FOOD SAFETY PRACTICES, NUTRITION KNOWLEDGE AND MENU ADEQUACY AT NON-REGISTERED EARLY CHILDHOOD DEVELOPMENT (ECD) CENTRES IN THE NTUZUMA AREA, DURBAN, SOUTH AFRICA

Dissertation submitted in fulfillment of the requirements of the Master of Applied Science in Food and Nutrition in the Department of Food and Nutrition: Consumer Sciences, Faculty of Applied Sciences at the Durban University of Technology

By

Gugu Bongiwe Shabangu

20419192

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Supervisor: Dr Heleen Grobbelaar

Co-supervisor: Prof. Carin Napier

Co-supervisor: Prof. Oluwatosin Ijabadeniyi

DECLARATION

I, Ms. G.B. Shabangu, student number 20419192, declare that this study entitled: **Food safety practices, nutrition knowledge and menu adequacy at non-registered Early Childhood Development (ECD) centres in the Ntuzuma area, Durban, South Africa** is my original work and it has not been submitted previously in any form to another academic institution. Where use was made of the work of others, it has been duly acknowledged in the text. The research described in this dissertation was carried out in the Department of Food and Nurition: Consumer Sciences, Faculty of Applied Sciences, Durban University of Technology, South Africa and the Agricultural Research Council, Roodeplaat, Pretoria, South Africa under the supervision of Dr H. Grobbelaar, Prof. C. Napier and Prof. O. Ijabadeniyi.

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Signature of student Date

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Signature of supervisor Date

28 March 2023

Signature of co-supervisor Date

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Signature of co-supervisor Date

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ABSTRACT

Globally, millions of children are deprived of their right to good nutrition which contributes to child development and nurturing while eliminating preventable diseases that could affect them at their early age. According to the World Health Organisation (WHO), food safety has become a health priority over the years with more than 95% of deaths reported globally due to diarrhoea and dehydration and 40% of these being young children. Food safety is the responsibility of every person who is involved in food handling. In general, food handlers' mistakes include serving contaminated food, inadequate cooking, heating or reheating of food and allowing the consumption of food from unsafe sources. Children spend more than 50% of their day at an Early Childhood Development (ECD) centre therefore centres need to provide adequate meals and snacks in order to provide for the basic nutritional needs of these children. Nutrition remains an essential element of a child's health care and nutrients are important for optimum growth, which is why regular small healthy meals for young children should include fruit and vegetables, whole grain and cereals, meat and meat alternatives (fish, legumes).

The aim of this study was to investigate the food safety and hygiene practices, and evaluate the current nutrition knowledge of food handlers and also assess the nutritional adequacy of the menus at non-registered ECD centres. This study also aimed to observe the food handling and hygiene practices of the food handlers and also determine the menu adequacy of meals served to the young children in these non-registered ECD centres.

The designing of the research is one of the important steps in conducting a research as it helps structure research questions and objectives that have been outlined to provide a solution. This cross sectional study was of a quantitative nature and data was collected through structured research measuring tools that have been tested for their validity and reliability, and ensuring accuracy in measurements.

A list of non-registered ECD centres (n=10) based in the Ntuzuma area was provided to the researcher by the Department of Social Development's (DSD) Durban office. It must be stated that this list consisted of ECD centres that were not registered with DSD at the time of the study but were in the process of complying with the regulations and requirements stated by DSD, to assist in the sampling process. All ten of the centres were approached by the researcher and they all agreed to participate. Questionnaires and the observation checklist were then piloted in a sample group to establish suitability and adapted if necessary in one ECD centre while the remaining ECD centres formed part of the study (n=9). Eleven participants in total, two of whom were food handlers who assisted the managers when they were not available and nine who were both managers and food handlers formed part of the study. The researcher also conducted a plate waste study to determine the consumption patterns during meal times. Food finder version 2019 software was used to analyse the menu adequacy in each ECD centre by comparing it to the DRIs for children younger than five years old.

Data collected from this study showed that food handlers were more knowledgeable on certain aspects of food safety as the majority of the food handlers knew that raw and cooked food needed to be placed separately during storage to prevent cross contamination. The vast majority of the centres had adequate space and utensils for cooking but insufficient chopping boards. Furthermore, simple hygiene practices such as washing of hands after a visit to the toilet and before food preparation were demonstrated by most of the food handlers. However, there was no antibacterial soap available for hand washing and no designated hand washing stations. Knowledge on temperature control was poorly demonstrated as all cooked foods should be kept very hot before serving; however, the food handlers kept their food warm by leaving it in pots on the stove with the lid tightly secured during the holding stage. The data gathered from this study was that food handlers at all the non-registered ECD centres needed to attend intensive formal training on food safety and hygiene practices on all the different aspects of food safety.

