2162.9	432.6	572.0

APPENDIX 7: MENU QUANTITIES FORMULA SCHEDULE

NSNP MENU QUANTITIES FORMULA SCHEDULE

FOOD ITEM	QUANTITY FORMULA PER DAY (Daily quantity)	FREQUENCY OF ITEM SERVING PER WEEK	WEEKLY QUANTITY
PILCHARDS (FISH)	ENROLMENT X 50g(sec)/40g(Pr) divided by size of the tin = No. of tins per day	Once a week	Total number of tins per week
RICE (10KG)	ENROLMENT X 50g(sec)/35g(Pr) divided by 1000 = kilograms per day	Three times a week	Total number of rice bags per week (Daily quantity x 3)
SOYA MINCE(5kg or25kg)	ENROLMENT X40(sec)/35(Pr) divided by 1000 = kilograms per day	Two times a week	Total number of soya bags per week (Daily quantity x 2)
BEANS (5kg or 10kg)	ENROLMENT X40g(sec)/35g(Pr) divided by 1000 = kilograms per day	Once a week	Total number of beans bags per week (Daily quantity x 1)
SAMP(10kg)	ENROLMENT X60g(sec)/40g(Pr) divided by 1000 = kilograms per day	Once a week	Total number of 10kg bags a week (Daily quantity x1)
MAIZE MEAL (10kg)	ENROLMENT X 60g(sec)/50g(Pr) divided by 1000 = kilograms per day	Once a week	Total number of 10kg bags a week (Daily quantity x 1)

FOOD ITEM	QUANTITY FORMULA PER DAY (Daily quantity)	FREQUENCY OF ITEM SERVING PER WEEK	WEEKLY QUANTITY
GREEN VEGETABLE (Cabbage/peas/spinach/green beans/broccoli)	ENROLMENT X 80g (Pr and Sec) divided by 1000 = kilograms of green veg per day	Two times a week	Total green veg kilograms per week (Daily quantity x 2)
Yellow veg (Butternut/Carrot)	ENROLMENT X 80g(sec)/60g(Pr) divided by 1000 = kilograms of yellow veg per day	Once a week	Total yellow veg kilogram per week (Daily quantity x1)
Tomato	ENROLMENT X 10g(sec)/5g(Pr) divided by 1000 = kilograms of tomatoes per day	Once a week	Total tomato kilograms per week (Daily quantity x 1)
Onions	ENROLMENT X 10g(sec)/5g(Pr) divided by 1000 = kilograms of onions per day	5 days a week	Total onions kilograms per week (Daily quantities x 5)
Fruit	1 Medium size fruit in season	Once a week	Total number of fruits per school per week
Maas (4Lt/5Lt)	ENROLMENT X 0.200(Pr)/0.250(Sec)= Total litres divided by 4or5Litres = Number of 4 or 5litre to be delivered at school per day	Once a week	Total number of 4 litres or 5Litres delivered at school per week

APPENDIX 8: INTRODUCTION LETTER

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30 August 2016

TO WHOM IT MAY CONCERN

REGISTRATION FOR PHD AND RESEARCH STUDY ASSISTANCE FOR TAFIRENYIKA MAFUGU (201615063)

This serves to confirm that Mr Tafirenyika Mafugu is a registered PhD candidate at the University of Fort Hare under my supervision. He is working on a study entitled; **IMPLEMENTATION OF THE SCHOOL NUTRITION PROGRAMME IN SELECTED HIGH SCHOOLS IN KWAZULU NATAL PROVINCE: IMPLICATIONS FOR LEARNERS' HEALTH**

May you kindly assist and grant him any necessary support he requires to conduct his study in schools in the KwaZulu Natal Province.

For any further information do not hesitate to contact the undersigned.

Faithfully Yours

PROFESSOR COSMAS MAPHOSA
RESEARCH PROFESSOR AND SUPERVISOR
UNIVERSITY OF FORT HARE
FACULTY OF EDUCATION
Email: cmaphosa@ufh.ac.za
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APPENDIX 9: INFORMED CONSENT FOR LEARNERS.

NAME OF APPLICANT Ethics Human 2011

<<Approved >> OFFICE USE ONLY

Ref:	Date:

University of Fort Hare
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CHILD ASSENT TEMPLATE

PARTICIPANT INFORMATION LEAFLET AND ASSENT FORM

TITLE OF THE RESEARCH PROJECT: Implementation of the School Nutrition Programme in Selected High Schools in Kwazulu Natal Province: Implications for Learners' Nutritional Education.

RESEARCHER'S NAME(S): MAFUGU TAFIRENYIKA

ADDRESS: 03 Ebor Heights
41 Bamboo Lane
Pinetown
3610
South Africa

CONTACT NUMBER: 0783334998

What is RESEARCH?

Research is something we do to find new knowledge about the way things (and people) work. We use research projects or studies to help us find out more about disease or illness. Research also helps us to find better ways of helping, or treating children who are sick.

What is this research project all about?

This focuses on how the school nutrition programme is implemented in high schools. The school nutrition programme should promote good health of children by filling gaps of various nutrient deficiencies, help children to focus on their studies. Implementation should be done according to guidelines in order to derive maximum benefits from the school nutrition programme.

The duration of the research project

You are expected to respond to a questionnaire with 31 main questions. Some of the main questions have sub-questions and responding to the questionnaire could take you up to 30 minutes. Most of the question items have suggested responses from which you are select the most appropriate answer.

Why have I been invited to take part in this research project?

You have been chosen to participate in this research simply because you are the beneficiary of the school nutrition programme and have been exposed to the nutrition programme for a long time, hence you are likely to provide more information based on the programme.

Confidentiality

You will not be required to write your name on the questionnaire and your responses will be securely kept to be used only for the purpose of this research study.

Is a sponsor to be involved?

A sponsor is yet to be identified

Who is doing the research?

My name is Tafirenyika. I am doing a Doctor of Philosophy degree with the University of Fort Hare; South Africa. Currently I am an Educator in Kwazulu Natal Education Department.

What will happen to me in this study?

You are expected to individually answer questions contained in a questionnaire or during a face to face interview with the researcher. You are expected to answer the questions freely and to be honest in your responses.

Can anything bad happen to me?

You are assured that no emotional, social or physical harm will occur to you during and after participating in this study.

Who else is involved in the study?

One hundred learners from 8 secondary schools in Pinetown district; Molweni circuit are also participating in this study.

Can anything good happen to me?

You will not have any material personal benefits for participating in this study but your responses will help in giving recommendations for improving the implementation of the nutrition programme in poor communities for maximum benefit of the learners in the learning process and nutrition knowledge.

Will anyone know I am in the study?

No one will ever know that you have participated in this study since your name will not be mentioned anywhere in the study i.e. anonymity is assured.

Who can I talk to about the study?

You are free to contact me: Mr T. Mafugu on cell number 0783334998. You can also communicate with other learner participants at your school, nutrition teacher coordinator and the school principal.

What if I do not want to do this?

Participation in this study is voluntary and you are free to decline to participate or to withdraw from participating at any time during the study and be assured nothing bad will happen to you.

Answer the questions below by putting an [x] on the appropriate response:

Do you understand this research study and are you willing to take part in it?

YES	NO

Has the researcher answered all your questions?

YES	NO

Do you understand that you can pull out of the study at any time?