Nutrition knowledge questionnaire showed that majority of the FHs were able to correctly answer most of the questions relating to the South African Food Based Dietary Guidelines. However, it was disappointing that most of the food handlers were not aware that an average of 8 glasses of water a day are recommended to be drunk. The dietary analysis indicated that there was a low consumption of fruits and vegetables and dairy products as most meals lacked essential macro and micronutrients, contributing to the poor nutritional status of the young children.

The microbial analysis revealed that the occurrence of *Staphylococcus aureus* and *Escherichia coli* was visible on the hands of the food handlers, the chopping boards and the preparation surface areas in each centre before washing but no growth was observed after washing, indicating that the cleaning process was effective.

The overall observation assessment suggested that food safety compliance was not implemented. This indicates that thorough food safety and hygiene training is urgently needed.

This study aimed to determine the food safety, hygiene practices and nutrition knowledge of all the food handlers, while analysing and assessing the nutrition adequacy of the menus offered to the children in these non-registered ECD centres, and lastly, to observe the food safety practices of food handlers and analyse the food workspaces for bacterial count.

More research at non-registered ECD centres in other provinces is crucial in order to compare the results to the results obtained in this study. It is also recommended that other government stakeholders such as the Department of Social Development and the Department of Health be engaged in order to supplement existing knowledge and implement further practical improvements.

ACRONYMS AND ABBREVIATIONS

AI	Adequate Intake
AIDS	Acquired Immune Deficiency Syndrome
AMDR	Acceptable Macronutrient Distribution Ranges
AND	Academy of Nutrition and Dietetics
BMI	Body Mass Index
CAC	Codex Alimentarius Commission
CCC	Child Care Centre
CCFs	Child Care Facilities
CCW	Child Care Workers
DAFF	Department of Agriculture, Forestry and Fisheries
DNA	Deoxyribonucleic acid
DoE	Department of Education
DoH	National Department of Health
DRIs	Diet Reference Intakes
DSD	Department of Social Development
DTI	Department of Trade and Industry
EAR	Estimated Average Requirements
EC	Eastern Cape
ECD	Early Childhood Development
EER	Estimated Energy Requirement
FAO	Food and Agriculture Organization
FAP	Food Assistance Programme
FBDGs	Food Based Dietary Guidelines
FF	Food Finder
FFQ	Food Frequency Questionnaire
FHs	Food Handlers
FIFO	First In First Out
FRC	Faculty Research Committee
g	gram

GDP	Gross Domestic Product
HACCP	Hazard Analysis Critical Control Point
HIV	Human Immunodeficiency Virus
Hrs	Hours
ID	Iron Deficiency
IDD	Iodine Deficiency Disorder
IFAD	International Fund for Agricultural Development
INK	Inanda, Ntuzuma, Kwa-mashu
INP	Integrated Nutrition Programme
IREC	Institutional Research Ethics Committee
ISO	International Standardization for Organisation
Kg	Kilogram
kJ	Kilojoules
KZN	KwaZulu-Natal
LNS	Lipid-based Nutrient Supplementation
m	meter square
mg	microgram
mm	millimetre
MEC	Member of the Executive Council
MDG	Millennium Development Goals
MRC	Medical Research Council
MRF	Model Food Ratio
n	Number
NDP	National Development Plan
NFCS	National Food Consumption Survey
NPAC	National Plan of Action for Children
NSNP	National School Nutrition Programme
NQF	National Qualifications Framework
NZ	New Zealand

NY	New York
RDA	Recommended Dietary Allowance
RDP	Reconstruction and Development Programme
RE	Retinol Equivalent
SA	South Africa
SABS	South African Bureau of Standards
SAFBDGs	South African Food Based Dietary Guidelines
SAM	Severe Acute Malnutrition
SAMRC	South African Medical Research Council
SANHANES	South African National Health and Nutrition Examination Survey
SASSA	South African Social Security Agency
SD	Standard Deviation
SDG	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
TB	Tuberculosis
UK	United Kingdom
UL	Tolerable Upper Intake Level
UNICEF	United Nations Children's Fund
USA	United States of America
USAID	United States Agency for International Development
US	United States
VAD	Vitamin A Deficiency
WFP	World Food Program
WFR	Weighed Food Records
WHO	World Health Organisation

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Chapter 1: Background and motivation for the study

1.1 Introduction

Globally, millions of children are deprived of their right to good nutrition, which contributes to child development and nurturing while eliminating preventable diseases that could affect them at their prime age (UNICEF 2016: 4).

The purpose of this study is to investigate food safety practices, understand the current nutrition knowledge of Early Childhood Development (ECD) managers and food handlers, assess the nutritional adequacy of the menus in each ECD centre and compare the findings to the Dietary Reference Intakes (DRIs) for children aged 0 - 5 years. This chapter will also report on ECD centres in South Africa (SA), the Department of Social Development guidelines and the Children's Act. It will also deal with some related studies that have been conducted in South Africa.

1.2 Background to the study

1.2.1 Early Childhood Development (ECD) centres

Prior to the 1994 democratic elections, early childhood development (ECD) in South Africa was not a popular topic; however, as the years passed it started to emerge as a field of research. Without a doubt children need to be given the best start in life and this is done by ensuring that they are in good health and are given proper nutrition and cognitive stimulation. An ECD centre is a place, or a facility, where young children are cared for and where learning takes place (South Africa. Department of Social Development 2006a: 11). Depending on registration, an ECD centre can admit babies, toddlers and/or pre-school-aged children. The term ECD centre can refer to crèches, day-care centres for young children, a playground, a pre-school or an after-school care centre (South Africa. Department of Social Development 2006a: 7). This establishment sets the foundation for the schooling system (Biersteker and Dawes 2008: 185) and it is where children are given the support and guidance appropriate for their developmental age and stage.

In recent years ECD has become an important sector in South Africa for children aged 0 to 5 years (Mbarathi, Mthembu, Diga 2016: 8). Early Childhood Development was prioritized by the SA government in its National Development Plan of 2030 which introduced the National Integrated Early Childhood Development Policy to invest in resources to support and promote optimal child development and early learning (South Africa. Department of Social Development 2015b: 08). The Department of Social Development (DSD) defined an ECD service as "the process of emotional, mental, spiritual, moral, physical and social development of children from birth to nine years". It was providing a service to young children living in South Africa and ensuring that good health, proper nutrition and developmental needs were met (South Africa. DSD 2006a: 2).

In 2013 a national audit was conducted to establish whether ECD centres were registered or not (Mbarathi, Mthembu and Diga 2016: 16-17). The findings of this national audit were that the majority of

ECD centres were not registered with the DSD due to poor infrastructure which did not provide a secure place where children would be able to learn and be productive. Other requirements for registration included the availability of safe drinking water, proper sanitation and a designated area for the preparation of meals, cooking and washing dishes (South Africa. DSD 2006: 50, Mbarathi, Mthembu and Diga 2011:17). The majority of ECD centres that operated without being registered were at a distinct disadvantage as the provisioning system did not recognize non-registered ECD centres. The young children in these unregistered centres were deprived of optimum services because the system only acknowledged and funded centres that were registered with the Department of Social Development (Mbarathi, Mthembu and Diga 2016: 17.

All ECD providers were required by law to register their facility with the Department of Social Development closest to where their facility was situated. An application form together with all relevant documents (a copy of the lease agreement or some other form of agreement to occupy the land, a job description for each staff member, a menu and a daily programme) had to be submitted (Berry, Jamieson and James 2011: 32). Once the application had been submitted, an official employee of the provincial DSD would visit the premises and also inform the environmental health officer and the Department of Education of the application. All relevant stakeholders then filed reports to the DSD once they had also inspected the premises to see if the ECD facility complied with the minimum standards set by this department. Standards included: the physical condition and surroundings of the structure had to be safe and secure, the health, general hygiene and safety requirements had to be adhered to, and the staff had to be fit and skilled to work with young children as prescribed by regulations 75 (1), 82 and 83 (3). Although non-registered ECD centres might find it difficult to overcome these challenges, the Children's Act made provision for assistance to be provided by the provincial Department of Social Development to applicants in preparing for the application (Berry, Jamieson and James 2011: 48). If successful, the ECD manager would be issued with a certificate of registration which was valid for a period of two years. However, if the ECD centres did not meet the minimum requirements they were granted a conditional registration and given the opportunity to work towards meeting the Department of Social Development standards (Berry, Jamieson and James 2011: 40).

Non-registered ECD centres continued to flourish in communities and operated illegally because community members were determined to protect and care for their young children from the crime that was prevalent in communities and specifically in informal settlements. Parents were more at ease if they were able to leave their children with a child minder who was a known responsible community member rather than leaving them unattended at home (Mbarathi, Mthembu and Diga 2016: 20). According to Walker *et al.* (2011: 1331), an estimated 300 million children younger than five years in South Africa were exposed to violent behaviour within their society. However, as previously mentioned, these non-registered ECD centres were disadvantaged because of the lack of funding as they were operating without being registered (Mbarathi, Mthembu and Diga 2016: 18). Early Childhood Development centres were part of a community, and found in most instances in informal settlements and therefore one tended to find that the staff employed at non-registered centres were community

members who had no formal qualification or even any ECD related training. This made the effective running of the centres extremely difficult as even basic knowledge of and experience in nutrition and food safety practices were often lacking.