YES	NO

_____ _____

Signature of Child Date

APPENDIX 10: QUESTIONNAIRE FOR LEARNERS

INTRODUCTION AND CONSENT

How are you? My name is Tafirenyika Mafugu. I am a PhD candidate studying with University of Fort Hare, Eastern Cape, South Africa. As part of the requirements of the degree programme, I am conducting a study entitled: "**Implementation of the School Nutrition Programme in selected High Schools in Kwazulu Natal Province: Implications for Learners' Nutritional Education".** The data gathered will help the government, the department of education and your school to improve the implementation process of the school nutrition programme to enhance maximum benefit of the learner. Your school has been selected because it is one of the schools where the national school nutrition programme is being implemented. Your views in this regard are of great value.

My target participants/respondents include principals, nutrition teacher coordinators, food handlers, SGB chairpersons, food suppliers and learners.

I am requesting you to honestly complete this questionnaire. Please be assured that your responses will be confidential. Feel free to be as open as possible.

PREAMBLE OF THE NSNP

The national school nutrition programme is a national intervention programme which mandates schools, food suppliers, food handlers and learners to follow implementation procedures, conditions, policies, rules and regulations that recognise and uphold the rights of children.

INSTRUCTIONS

Please indicate your responses with an **(X)** in the appropriate box or filling in the provided spaces with brief explanatory notes.

SECTION A: BIOGRAPHIC DATA FOR LEARN-ERS

1. Your School Quintle:

1	2	3

2. Gender

male	female

3. Age in years

10 to 15	15 to 20	20 to 25	Above 25

4. Position of responsibility in the school

none	Class monitor/representative	Others specify	

5. Years in the same school from grade 8 to 12

1	2	3	4	5	More than 5

SECTION B: FOOD HANDLERS', PRINCIPAL'S, GARDENERS', TEACHER COORDINATOR'S, SGM MEMBER'S BEHAVIOURS WHICH SHOW THE EVIDENCE OF TRAINING, MONITORING AND SUPPORT IN THE SCHOOL NUTRITION PROGRAMME.

6. To what extent do you acknowledge food handlers', principals', gardeners', teacher coordinators', SGB members' behaviours which show their training, monitoring and support provided to them in the school nutrition programme? Indicate by a tick **(√**) your response to the following statements using the following as indicators.

Statements on food handlers', principal's, gardeners', teacher coordinator's, SGB member's, & supplier's behaviours related to training, monitoring and support provided to them in the school nutrition programme.	**Always true 5**	**Sometimes true 4**	**Neutral 3**	**Rarely true 2**	**Never true 1**
a. In this school, food handlers prepare the food on time every day.					
b. Food handlers are always clean.					
c. A poster on hand washing principles is displayed around the kitchen.					
d. Food handlers have a recipe book which they use to prepare meals.					
e. Meals provided on similar					

days of the week are of the same quality.					
f. Meals provided on each day are of good quality always					
g. The environment around the kitchen is always clean.					
h. Utensils are cleaned using soap every day.					
i. The principal monitors the food prepared.					
j. Departmental officials monitor the food prepared.					
k. The kitchen always has sufficient equipment to prepare meals.					
l. Broken equipment is immediately replaced.					
m. The principal &/or teacher coordinator checks the food delivered by the supplier					
n. The SGB member monitors the food served in the school nutrition programme.					
o. Vegetables are grown in the school garden					
p. Fruits trees are grown in the school garden					
q. The school has a fruit tree and vegetable garden.					
r. Vegetables are well maintained in the school garden					
s. Fruits are well maintained in the school garden					
t. Vegetables are sprayed when attacked by diseases and pests					
u. Fruits are sprayed when attacked by diseases and pests					
v. Vegetables in the school garden are of good quality					
w. Fruits in the school garden are of good quality					
x. The gas tank is outside the kitchen & is secure.					

7. State any other indicators of support, training and monitoring given to food handlers', principal's, gardeners', teacher coordinator's, SGB member's, & supplier's in the school nutrition programme

……
.....
.....

SECTION C: STRATEGIES USED TO PROCURE AND PREPARE FOOD FOR THE SCHOOL NUTRITION PROGRAMME

8. Indicate by a tick **(√)** your level of agreement for the strategies used in the procurement and preparation of food in the school nutrition programme.

Strategies used to procure and prepare food in the school nutrition programme.	**Strongly agree 5**	**Agree 4**	**Neither agree nor disagree 3**	**Disagree 2**	**Strongly disagree 1**
a. Food for the school nutrition programme is bought and supplied by an independent supplier					
b. Food for the school nutrition programme is bought and supplied by the school					
c. Food for the school nutrition programme is bought from local small holder farmers					
d. Food for the school nutrition programme is bought from local retailers					
e. Food for the school nutrition programme is bought from local supermarkets/wholesalers					
f. Soya mince for the school nutrition programme is manufactured by one of the recommended soya manufacturers					

g. Food for the school nutrition programme is bought from the fruit and vegetable market					
h. Food is prepared by food handlers					
i. Food is prepared in a clean kitchen					
j. Cutting boards are always clean					
k. Separate cutting boards are used for fresh vegetables and meat					
l. Utensils, cutting boards and work surfaces are cleaned with soapy water					
m. Damaged or bruised areas of food are cut away					
n. Vegetables are cleaned before cutting and cooking					
o. Vegetables are cleaned after cutting					
p. Food is prepared using a gas stove					
q. Food is prepared using an electric stove					
r. Food is prepared using Mnandi 4 sure recipe book					
s. The floor is swept and mopped daily before leaving					
t. Fortified maize meal/bread is used in the school nutrition programme					
u.					

Give any other strategies used in the procurement & preparation of food

……
……
……

SECTION D: THE NUTRITIONAL VALUE OF FOOD CONSUMED IN THE SCHOOL NUTRITION PROGRAMME.

9. This section seeks to generate information about the food consumed and it's nutritional value. Write down the food items that are provided in the school nutrition programme in each of the days indicated below (eg Monday: soya mince, boiled rice and cabbage).

Week Day	Food Item	Food Item
a. Monday		
b. Tuesday		
c. Wednesday		
d. Thursday		
e. Friday		

10. Write down the meals that you dislike and avoid eating in the school nutrition programme

Indicate the day(s) on which the meal(s) you dislike is(are) served

11. Briefly write down the reasons why you dislike the food

Day	Reason(s) for disliking the food (if applicable)
Monday	

Tuesday	
Wednesday	
Thursday	
Friday	

12. Write down your most favourite meal in the school nutrition programme

Indicate the day on which your most favourite meal is served.

13. Indicate by an [x] in the appropriate box whether the following products supplied to your school are fortified.

Maize meal

yes	no	Not sure

Rice

yes	No	Not sure

14. Indicate by an [x] in the appropriate box whether the type of rice served.

Parboiled	Brown	white

SECTION E: CHALLENGES ENCOUNTERED BY LEARNERS IN THE SCHOOL NUTRITION PROGRAMME.

15. This section seeks to generate information about the challenges encountered in the school nutritional programme. Indicate with an (X) the extent to which the suggested challenges affect the school nutrition programme

Challenges/Barriers	**Strongly agree**	**Agree**	**Neither agree nor disagree**	**Disagree**	**Strongly disagree**

		5	4	3	2	1
a.	Food is of poor quality on the following days					
i	Monday					
ii	Tuesday					
iii	Wednesday					
iv	Thursday					
v	Friday					
b	Food is of low quantity on the following days					
i	Monday					
ii	Tuesday					
iii	Wednesday					
iv	Thursday					
v	Friday					
c	Food is sometimes not available					
d	There are sometimes delays in serving the food					
e	A different menu is served than expected					
f	I have health problems after eating some of the food.					
g	The food served on some days interferes with my culture/beliefs					
f	I just don't like the taste for some of the food					
g	Nutrition education is taught at secondary school					
h	Are you familiar with the food groups of the food guide pyramid?					
i	Are you aware of the components to include in your school lunch box?					
j	Are you aware of the components to avoid in your school lunch box?					
k	Are you aware of a balanced diet?					

l	Posters on healthy eating habits are displayed in the school					
m	The school has a vegetable garden					
n	Do you wash your hands with soap before eating					
o	Are familiar with health risks associated with too much fats?					
p	Are you familiar with health risks associated with too much carbohydrates?					
q	Are you aware of the nutritional value of various foods provided in the nutrition programme?					
r	Are you aware of the risks associated with various nutrient deficiencies					
s	Lack of plates & spoons					
t	Lack of washing soap					

16. Indicate any other challenges you have experienced in the food served by the school nutrition programme

_____

_____

_____

17. Indicate with an (X) how familiar you are with the following issues which influence your food preference and health and are influenced by nutrition education information.