Parents in these informal settlements were socially and economically challenged and were looking for child minders who were affordable to look after their children while they were at work. Many of these non-registered centres had inadequate facilities, did not serve nutritionally adequate meals and did not have good hygiene practices. Good nutrition was not only about the availability of food; the concept also had to take into consideration other factors such as water, sanitation, and health care services to which poor households often lacked access (UNESCO 2015: 50).

1.2.2 Legislation and policies pertaining to ECD in South Africa

National legislation and policies are what guide the care of children in South Africa (S.A). This section will cover the Children's Act 38 of 2005, the United Nations Convention on the Rights of the Child and the National Plan of Action; the DSD Guidelines for Early Childhood Development will also be discussed.

1.2.3 The Children's Act 2005 (Act 38 of 2005)

Early Childhood Development is guided by policies and programmes designed to protect the child's rights and address delays in child development, thereby facilitating early development (Martinez, Naudeau, and Pereira 2012: 1). According to research conducted by Berry, Jamieson and James (2011: 13), the Children's Act was developed to provide and support a range of social services to children and their families. These services included ensuring and reinforcing the appropriate care and protection of school-going children (Berry, Jamieson and James 2011: 14).

Table 1.1: The Children's Act 2005 (Act 38 of 2005) (2005: 80-81), under the heading Early Childhood Development in Section 91, makes reference to the following:

Chapter 6
Section 91. Early childhood development
(1) Early childhood development services mean services
(a) intended to promote early childhood development; and
(b) provided by a person, other than a child's parent or caregiver, on a regular basis to children up to school-going age
(2) An early childhood development programme means a programme structured within an early childhood development service to provide learning and support appropriate to the child's developmental age and stage.
Section 93. Provision of early childhood development programmes
(1) The MEC for social development may from money appropriated by the relevant provincial legislature, provide and fund early childhood programmes for that province
(2) An early childhood development programme must

Table 1.1: The Children's Act 2005 (Act 38 of 2005) (2005: 80-81) continue

(a) be provided in accordance with this Act; and (b) comply with the prescribed national norms and standards contemplated in section 94 and such other requirements as may be prescribed. (4) The funding of early childhood development programmes must be prioritized (a) in communities where families lack the means of providing proper shelter, food and other basic necessities of life to their children. **94. National norms and standards for early childhood development programmes** (1) The Minister must determine national norms and standards for early childhood development programmes by regulation after consultation with interested persons and the Ministers of Education, Finance, Health, Provincial and Local Government, and Transport. (2) The prescribed national norms and standards contemplated in subsection (1) must relate to the following: (a) The provision of appropriate developmental opportunities; (b) Programmes aimed at helping children to realise their full potential; (c) Caring for children in a constructive manner and providing support and security; (d) Ensuring the development of positive social behaviour; (e) Respect for and nurturing of the culture, spirit, dignity, individuality, language and development of each child; and (f) Meeting the emotional, cognitive, sensory, spiritual, moral, physical, social and communication development needs of children.

Laws, policies and programmes were put in place to alleviate and improve the lives of young children in SA; however, these efforts were not sufficient to promote optimal child development (Berry, Dawes and Biersteker 2013: 27). The Children's Act 38 of 2005 defined the services of ECD as ensuring that quality education was implemented at an early age while stimulating the child's cognitive and communication abilities (South Africa, Department of Justice 2005: 57). Furthermore, it ensured that less fortunate children received basic life necessities such as food and shelter. The Children's Act 38 of 2005 furthermore reiterated that the relevant Member of the Executive Council (MEC) may provide and fund ECD programmes if they complied with the national norms and standards as mentioned in Section 94, provided that they were situated in a community where families came from a background with poor infrastructure (South Africa, Department of Justice 2005: 81-82).

1.2.4 The United Nations Convention on the Rights of the Child

The United Nations Convention on the Rights of the Child was adopted by many nations internationally in 1989 with South Africa adopting it in 1995. Adoption of this Convention implied that it should be obeyed at all times. This Convention illustrated the basic rights necessary for children's survival, protection and development. In South Africa, the Constitution and the Child Care Act of 1983 afforded

young children their constitutional rights and protected them from any injustice that might be done to them (South Africa. Department of Social Development 2006a: 14).

1.2.5 The National Plan of Action for Children (NPAC)

The National Plan of Action for Children (NPAC) 2012-2017 was one of the many policies developed with children's rights at its core. The NPAC's mandate was to improve the nutritional, development and health status of infants and young children by promoting safe feeding practices while encouraging healthy eating patterns to reduce malnutrition and obesity in children attending ECD facilities in SA (South Africa. Department of Women, Children and People with Disabilities 2012: 5). The long-term goal of this policy was to have a fully comprehensive and high quality ECD programme by 2030 that would benefit and enrich infants, young children and caregivers in rural settlements (South Africa. Department of Women, Children and People with Disabilities 2012: 8). Furthermore, the DSD also developed guidelines to facilitate mandates for Early Childhood Development where important aspects such as nutrition, infrastructure, environmental safety and early learning were set out (South Africa. Department of Social Development 2006a: 2).

1.2.6 Department of Social Development in South Africa: Guidelines, Legislation and Laws

The Department of Social Development introduced a set of guidelines to facilitate a mandate to all ECD centres in South Africa. The following are a few extracts from the guidelines which are relevant to this study.

Table 1.2: Guidelines for Early Childhood Development (South Africa. Department of Social Development 2006a: 41)

Section 6.1 Premises and Equipment
6.1.5
Where food is prepared on the premises, there must be an area for preparation, cooking and washing up. When the kitchen is in the same area as the playroom, it must be cornered off and safety requirements must be complied with. Children must be protected from the dangers of hot liquids and food, and from fire and other cooking fuels such as paraffin.
The kitchen area or separate kitchen must also:
Be safe and clean
Have adequate washing up facilities and clean, drinkable water
Have hand washing facilities for staff
Have adequate storage space
Have adequate lighting and ventilation
Have cooling facilities for the storage of perishable food
Have an adequate number of waste bins with tightly fitting lids
Have an adequate supply of water and cleaning agents for the cleaning of equipment and eating utensils
Cleaning agents must be kept in their original containers and out of reach of children.

Table 1.2: Guidelines for Early Childhood Development continue

Section 6.2 Health, Safety and Nutrition
6.2.4
There must be action plans to deal with emergencies.
All staff, children and their families and the surrounding community must know what the plan is and what actions will be taken in an emergency.
Staff must be trained in first aid.
6.2.6
Staff should be trained to recognize early signs of child abuse and how to protect children.
If the child shows repeated bruising or injuries, abuse or neglect or suspected malnutrition, this must be observed, recorded and reported to the social worker of the regional or branch office of the Department of Social Development or any other welfare organization as well as the Child Protection Unit.
6.2.10
There should be a healthy environment for the children and staff.
The centre should be cleaned at least once a day and toilets and potties must be cleaned after use and disinfected at least once a day.
Staff should wash their hands with soap and water before preparing or serving food.
Regular training should be given to staff on childhood illnesses, other infections such as HIV and AIDS, Hepatitis B and notifiable diseases such as meningitis.
6.2.12
All meals and snacks should meet the nutritional requirements of the children.
The amount of food and drink provided for children must be adequate for their age. The dieticians of the Department of Health or medical institutions can be consulted for guidelines in this respect.
Food served each day depends on the hours the centre is open:
If the centre is open for less than five hours, a snack must be provided.
If a centre is open for five hours or more but less than eight hours, two snacks and lunch must be provided.
If the centre is open for eight hours or longer each day, two snacks and two meals (breakfast and lunch) must be provided. Meals can be provided by the centre or the parents.
6.2.13
Planning of a menu, whether for babies, toddlers or older children, must be done in consultation with an expert because children of different ages have different nutritional needs.
Menus for all meals at ECD centres should be available for inspection, as well as for the information of parents, at all times.
6.2.15
Children must be supervised by an adult when they are eating.
Staff should make sure meal times are relaxed.
Staff should be role models for healthy eating habits.
Children should be encouraged to try all the food available, but they should never be forced to eat anything they do not want to eat.

Table 1.2: Guidelines for Early Childhood Development continue

6.2.16

Safe, clean drinking water must always be available.

If water is not from a pipe source, it can be made safe by adding one teaspoon of bleach to 25 litres of water and left to stand overnight.

All water containers must be kept covered.

6.5 Practitioners

All practitioners must be trained and must receive ongoing training in early childhood development and the management of programmes and facilities for young children.

Efficient and effective early childhood development services aim to educate and care for children in a holistic way. This task requires responsible, trained and caring persons who will be able to meet the children's needs holistically and in a child-friendly way. Practitioners should receive training to identify and deal with children with disabilities and other special needs.

6.5.4

Practitioners should have at least the minimum qualification and work towards improving their qualifications.

The minimum qualification of practitioners is the registered Basic Certificate in ECD NQF Level 1 of the South African Qualifications Authority. This qualification entails knowledge and skills about child development from birth to six years old. The practitioner must at this level demonstrate how to facilitate growth and skills development in early childhood development programmes.

ECD centre supervisors should have a minimum qualification of the National Certificate in ECD at NQF Level 4 issued by the South African Qualifications Authority. They should have a general understanding of early childhood development from birth to six years old. ECD programme supervisors should demonstrate theoretical and practical knowledge and experience in managing ECD centres.