Nutritional issue		**Extremely familiar**	**Moderately familiar**	**Somewhat familiar**	**Slightly familiar**	**Not familiar at all**
		5	**4**	**3**	**2**	**1**
a.	The food groups of guide pyramid?					
b.	Nutritious Food to					

	include in your school lunch box?					
c.	Food to avoid in your school lunch box?					
d.	A balanced diet?					
e.	Posters on healthy eating habits displayed in the school					
f.	How to grow vegetables					
g.	Washing your hands **with soap** before eating					
h	Washing your plate/lunch box **with soap** after eating					

Write down the different food groups of the food guide pyramid.

_____

_____

18. Did you learn about the food guide pyramid or nutrition at any grade at a school (grade 8 to 12)?

yes	No	Not sure

19. If yes, indicate the grade in which you were taught about nutrition:

20. Indicate with an (X) in the appropriate box the subject(s) in which you learnt about nutrition education at high school?

a.	Life Sciences	
b.	Life Orientation	
c.	Nutrition programme posters	
d.	Any other (Specify)	

21. Indicate how you rate the level of your understanding of the following Nutrition principles

	Nutrition principles	**Excellent 5**	**Very good 4**	**Good 3**	**Fair 2**	**Poor 1**
a.	Balanced diet					
b.	Components of a balanced diet					
c.	Food groups of the food guide pyramid					
d.	Recommended dietary allowances or intakes					
e.	Over-nutrition					
f.	Under-nutrition					
g.	Obesity					
h	Causes of obesity					
i	Overweight					
j	Causes of overweight					
k	marasmus					
l	Causes of marasmus					
m	Importance of menu variety					
n	Hygiene					
o	Food poisoning					
p	Importance of exercise					

22. Which one(s) of the principles above do you think is most important?.....
.....
.....
23. Give reasons for your choice above
.....
.....
.....
.....
24. What additional information can you provide to show your understanding of good nutrition?

……
……
……
……

SECTION F: IMPLICATIONS OF THE SCHOOL NUTRITION PROGRAMME ON THE LEARNERS' NUTRITIONAL EDUCATION.

25. At what grade was the nutrition education first introduced to you?

Primary school	Grade 8	Grade 9	Grade 10	Grade11	Grade 12	None

26. If **NONE i**s your response Question 25, how do you make your choices for the food you eat?

.....
.....
.....
.....
.....

27. Indicate your level of agreement on a five point scale to the suggested principles of nutrition education to promote healthy eating habits. **(SA-Strongly Agree5; A- Agree 4; N- Neutral 3; D- Disagree 2; SD- Strongly Disagree 1)**

Approach	**SA 5**	**A 4**	**N 3**	**D 2**	**SD 1**
a. Nutrition education should be integrated into the school curriculum.					
b. Learners should be familiarised with some concepts of nutrition education.					
c. The food guide pyramid should be a study component in nutrition education in the school curriculum.					
d. Learners should be familiarised with the food guide pyramid for them to make informed food choices					
e. Learners should be exposed to healthy life style posters so as to be more					

informed about food choices.					
f. Nutrition education sessions should be regularly conducted at school level to assist learners to make good food choices.					
g. Nutrition education competitions should be organised and conducted at school level to assist learners to make good food choices.					
h. Nutrition education competitions should be organised and conducted at cluster level					
i. Nutrition education competitions should be organised an conducted at district level					
j. All learners in a school should be provided with booklets on healthy eating life style					
k. School principals or teacher coordinators should be mandated to regularly teach learners on nutrition education.					
l. Learners' nutrition education should be assessed and evaluated to check where learners need more assistance in nutrition education.					
m. There should be compulsory subject in the school curriculum which teaches and assess nutrition education.					
n. School nutrition programme stakeholders need to recognise and acknowledge their role in promoting good eating habits.					

28. If offered an opportunity to be taught immediately in nutrition education, indicate your priority level of the following nutrition education principles. Generally high priority will be given to what you feel is very important yet you don't understand the concept.

Nutrition Principles	**Essential priority 5**	**High priority 4**	**Medium priority 3**	**Low priority 2**	**Not a priority 1**
Balanced diet					
Components of a balanced diet					
Food groups of the food guide pyramid					
Recommended dietary allowances or intakes					

Over-nutrition					
Under-nutrition					
Obesity					
Causes of obesity					
Overweight					
Causes of overweight					
marasmus					
Causes of marasmus					
Importance of menu variety					
Importance of hygiene					
How to stop spreading of germs					
How to wash hands					
Growing vegetables					

29. State any interventions your current school has done to develop your knowledge and skills on nutrition education

    .....

    .....

    .....

30. Give any suggestions on how you think your knowledge and skills on good food choices be improved:

    .....

    .....

31. Do you think that teacher coordinators, principals and food handlers have a pivotal role in promoting intake of healthy foods in the school nutrition programme?

a. Yes	
b. No	
c. Not sure	

THANK YOU FOR PARTICIPATING IN THIS STUDY

APPENDIX 11: INTERVIEW GUIDE FOR SCHOOL PRINCIPALS

SECTION A: DEMOGRAPHIC DATA FOR THE SCHOOL PRINCIPALS

1. Gender……
2. What is your age?
3. How long have you been in office as a school principal?
4. What is your highest professional qualification?
5. What is your understanding of the school nutrition programme?

STUDY GUIDING RESEARCH QUESTIONS	**INTERVIEW QUESTIONS**
1. How are training, monitoring and support provided to key role players in the school nutrition programme?	• What time is the food for the school nutrition programme served in your school? • Does the school have posters that guide in hygiene and hand washing? • Does your school have its own recipe book? • Do food handlers always follow instructions in the recipe book? • Are the meals always of the same quality? • Who were involved in the training of stakeholders in the school nutrition programme? • How often is the training offered to various stakeholders? • Is the environment around the kitchen always clean? • Are utensils used in the school nutrition programme always clean? • Who are involved in the monitoring the school nutrition programme? • Which aspects do they focus on when monitoring? • How often do monitors come at your school? • Which aspects do you check when food is being delivered at your school? • Does the school have a checklist for aspects to be monitored when food is delivered? • Does the school have a guideline on how the food should be stored? • Does the school have a fruit and vegetable garden? • Are there any documents to support the successful growing of fruits and vegetables? • Who is involved in the growing of fruits and vegetables? • What additional support is provided to the