APPENDIX H: General guidelines for nutrition

1. Plan menus according to the following basic meal patterns:

Breakfast

Porridge with milk and sugar

Mid-morning snack

Brown bread with margarine

Milk

Midday meal

Protein-rich food or dish, eg. dry beans, meat, fish, chicken, eggs, cheese

Starchy food eg. porridge, samp, maize, rice, potato

Vegetables, preferably dark green or deep yellow in colour, eg. spinach, green beans, cabbage, carrots, pumpkin. The nutritional value of these vegetables is higher than that of other vegetables. Fruit, if possible, should be served twice a week.

Afternoon snack

Brown bread with margarine, peanut butter or other spread

Milk to drink

2. Do not discard meat bones or the outer leaves of vegetables but use these in soups or stews.

Table 1.2: Guidelines for Early Childhood Development continue

3. Do not scrape, peel or cut vegetables and potatoes the previous evening and leave them in water. These should all be prepared shortly before they are to be used, as the longer a vegetable (either raw or cooked) is left standing, the more food value is lost. Do not soak vegetables once cut.
4. Always put vegetables to be cooked in a small amount of boiling water; more can be added later, if necessary. Cook until soft, and no longer, as over cooking diminishes the food value. Any leftover water should be used in soup or gravy.
5. A protein–rich food or body–building food such as dry beans, meat, fish, eggs or cheese, or a combination of these, should form part of the main meal every day as it is essential for good nutrition. A small amount of fish, meat, chicken, egg or cheese, combined with dry beans or other dry legumes, makes a nutritionally adequate dish. Soya beans have a higher nutritional value than other dry legumes. Serve these products at least once or twice a week.
6. Peanut butter on brown bread is a good body building food. It is preferable if milk is served with the same meal.
7. A meal consisting of vegetable soup with bread or porridge is not adequate unless a body building food is served at the same time.
8. Sufficient protective foods, such as vegetables and fruit, have to be included every day in order to protect children against disease. If fruit is not available, use fresh, raw vegetables, eg. tomatoes, cabbage, carrots. 9. Skim-milk powder is the cheapest form of milk. If funds permit, full cream, or low-fat (2%) milk should be used. Milk blends, although much cheaper, are not recommended, as these do not have the same nutritional value as milk products. Always look for the “Real Dairy” mark before you buy dairy products.
10. Use measuring spoons and cups and/ or a scale to measure and weigh ingredients for recipes.

These guidelines placed special emphasis on the importance of the child’s safety as stipulated in Section 6.1.5, which states that there must be a designated area for food preparation, cooking and washing up. It also mentions that the kitchen area must always be safe and clean. The Department of Social Development further makes reference to the basic meal pattern as mentioned in Table 1.2 that the requirement of ECD centres is to provide a well-balanced nutritious meal which includes plenty of fruits and vegetables, whole and unrefined cereals, meat, dairy products and plant-based protein.

Section 27(1)(b) of the South African Constitution states that “everyone has the right to have access to sufficient food”. Furthermore, the Constitution provides children with additional protection in Section 28 (1)(c) where it states that “every child has the right to basic nutrition” (South Africa. Department of Justice 1996: 11).

1.3 The role of caregivers or practitioners

Young children would always depend on someone older such as a caregiver or a practitioner (Tomlinson 2013: 56) to help build their characters and minds while instilling core values for the future, but often they did not receive any recognition for their hard work and dedication (Fourie 2014: 510). According to the South African Department of Social Development Guidelines (2006a: 13), an ECD practitioner’s role was to perform their duties and responsibilities as caregivers. Regulations and

guidelines were put in place for all ECD staff members to provide basic information on providing children with the best possible care.

Caregivers and practitioners were influential in a child's early life through the planning and organizing of activities to help children to develop a variety of skills (Biersteker and Dawes 2008: 186). It is assumed that everyone can take care of a child despite not having any qualification in ECD, and often caregivers and practitioners are the dispensers of knowledge at these centres but are not given any ongoing training as most of the staff that work at ECD centres are community members who sometimes volunteer to assist and who have no qualification in ECD. Section 6.5 states that practitioners and managers of ECD programmes and facilities should receive ongoing training in ECD and that practitioners should have appropriate qualities to work with children. However, in non-registered facilities this is not always the case; hence the focus of this study was on observing the food safety practices, nutrition knowledge and behaviours in non-registered ECD centres to enable a comparison to be made between the two types of centres.