	gardeners in promoting the successful growth of fruits and vegetables? • Do you know the expected quality of fruits and vegetables to be supplied in the school nutrition programme? • How do you rate food handlers' knowledge on food preparation? • Do you think food handlers have sufficient training and knowledge on food preparation? • Give reasons for your answer in the question above. • Which of the stakeholders do you think need more training in the school nutrition programme? • Which material is offered to the nutrition programme to support nutrition education among learners? • Have you made your food handlers aware of any documents that support the school nutrition programme? How have you done so? • Have you made your food suppliers aware of any documents that support the school nutrition programme? How have you done so? • Does training and support given to food handlers give them confidence in preparing meals for the NSNP? • Does your school offer food handlers an opportunity to gain knowledge and skills that help them to maintain hygiene and prepare food well? How is this done? • Are there any other forms of school-based support you offer suppliers to promote the supply of quality food? Which are they? • Are there any other forms of school-based support you offer learners to promote good eating habits? Which are they? • How does your school liaise with the district or provincial office to support food handlers, suppliers and gardeners in the school nutrition programme?
2. How is the procurement and preparation of food accomplished for the food served in the school nutrition programme?	• Who are involved in the procurement of food in the school nutrition programme? • When new food handlers and suppliers are recruited into the school nutrition programme, are they offered training on how they should perform their duties? • If yes, who offers them that training? If no, why

	are they not trained? • How is training offered to food handlers and suppliers in the school nutrition programme? • Is your school food supplier in partnership with any farmers, wholesalers or supermarkets to ensure the supply of quality products in the school nutrition programme? • What kind of support do these organisations offer? • How are cutting boards and work surfaces cleaned? • Is cooking done using gas or electricity? • Who pays for the gas or electricity used in the school nutrition programme? • Is there any recipe book/booklet that guides the preparation of food for the school nutrition programme? • Does training and support given to food handlers give them confidence in preparing meals for NSNP?
3. What is the nutritional value of food consumed in the school nutrition programme?	• Which food items are provided to learners in your school on: Mondays?; Tuesdays?; Wednesdays?; Thursdays? and Fridays? Are you aware of the expected quantities of the food items for each day? • Are there any learners who do not eat some of the meals above? • On which day(s) do you have the greatest number of learners who do not eat the school meal? • What are some of the reasons why some learners do not like some of the meals? • Are there any alternative meals for such learners? Specify the meals if any. • On which day(s) do you have the least number of learners who do not eat the school meal? • What do you think is the reason for them to like the meal(s) • Does your school receive fortified maize meal, rice or bread? How do you know that it is fortified? • Does your school receive parboiled rice? What indicates that the rice is parboiled?
4. What are the challenges encountered in the implementation of the	• **M**ay you briefly explain how the following situations and conditions may be challenges in the school nutrition programme:

school nutrition programme?	a). Are the food handlers unfamiliar with NSNP food preparation guidelines? Explain. b). Are there any challenges in terms of quality and quantity of food served in the school nutrition programme? c). Are there any challenges to food handlers and food suppliers of having limited relevant skills and knowledge to promote good implementation of the NSNP? d). Are there any challenges of unavailability of posters, recipe books and other resources to promote the school nutrition programme? e). Are there any challenges of the amount of work done by food handlers in the NSNP and the remuneration? f). Are there any challenges of the budget for the NSNP that make it impossible to cater for individual learner's food requirements? g). Are there any challenges of training or induction of new food handlers and service providers on the NSNP roles? h). Are there any challenges of non-existence of both pre-service and in-service programmes on roles of stakeholders in the NSNP. i). Are there any challenges of inadequate time and space for teachers to promote nutrition education among the learners? j) Are there any challenges of Nutrition education not being regarded important in the implementation of NSNP. k) Are there any challenges of stakeholders and parents of not being supportive of food handlers' effort in promoting good nutrition and nutrition education? l). Are there any challenges of unavailability of notice board/space to display relevant nutrition posters and other relevant information? m). Are there any challenges of large number of learners against very limited resources compromising the quantity and quality of food? • Does the school sometimes fail to provide food for the NSNP? State the reasons for the failure. • Are there sometimes some delays in serving the food? State the reason for the delays. • Do learners sometimes get sick after eating food for the NSNP?

	• Does the NSNP provide nutrition education to learners to encourage them to eat school meals? • Are there any posters on healthy eating habits? • Does the school provide plates, spoons and hand washing soap to learners? • Do the teacher coordinators, department officials, SGB representatives and you know what to monitor in the NSNP. • Is the school garden functional? • What other challenges may be there for teacher coordinators, food handlers, learners, gardeners and principals in the implementation of NSNP? How can these challenges be addressed?
5. What are the implications of the school nutritional programme on the learners' nutritional education?	• Did you receive any training on good nutrition as well as monitoring the school nutrition programme? When were you trained? Who trained you? What was the nature of your training? How long was the training? If not trained what is your comment? • Are the learners taught about good eating habits in Life Orientation/Life Science and the school nutrition programme? In what grade are they taught? Who are involved in teaching them nutrition education? How much time is allocated to teaching nutrition education? • What are some of the reasons for learners not being taught nutrition education? • How do you rate learners' knowledge of nutrition education with reference to the food guide pyramid? • When and in which grade do you think learners need to be taught on nutrition so as to help them to make informed food choices? • Which nutrition aspects are most important to learners? • How do you think learners need to be taught the aspects you mentioned? • How should the school intervene in Life Skills, Life Sciences and the school nutrition programme to improve learners' knowledge on nutrition education? • Do you think that stakeholders of the NSNP have a pivotal role in the promotion of nutrition education among learners? Give reasons for your response. **THANK YOU**

APPENDIX 12: INTERVIEW GUIDE FOR SCHOOL FOOD HANDLERS

SECTION A: DEMOGRAPHIC DATA FOR THE SCHOOL FOOD HANDLERS

6. Gender……
7. What is your age?
8. How long have you been a cook in the NSNP?
9. What is your highest professional qualification?
10. What is your understanding of the school nutrition programme?

INDIVIDUAL INTERVIEWS WITH FOOD HANDLERS

STUDY GUIDING RESEARCH QUESTIONS	INTERVIEW QUESTIONS
1. How are training, monitoring and support provided to key role players in the school nutrition programme?	• What time is the food for the school nutrition programme served in your school? • Does the school have posters that guide in hygiene and hand washing? • Does your school have its own recipe book? • What other documents are available to you to support you as food handlers in the school nutrition programme? • Do you as food handlers always follow instructions in the recipe book? • Are the meals always of the same quality? • Who were involved in the training you in the school nutrition programme? • How often is the in-service training offered to you as food handlers? • Is the environment around the kitchen always clean? • Are utensils used in the school nutrition programme always clean? • Who are involved in the monitoring the school nutrition programme? • Which aspects do they focus on when monitoring? • How often do monitors come at your school? • Which aspects are checked when food is being delivered at your school? • Does the school have a checklist for aspects to be monitored when food is delivered? • Does the school have a guideline on how the food should be stored? • Does the school have a fruit and vegetable garden?