1.4 Practices in ECD centres and their impact

1.4.1 Food safety practices in ECD centres

According to UNICEF, the second most common cause of child death worldwide was diarrhoea with an estimated 2.5 billion cases of diarrhoea reported each year, with South Asia and Africa leading in terms of the number of cases (UNICEF 2009: 5-6). Unhygienic preparation of food, lack of nutritional knowledge and inadequate nutrient intake in menu planning were some of the contributing factors that could lead to the vicious cycle of malnutrition (Nair and Radhakrishnan 2004: 230). Poor sanitation and unsafe running water were some of the conditions that exposed children to life threatening and infectious diseases.

Foodborne illnesses were defined as infectious or toxic in nature and caused by bacteria, viruses, parasites or chemical substances entering the body through contaminated food or water (Glowacki, Glowacki, Chung and Wilcox 2019: 1280). They were caused by eating contaminated food which could lead to diarrhoea. Food handling practices contributed to the risk factors that could lead to foodborne illnesses and these could include unsafe water (UNICEF 2012: 15), poor hygiene and basic sanitation practices, cross-contamination and improper cooking procedures (Aziz and Dahan 2013: 221).

The food prepared at ECD centres by food handlers needed to be safe for consumption to reduce the contamination of microorganisms (Department of Health 2016: 11). Food safety was caused by bacterial, parasitic and viral microorganisms and chemical hazards that could be present in food or appear due to contamination (Michaelsen *et al.* 2000: 235). Good hygiene practices, clean water and safe food handling were significantly important in preventing childhood diarrhoea.

Early childhood practitioners needed to be aware of how quickly illnesses could spread especially amongst children, therefore interventions such as washing of hands with safe running water and soap

before touching or eating food and using sanitized utensils for food preparation and during serving were essential (Department of Health 2016: 11). According to Cosby, Costello, Morris, Haughton, Devereaux, Harte, and Davidson (2008:6918), ongoing food hygiene assessment was needed especially in childcare facilities where food came into contact with preparation surfaces, as these surfaces might contain bacteria which could be transferred to the food itself. According to Seth and Obrah (2004:882), food safety education amongst care workers and food handlers should be an important focus not only in reducing diarrhoeal deaths, but also in increasing awareness of good hygiene practices in early childhood development centres.

1.4.2 Nutrition knowledge in ECD centres

South Africa (SA) was 22 years into democracy and still the problem of childhood malnutrition had not shown any significant improvement, with about a fifth of children under five years suffering from stunting, making this condition the most prominent form of malnutrition in S.A (Armstrong, Lambert and Lambert 2011: 835). Poverty, inadequate access to nutritious food and prolonged exposure to infections were some of the factors that contributed to stunting in children and therefore much more needed to be done to combat stunting (Hall, Sambu, Berry, Giese and Almeleh 2017: 18).

In 2016 UNICEF, WHO and the World Bank (2017: 5, 9) reported that 86.5 million children under the age of five in Asia and 59 million in Africa were stunted. The highest prevalence of stunting was in southern Asia and eastern Africa with 61.2 million and 24 million respectively, and with southern Africa contributing 1.8 million. However, between the years 2000 and 2016, the number of children who were stunted had dropped by 35% in Asia and increased by 17% in Africa (UNICEF, WHO and World Bank 2017: 5). Globally, more than 51.7 million children were reported to be wasted, with Asia being the most affected with 35.7 million and Africa with 14 million. Southern Asia had 27.6 million and southern Africa had 0.3 million children affected.

According to Iversen, Marais, Du Plessis and Herselman (2012: 5930), the nutritional status of children in SA had improved significantly over the years; however, there were some issues that still needed to be addressed, which included inadequate macro- and micronutrient intake and inappropriate feeding practices in ECD centres (Petrou and Kupek 2010:1367). In 2008 the Minister of Health signed a South African Infant and Young Child Feeding Policy which aimed at addressing problems and challenges to infant feeding and promoting optimum feeding practices (Iversen *et al.* 2012: 5933) while eliminating nutrition deficiencies. According to Stallings and Yaktine (2007: 29-30), a nutritious intake was essential for young children to help them reach their growth potential and maintain body functions.

Early intervention in ECD was what the Children's Act considered important for the well-being of children. Research in Kenya on the relationship between nutrition knowledge of caregivers and dietary practices in children under five years found that the knowledge of caregivers on nutrition was generally low, in that they did not know the different food groups that were available, and had poor knowledge of food preparation methods and appropriate food combinations (Chege and Kuria 2017: 4). This indicated

that caregivers who had some form of nutrition knowledge had a better chance of adopting good dietary habits that would benefit young children. Grobbelaar, Napier and Oldewage-Theron (2013: 36) indicated in their study that to improve food choices in children's homes, nutrition education programmes needed to be implemented to address nutritional awareness gaps. Another study conducted by Oduor, Boedecker, Kennedy, Mituki-Mungiria and Termote (2019: 8) mentioned that education was an important factor that mediated change in children's diets.