	• Are there any documents to support the successful growing of fruits and vegetables? • Who is involved in the growing of fruits and vegetables? • What additional support is provided to the gardeners in promoting the successful growth of fruits and vegetables? • Do you know the expected quality of fruits and vegetables to be supplied in the school nutrition programme? • How do you rate your knowledge as food handlers' on food preparation? • Do you think you as food handlers have sufficient training and knowledge on food preparation? • Give reasons for your answer in the question above. • Which of the stakeholders do you think need more training in the school nutrition programme? • Which material is offered to the nutrition programme to support nutrition education among learners? • Does training and support given to you give you confidence in preparing meals for the NSNP? • Does your school offer you opportunities to gain knowledge and skills that help you to maintain hygiene and prepare food well? How is this done? • Are there any other forms of school-based support offered to suppliers to promote the supply of quality food? Which are they? • Are you aware of any documents that support nutrition education in the school nutrition programme? • Are there any other forms of school-based support offered to learners to promote good eating habits? Which are they? • How does your school liaise with the district or provincial office to support food handlers, suppliers and gardeners in the school nutrition programme?
2. How are the procurement and preparation of food accomplished for the food served in the school nutrition	• Who are involved in the procurement of food in the school nutrition programme? • Is your school food supplier in partnership with any farmers, wholesalers or supermarkets to ensure the supply of quality products in the school nutrition programme?

programme?	• What kind of support do these organisations offer? • How are cutting boards and work surfaces cleaned? • Is cooking done using gas or electricity? • Who pays for the gas or electricity used in the school nutrition programme? • Is there any recipe book/booklet that guides the preparation of food for the school nutrition programme?
3. What is the nutritional value of food consumed in the school nutrition programme?	• Which food items are provided to learners in your school on each day of the week from Monday to Friday? • How many learners are fed in the school? • How much of each of different food item is used per day?(mass or handy measures which the researcher will used to determine the mass). • Are there any learners who do not some of the meals above? • On which day(s) do you have the greatest number of learners who do not eat the school meal? • What are some of the reasons why some learners do not like some of the meals? • Are there any alternative meals for such learners? Specify the meals if any. • On which day(s) do you have the least number of learners who do not eat the school meal? • What do you think is the reason for them to like the meal(s) • Does your school receive fortified maize meal, rice or bread? How do you know that it is fortified? • Does your school receive parboiled rice? What indicates that the rice is parboiled?
4. What are the challenges encountered in the implementation of the school nutrition programme?	• **M**ay you briefly explain how the following situations and conditions may be challenges for you as food handlers and for food suppliers: a). food handlers' unfamiliarity with NSNP food preparation guidelines. b). quality and quantity of food served in the school nutrition programme. c). food handlers and food suppliers having limited relevant skills and knowledge to promote

	good implementation of the NSNP. d). unavailability of posters, recipe books, food quality guidelines and other resources to promote the school nutrition programme. e). the amount of work we do in the NSNP is not in line with the remuneration. f). there are not enough money for the NSNP to cater for individual learner's food requirements. g). no training or induction of new food handlers and service providers on the NSNP roles. h). non-existence of both pre-service and in-service programmes on roles in the NSNP. i). inadequate time and space for teachers to promote nutrition education among the learners j) Nutrition education not regarded important in the implementation of NSNP. k) Stakeholders and parents not supportive of food handlers' effort in promoting good nutrition and nutrition education. l). unavailability of notice board/space to display relevant nutrition posters and other relevant information m). Large number of learners against very limited resources compromise the quantity and quality of food. • Does the school sometimes fail to provide food for the NSNP? State the reasons for the failure. • Are there sometimes some delays in serving the food? State the reason for the delays. • Do learners sometimes get sick after eating food for the NSNP? • Does the NSNP provide nutrition education to learners to encourage them to eat school meals? • Are there any posters on healthy eating habits? • Does the school provide plates, spoons and hand washing soap to learners? • Do the teacher coordinators, department officials, SGB representatives and school principals know what to monitor in the NSNP. • Is the school garden functional? • What other challenges may be there for teacher coordinators, food handlers, learners, gardeners and principals in the implementation of NSNP? How can these challenges be addressed?
5. What are the	• Did you receive any training on good nutrition as

implications of the school nutritional programme on the learners' nutritional education?	well as preparation of food in the school nutrition programme? When were you trained? Who trained you? What was the nature of your training? How long was the training? If not trained what is your comment? • Are the learners taught about good eating habits in the school nutrition programme? In what grade are they taught? Who are involved in teaching them nutrition education? How much time is allocated to teaching nutrition education? • What are some of the reasons for learners not being taught nutrition education? • Do you think learners know the importance of different types of foods provided in the school nutrition programme? Give a reason for your answer. • When and in which grade do you think learners need to be taught on nutrition so as to help them • How should the school intervene in Life Skills, Life Sciences and the school nutrition programme to improve learners' knowledge on nutrition education? • Do you think that stakeholders of the NSNP have a pivotal role in the promotion of nutrition education among learners? Give reasons for your response. **THANK YOU**

APPENDIX 13: INTERVIEW GUIDE FOR SERVICE PROVIDERS

SECTION A: DEMOGRAPHIC DATA FOR THE SCHOOL FOOD SUPPLIERS

1. Gender……
2. What is your age?
3. How long have you been a food supplier in the NSNP?
4. What is the school enrolment for 2017 in the school that you supply food?
5. What is your highest professional qualification?
6. What is your understanding of the school nutrition programme?

STUDY GUIDING RESEARCH QUESTIONS	**INTERVIEW QUESTIONS**
1. How training, monitoring and support are provided to key role players in the school nutrition programme?	• What time is the food for the school nutrition programme served in your school? • Does the school have posters that guide in hygiene and hand washing? • Does the school have its own recipe book? • Do you as food suppliers always follow guidelines for the quality of food to be purchased? • Are the meals always of the same quality? • Who were involved in training you in the school nutrition programme? • How often is the in-service training offered to you as food suppliers? • Is the environment around the kitchen always clean? • Who are involved in the monitoring the food supplied in school nutrition programme? • Which aspects are checked when food is being delivered at your school? • How often do monitors check the food you supply in each school? • Does the school have a checklist for aspects to be monitored when food is delivered? • Does the school have a guideline on how the food should be stored? • Does the school have a fruit and vegetable garden? • What additional support is provided to the gardeners in promoting the successful growth of fruits and vegetables? • Do you know the expected quality of fruits and vegetables to be supplied in the school nutrition programme?

	• How do you rate your knowledge as food suppliers' on food to be supplied? • Do you think you, as food suppliers, have sufficient training and knowledge on food to supply? • Give reasons for your answer in the question above. • Are the suppliers aware of any documents that support the food to be supplied in the school nutrition programme? • Does training and support given to you give you confidence in purchasing food for the NSNP? • Does the school that you supply food offer you opportunities to gain knowledge and skills that help you to purchase the required quality of food? How is this done? • Are there any other forms of school-based support offered to suppliers to promote the supply of quality food? Which are they? • How does your school liaise with the district or provincial office to support you as food suppliers in the school nutrition programme?
2. How are the procurement and preparation of food accomplished for the food served in the school nutrition programme?	• How were you selected to be in the procurement of food in the school nutrition programme? • Are you as a school food supplier in partnership with any farmers, wholesalers or supermarkets to ensure the supply of quality products in the school nutrition programme? • What kind of support do these organisations offer? • How do you obtain the different food that is supplied to the school? • What aspects do you consider before purchasing the food to supply to the school? • Do you have departmental food guidelines to help you to purchase the right quality and quantity of food for the NSNP? • Is cooking done using gas or electricity? • Who pays for the gas or electricity used in the school nutrition programme? • Is there any recipe book/booklet that guides the preparation of food for the school nutrition programme? • Are you aware of how the food is prepared in the school nutrition programme?

3. What is the nutritional value of food consumed in the school nutrition programme?	• Which food items are provided to learners on under the NSNP on each of the following days: Monday?; Tuesday?; Wednesday?; Thursday? Friday? • How many learners are fed in the school? • How much of each of the different food items do you buy for all the learners per day or per week? • How much of each of the different food items is used per day? (mass or handy measures which the researcher will used to determine the mass). • How do you assist food handlers to ensure that they prepare the correct quantities? • Do you have any records for the items purchased over the past two months? • Are you aware of any learners who do not eat some of the meals above? • Have you received any complaints about learners' dislike of certain meals? • Which meal(s) is (are) most disliked by learners? • What are some of the reasons for the learners' dislike of some of the meals? • Are there any alternative meals for such learners? Specify the meals if any. • Which menu(s) is (are) most liked by learners? • What do you think is the reason for them to like the meal(s) • Do you supply the school fortified maize meal and fortified rice? How do you know that it is fortified? • Does your school receive parboiled rice? What indicates that the rice is parboiled? • Is there any policy that guides you on the type of maize meal or rice to supply?
4. What are the challenges encountered in the implementation of the school nutrition programme?	• **M**ay you briefly explain how the following situations and conditions may be challenges in the school nutrition programme: a). Are the food handlers unfamiliar with NSNP food preparation guidelines? Explain. b). Are there any challenges in terms of quality and quantity of food served in the school nutrition programme? c). Are there any challenges to food handlers and food suppliers of having limited relevant skills and knowledge to promote good implementation of

	the NSNP? d). Are there any challenges of unavailability of posters, recipe books and other resources to promote the school nutrition programme? e). Are there any challenges of the amount of work done by food handlers in the NSNP and the remuneration? f). Are there any challenges of the budget for the NSNP that make it impossible to cater for individual learner's food requirements? g). Are there any challenges of training or induction of new food handlers and service providers on the NSNP roles? h). Are there any challenges of non-existence of both pre-service and in-service programmes on roles of stakeholders in the NSNP. i). Are there any challenges of inadequate time and space for teachers to promote nutrition education among the learners? j) Are there any challenges of Nutrition education not being regarded important in the implementation of NSNP. k) Are there any challenges of stakeholders and parents of not being supportive of food handlers' effort in promoting good nutrition and nutrition education? l). Are there any challenges of unavailability of notice board/space to display relevant nutrition posters and other relevant information? m). Are there any challenges of large number of learners against very limited resources compromising the quantity and quality of food? • Does the school sometimes fail to provide food for the NSNP? State the reasons for the failure. • Are there sometimes some delays in serving the food? State the reason for the delays. • Do learners sometimes get sick after eating food for the NSNP? • Does the NSNP provide nutrition education to learners to encourage them to eat school meals? • Are there any posters on healthy eating habits? • Does the school provide plates, spoons and hand washing soap to learners? • Do the teacher coordinators, department officials, SGB representatives and school principals know

	what to monitor in the NSNP. • Is the school garden functional? • What other challenges may be there for teacher coordinators, food handlers, learners, gardeners and principals in the implementation of NSNP? How can these challenges be addressed?
5. What are the implications of the school nutritional programme on the learners' nutritional education?	• Did you receive any training on good nutrition as well as quality of food to be supplied in the school nutrition programme? When were you trained? Who trained you? What was the nature of your training? How long was the training? If not trained what is your comment? • Do you receive any complaints from learners about the type of food supplied? • Do you see any signs that indicate that learners are being taught about nutrition education? • What are some of the reasons for learners not being taught nutrition education? • Do you think learners know the importance of different types of foods provided in the school nutrition programme? Give a reason for your answer. • When and in which grade do you think learners need to be taught on nutrition so as to help them understand the importance of food variety and food choices? • How should the school intervene in Life Skills, Life Sciences and the school nutrition programme to improve learners' knowledge on nutrition education? • Do you think that stakeholders of the NSNP have a pivotal role in the promotion of nutrition education among learners? Give reasons for your response. **THANK YOU**

APPENDIX 14: INTERVIEW GUIDE FOR TEACHER COORDINATORS

SECTION A: DEMOGRAPHIC DATA FOR TEACHER COORDINATORS

1. Gender……
2. What is your age?
3. What is the school enrolment in 2017?
4. How long have you been involved in the NSNP?
5. What is your highest professional qualification?
6. What is your understanding of the school nutrition programme?

INDIVIDUAL INTERVIEWS WITH TEACHER CO-ORDINATORS

STUDY GUIDING RESEARCH QUESTIONS	INTERVIEW QUESTIONS
1. How is training, monitoring and support provided to key role players in the school nutrition programme?	• What time is the food for the school nutrition programme served in your school? • Does the school have posters that guide in hygiene and hand washing? • Does your school have its own recipe book? • What other documents are available to you to support in the school nutrition programme? • Are the meals always appealing to you? • Who were involved in training you in the school nutrition programme? • How often is the in-service training offered to you? • Is the environment around the kitchens always clean? • Are utensils used in the school nutrition programme always clean? • Who are involved in the monitoring the school nutrition programme? • Which aspects do they focus on when monitoring? • How often do monitors visit each school? • Which aspects are checked when food is being delivered at your school? • Does the school have a checklist for aspects to be monitored when food is delivered and prepared? • Does the school have a guideline on how the food should be stored? • Does the school have a fruit and vegetable garden? • Are there any documents to support the successful growing of fruits and vegetables? • Who is involved in the growing of fruits and

	vegetables? • What additional support is provided to the gardeners in promoting the successful growth of fruits and vegetables? • Do you know the expected quality of fruits and vegetables to be supplied in the school nutrition programme? • How do you rate your knowledge as a teacher coordinator on monitoring the NSNP? • Do you think you as teacher coordinator have sufficient training and knowledge on monitoring the NSNP? • Give reasons for your answer in the question above. • Which of the stakeholders do you think need more training in the school nutrition programme? • Which material is offered to the nutrition programme to support nutrition education among learners? • Does training and support given to you give you confidence in monitoring the NSNP? • Does the school offer you opportunities to gain knowledge and skills that help you to monitor the NSNP? How is this done? • Are there any other forms of school-based support offered to stakeholders to promote the NSNP? Which are they? • Are you aware of any documents that support nutrition education in the school nutrition programme? • Are there any other forms of school-based support offered to learners to promote good eating habits? Which are they? • How does your school liaise with the district office to support food handlers, suppliers and gardeners in the school nutrition programme?
2. How is the procurement and preparation of food accomplished for the food served in the school nutrition programme?	• Who are involved in the procurement of food in the school nutrition programme? • Is the school food supplier in partnership with any farmers, wholesalers or supermarkets to ensure the supply of quality products in the school nutrition programme? • What kind of support do these organisations offer? • How are cutting boards and work surfaces

	cleaned? • Is cooking done using gas or electricity? • Who pays for the gas or electricity used in the school nutrition programme? • Is there any recipe book/booklet that guides the preparation of food for the school nutrition programme?
3. What is the nutritional value of food consumed in the school nutrition programme?	• Which food items are provided to learners on under the NSNP on each of the following days: Monday?; Tuesday?; Wednesday?; Thursday? Friday? • Are there any learners who do not consume some of the meals above? • On which day(s) do you have the greatest number of learners who do not eat the school meal? • What are some of the reasons why some learners do not like some of the meals? • Are there any alternative meals for such learners? Specify the meals if any. • On which day(s) do you have the least number of learners who do not eat the school meal? • What do you think is the reason for them to like the meal(s) • Does your school receive fortified maize meal, rice or bread? How do you know that it is fortified? • Does your school receive parboiled rice? What indicates that the rice is parboiled?
4. What are the challenges encountered in the implementation of the school nutrition programme?	• **M**ay you briefly explain how the following situations and conditions may be challenges in the school nutrition programme: a). Are the food handlers unfamiliar with NSNP food preparation guidelines? Explain. b). Are there any challenges in terms of quality and quantity of food served in the school nutrition programme? c). Are there any challenges to food handlers and food suppliers of having limited relevant skills and knowledge to promote good implementation of the NSNP? d). Are there any challenges of unavailability of posters, recipe books and other resources to promote the school nutrition programme? e). Are there any challenges of the amount of work done by food handlers in the NSNP and the

	remuneration? f). Are there any challenges of the budget for the NSNP that make it impossible to cater for individual learner's food requirements? g). Are there any challenges of training or induction of new food handlers and service providers on the NSNP roles? h). Are there any challenges of non-existence of both pre-service and in-service programmes on roles of stakeholders in the NSNP. i). Are there any challenges of inadequate time and space for teachers to promote nutrition education among the learners? j) Are there any challenges of Nutrition education not being regarded important in the implementation of NSNP. k) Are there any challenges of stakeholders and parents of not being supportive of food handlers' effort in promoting good nutrition and nutrition education? l). Are there any challenges of unavailability of notice board/space to display relevant nutrition posters and other relevant information? m). Are there any challenges of large number of learners against very limited resources compromising the quantity and quality of food? • Do the schools sometimes fail to provide food for the NSNP? State the reasons for the failure. • Are there sometimes some delays in serving the food? State the reason for the delays. • Do learners sometimes get sick after eating food for the NSNP? • Does the NSNP provide nutrition education to learners to encourage them to eat school meals? • Are there any posters on healthy eating habits? • Does the school provide plates, spoons and hand washing soap to learners? • Do the teacher coordinators, department officials, SGB representatives and school principals know what to monitor in the NSNP. • Is the school garden functional? • What other challenges may be there for teacher coordinators, food handlers, learners, gardeners and principals in the implementation of NSNP? How can these challenges be addressed?

5. What are the implications of the school nutritional programme on the learners' nutritional education?	• Did you receive any training on good nutrition as well as monitoring the school nutrition programme? When were you trained? Who trained you? What was the nature of your training? How long was the training? If not trained what is your comment? • Are the learners taught about good eating habits in the school nutrition programme? In what grade are they taught? Who are involved in teaching them nutrition education? How much time is allocated to teaching nutrition education? • What are some of the reasons for learners not being taught nutrition education? • Do you think learners know the importance of different types of foods provided in the school nutrition programme? Give a reason for your answer. • When and in which grade do you think learners need to be taught on nutrition so as to help them • How should the school intervene in Life Skills, Life Sciences and the school nutrition programme to improve learners' knowledge on nutrition education? • Do you think that stakeholders of the NSNP have a pivotal role in the promotion of nutrition education among learners? Give reasons for your response. **THANK YOU**

APPENDIX 15: INTERVIEW GUIDE FOR DISTRICT FIELD OFFICERS

SECTION A: DEMOGRAPHIC DATA FOR DISTRICT FIELD OFFICERS

11. Gender……
12. What is your age?
13. How long have you been a district field officer in the NSNP?
14. What is your highest professional qualification?
15. What is your understanding of the school nutrition programme?

SECTION A: DEMOGRAPHIC DATA FOR DISTRICT FIELD OFFICERS

1. Gender……
2. What is your age?
3. How long have you been a district field officer in the NSNP?
4. What is your highest professional qualification?
5. What is your understanding of the school nutrition programme?

INDIVIDUAL INTERVIEWS WITH FIELD OFFICERS

STUDY GUIDING RESEARCH QUESTIONS	INTERVIEW QUESTIONS
1. How is training, monitoring and support provided to key role players in the school nutrition programme?	• What time is the food for the school nutrition programme served in the schools? • Do the schools have posters that guide in hygiene and hand washing? • Do the schools have recipe books? • Do the books show the preparation procedures? • What other documents are available to you to support you as field officers in the school nutrition programme? • Are the meals of the same quality in all schools? • Who were involved in training you in the school nutrition programme? • Who trains stakeholders of the nutrition programme? • How often is the in-service training offered to you as district field officers? • How often is the in-service training offered to food handlers, teacher coordinators and principal? • Is the environment around the kitchens always clean? • Are utensils used in the school nutrition programme always clean? • Who are involved in the monitoring the school nutrition programme?

	• Which aspects do they focus on when monitoring? • How often do monitors visit each school? • Which aspects are checked when food is being delivered at each school? • Do the schools have a checklist for aspects to be monitored when food is delivered? • Does the school have a guideline on how the food should be stored? • Do the schools in Molweni Circuit have fruit and vegetable gardens? • Are there any documents to support the successful growing of fruits and vegetables? • Who is involved in the growing of fruits and vegetables? • What additional support is provided to the gardeners in promoting the successful growth of fruits and vegetables? • Do you know the expected quality of fruits and vegetables to be supplied in the school nutrition programme? • How do you rate your knowledge as district field officers on monitoring the NSNP? • Do you think you as district field officers have sufficient training and knowledge on monitoring the NSNP & training stakeholders? • Give reasons for your answer in the question above. • Which of the stakeholders do you think need more training in the school nutrition programme? • Which material is offered to the nutrition programme to support nutrition education among learners? • Does training and support given to you give you confidence in monitoring the NSNP? • Does the district offer you opportunities to gain knowledge and skills that help you to monitor the NSNP and improve? How is this done? • Are there any other forms of district-based support offered to stakeholders to promote the NSNP? Which are they? • Are you aware of any documents that support nutrition education in the school nutrition programme? • Are there any other forms of district-based support offered to learners to promote good

	eating habits? Which are they? • How does your district liaise with the provincial office to support food handlers, suppliers and gardeners in the school nutrition programme?
2. How is the procurement and preparation of food accomplished for the food served in the school nutrition programme?	• Who are involved in the procurement of food in the school nutrition programme? • Are your district food suppliers in partnership with any farmers, wholesalers or supermarkets to ensure the supply of quality products in the school nutrition programme? • What kind of support do these organisations offer? • Is cooking done using gas or electricity? • Who pays for the gas or electricity used in the school nutrition programme?
3. What is the nutritional value of food consumed in the school nutrition programme?	• Which food items are provided to learners on under the NSNP on each of the following days: Monday?; Tuesday?; Wednesday?; Thursday? and Friday? • How much of each of the different food items is expected to be provided per learner per day? • From your various visits in schools, are the suppliers and food handlers complying with the quantity and quality of meals? • Do you have a monitoring tool to assist you in checking if the quantities and the quality of food is correct? • Do you have any monitoring reports? • Are there any manuals to guide suppliers and food handlers on quantity and quality of food? • How do you ensure that food suppliers & food handlers supply the correct quantities and quality of food? • Are there any reports of learners who do not consume some of the meals of the NSNP? • Do you have any reports of meals disliked by learners in different schools? • What are some of the reasons for learners to dislike some of the meals? • Are there any alternative meals for such learners? Specify the meals if any. • Which meals do the learners like most? • What do you think is the reason for them to like the meal(s) • Are the school supplied fortified maize meal and

	fortified rice? How do you know that it is fortified? • Does your school receive parboiled rice? What indicates that the rice is parboiled?
4. What are the challenges encountered in the implementation of the school nutrition programme?	• May you briefly explain how the following situations and conditions may be challenges in the school nutrition programme: a). Are the food handlers familiar with NSNP food preparation guidelines? Explain. b). Are there any challenges in terms of quality and quantity of food served in the school nutrition programme? c). Are there any challenges to food handlers and food suppliers of having limited relevant skills and knowledge to promote good implementation of the NSNP? d). Are there any challenges of unavailability of posters, recipe books and other resources to promote the school nutrition programme? e). Are there any challenges on the payment of food handlers? f). Are there any challenges of the budget for the NSNP that make it impossible to cater for individual learner's food requirements? g). Are there any challenges of training or induction of new food handlers and service providers on the NSNP roles? h). Are there any challenges of non-existence of both pre-service and in-service programmes on roles of stakeholders in the NSNP. i). Are there any challenges of inadequate time and space for teachers to promote nutrition education among the learners? j) Are there any challenges of Nutrition education not being regarded important in the implementation of NSNP? k) Are there any challenges of stakeholders and parents of not being supportive of food handlers' effort in promoting good nutrition and nutrition education? l). Are there any challenges on the budget to cater for large number of learners compromising the quantity and quality of food? • Do the schools sometimes fail to provide food for the NSNP? State the reasons for the failure. • Are there sometimes some delays in serving the

	food? State the reason for the delays. • Do learners sometimes get sick after eating food for the NSNP? • Does the NSNP provide nutrition education to learners to encourage them to eat school meals? • Are there any posters on healthy eating habits? • Does the school provide plates, spoons and hand washing soap to learners? • Do the teacher coordinators, department officials, SGB representatives and school principals know what to monitor in the NSNP. • Are the school gardens functional in Molweni Circuit? • What other challenges may be there for teacher coordinators, food handlers, learners, gardeners and principals in the implementation of NSNP? How can these challenges be addressed?
5. What are the implications of the school nutritional programme on the learners' nutritional education?	• Did you & other stakeholders receive any training on good nutrition as well as monitoring the school nutrition programme? When were you trained? Who trained you? What was the nature of your training? How long was the training? If not trained what is your comment? • Are the learners taught about good eating habits in the school nutrition programme? Who are involved in teaching them nutrition education? How much time is allocated to teaching nutrition education? • What are some of the reasons for learners not being taught nutrition education? • Based on reports from schools, do you think learners know the importance of different types of foods provided in the school nutrition programme? Give a reason for your answer. • When and in which grade do you think learners need to be taught on nutrition so as to help them • How should the school intervene in Life Skills, Life Sciences and the school nutrition programme to improve learners' knowledge on nutrition education? • Which of the stakeholders of the NSNP do you think have a pivotal role in the promotion of nutrition education among learners? Give reasons for your response. **THANK YOU**

APPENDIX 16: APPLICATION FOR PERMISSION TO CONDUCT RESEARCH

Flat number 3

Ebor Heights

41 Bamboo Lane

Pinetown

3610

tmafugu@gmail.com

20/03/2017

Office of the HOD;

KwaZulu Natal Department of Education

Private Bag X9137;

Pietermaritzburg; 3200

Email kehologile.connie@kzndoe.gov.za / Phindile.Duma@kzndoe.gov.za

Dear sir/madam

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN PINETOWN DISTRICT, MOLWENI CIRCUIT

I am kindly requesting for permission to conduct research in Pinetown District, Molweni circuit.

The research study is a fulfilment of the requirements of Doctor of Philosophy degree at the University of Fort Hare. The research title is: **IMPLEMENTATION OF THE SCHOOL NUTRITION PROGRAMME IN SELECTED HIGH SCHOOLS IN KWAZULU NATAL PROVINCE: IMPLICATIONS FOR LEARNERS' NUTRITIONAL EDUCATION.**

I wish to collect data from Pinetown District officials, principals, teacher coordinators, service providers, food handlers and grade 12 learners from the following schools:

Kwadinabakubo Secondary

Hlahlindlela Secondary

Khabazela Secondary

Kwabazotini Secondary

Kwantebeni Comprehensive High School

Ingqungqulu Secondary

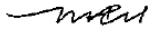
Thabela Secondary

Tholulwazi Secondary

The letter is accompanied with the following document: Ethical Research Clearance Certificate from the host University of Fort Hare- South Africa, a letter of support from my supervisor Prof C Maphosa, and copies of research instruments.

I am looking forward to hearing from you.

Yours faithfully



Tafirenyika Mafugu (Mr)

APPENDIX 17: PERMISSION LETTER FROM THE HOD KZN PROVINCE

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma | Tel: 033 392 1041 | Ref.:2/4/8/1189

Mr T Mafugu
41 Bamboo lane
03 Ebor Heights
Pinetown
3610

Dear Mr Mafugu

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"IMPLEMENTATION OF THE SCHOOL NUTRITION PROGRAMME IN SELECTED HIGH SCHOOLS IN KWAZULU-NATAL PROVINCE: IMPLICATIONS FOR LEARNERS' NUTRITIONAL EDUCATION",** in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 31 March 2017 to 07 June 2019.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Connie Kehologile at the contact numbers below
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and ~~interv~~iews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

Pinetown District

Dr. EV Nzama
Head of Department: Education
Date: 03 April 2017

...Championing Quality Education - Creating and Securing a Brighter Future

KWAZULU-NATAL DEPARTMENT OF EDUCATION
Postal Address: Private Bag X9137 • Pietermaritzburg • 3200 • Republic of South Africa
Physical Address: 247 Burger Street • Anton Lembede Building • Pietermaritzburg • 3201
Tel.: +27 33 392 1004/41 • **Fax.:** +27 033 392 1203• **Email:** Kehologile.Connie@kzndoe.gov.za/Phindile.Duma@kzndoe.gov.za •**Web:**www.kzneducation.gov.za
Facebook: KZNDOE....Twitter: @DBE_KZN....Instagram: kzn_education....Youtube:kzndoe

APPENDIX 18: ETHICAL CLEARANCE CERTIFICATE

University of Fort Hare
Together in Excellence

ETHICAL CLEARANCE CERTIFICATE
REC-270710-028-RA Level 01

Certificate Reference Number:	MAP111SMAF01
Project title:	**Implementation of the school nutrition programme in selected high schools in KwaZulu Natal Province: Implications of leaners' nutritional education.**
Nature of Project	PhD in Education
Principal Researcher:	Tafirenyika Mafugu
Supervisor:	Prof C Maphosa
Co-supervisor:	N/A

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instrument(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

The Principal Researcher must report to the UREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance.

Special conditions: Research that includes children as per the official regulations of the act must take the following into account:

Note: The UREC is aware of the provisions of s71 of the National Health Act 61 of 2003 and that matters pertaining to obtaining the Minister's consent are under discussion and remain unresolved. Nonetheless, as was decided at a meeting between the National Health Research Ethics Committee and stakeholders on 6 June 2013, university ethics committees may continue to grant ethical clearance for research involving children without the Minister's consent, provided that the prescripts of the previous rules have been met. This certificate is granted in terms of this agreement.

The UREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
  - Any unethical principal or practices are revealed or suspected
  - Relevant information has been withheld or misrepresented
  - Regulatory changes of whatsoever nature so require
  - The conditions contained in the Certificate have not been adhered to

- Request access to any information or data at any time during the course or after completion of the project.

- In addition to the need to comply with the highest level of ethical conduct principle investigators must report back annually as an evaluation and monitoring mechanism on the progress being made by the research. Such a report must be sent to the Dean of Research's office

The Ethics Committee wished you well in your research.

Yours sincerely

Professor Wilson Akpan
Acting Dean of Research

10 March 2017

APPENDIX 19: LANGUAGE EDITOR'S CERTIFICATE

SOL PLAATJE
UNIVERSITY

Dr. J. Sibanda (Senior Lecturer: English)
School of Education
Private Bag X 5008, Kimberley, 8300
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E-mail: Jabulani.Sibanda@spu.ac.za
jabusbnd@gmail.com
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Tel: 27534910142
Cell: 0845282087
23 January 2018

TO WHOM IT MAY CONCERN

I hereby confirm that I have proof read and edited the following PhD thesis using Windows 'Tracking' System to reflect my comments and suggested corrections for the author(s) to action:

IMPLEMENTATION OF THE SCHOOL NUTRITION PROGRAMME IN SELECTED HIGH SCHOOLS IN KWAZULU NATAL PROVINCE: IMPLICATIONS FOR LEARNERS' NUTRITIONAL EDUCATION

BY
Tafirenyika Mafugu

Although the greatest care was taken in the editing of this document, the final responsibility for the product rests with the author.

Sincerely

23.01.2018

SIGNATURE DATE