1.4.3 Menu adequacy

It was important that the food given to children in ECD centres met the Recommended Dietary Allowance (RDA) as the average amount of time a child spent at an ECD centre was about 25 hours a week and where a significant portion of meals and snacks were consumed daily (Erinosho, Ball, Hanson, Vaughn and Ward 2013: 1084). According to Humphries, Pepper, Traci, Olson, and Seekins (2009: 136), menu adequacy was a nutritional intervention aimed at improving the dietary intake in an establishment or a home. Kwinda, Van der Spuy and Viljoen (2011: 57) stated that children attending crèches or day-care centres should be provided with adequate meals and snacks in order to improve basic nutritional needs because a nutritious diet during childhood contributed to good health and better quality of health in later years. A child's eating pattern was determined by what was accessible and available (Kwinda *et al.* 2011: 57) at the time and therefore whatever the child was fed at ECD centres was important. It was thus important that essential nutrients were included in all meals and snacks provided to children and they should include a variety of foods from each food group.

Research conducted by Davis and Brann (2017: 1-4) in the United States of America (USA) indicated that vegetable gardens were introduced in childcare facilities to assist in providing the centres with adequate vegetable intake in the children's meals; however, there were some centres that faced challenges such as lack of time and volunteers in implementing this programme. The result of their study was that childcare providers were more informed and were willing to try to meet the children's nutrition requirements. The intake of vegetables had also increased in these childcare centres.

ECD centres had a planned menu which needed to be analysed to assess whether the nutrients and energy requirements of young children were being met (Wolmarans and Wentzel-Viljoen 2008: 809). Gidding, Dennison, Birch, Daniels, Gilman, Lichtenstein, Rattay, Steinberger, Stettler and Van Horn (2006: 548) stated the importance of bridging the gap between the recommended diet of children and current dietary practices, which included eating patterns, food choices made and adequate intake of a variety of specific nutrients. Gidding *et al.* (2006: 545) emphasised that regular, small healthy meals for a two-year-old should be rich in fruit and vegetables, whole grain and cereals, meat and meat alternatives (like fish or legumes). Trans and saturated fats and any added sugar or salt should be avoided, and physical activity should be encouraged.

1.5 Related studies conducted in South Africa (2000 - 2017)

1.5.1 Studies conducted in South Africa from 2000 - 2017 on child care facilities and ECD centres

Several studies relating to ECDs have been previously conducted in South Africa (refer to Table 1.4) and were used in this study to assist in the process of identifying the gap in the research. The research conducted by Nzama (2015: 147) revealed several issues where the focus was on registered childcare facilities in Inanda. The findings were that the nutrition knowledge of the caregivers was lacking, resulting in meals with inadequate nutrients being provided to young children aged 2-5 years who spent most of their day at these facilities. The South African government introduced a strategy of subsidizing registered childcare facilities to address malnutrition; however, based on Nzama's study (2015: 148), the subsidy was not allocated solely to cover the meals of the children but also to staff salaries and other needs within the facility. The Diet Reference Intakes (DRIs) for energy was not met by all the childcare facilities at Inanda. Food handlers did not get adequate training on meal planning, food safety and hygiene practices although they had well-equipped kitchens for food preparation and serving. It could safely be assumed that ongoing attention would be given to these registered childcare facilities by the DSD; however, based on these findings there was a clear indication that no official follow-ups and training were done at these centres. It was thus seen as crucial that both registered and nonregistered childcare managers and food handlers received annual training on all activities in the childcare facility (for example, nutrition knowledge, meal planning, portion size, food safety and hygiene practices). This lack of training and supervision has created a field for research on childcare facilities that are not registered within the INK area to establish whether food safety and hygiene practices in ECD establishments are receiving attention. This was necessary in order to create awareness of such practices, to offer guidance and to ascertain whether nutrition knowledge was being applied in menu planning by the caregivers in ECD centres in Ntuzuma.

Table 1.3: Childcare facility studies that have been conducted in South Africa from 2000-2017

Author & Reference	Study Population	Measuring Tools	Results
1. Dannhauser, Bester, Joubert, Badenhorst, Slabber, Badenhorst, Du Toit, Barnard, Botha and Nogabe. 2000 Nutritional status of preschool children in informal settlement areas near Bloemfontein, South Africa.	Preschool children (<72 months) from two informal settlement areas, Joe Slovo and JB Mafora, near Bloemfontein, South Africa	Standardized questionnaires Dietary intake 24-hour recall Anthropometric measurement Laboratory tests Blood samples Stool samples	Total protein was higher than the RDA. Micronutrients (energy, iron, vitamin C, zinc, niacin, riboflavin, thiamine, vitamin A, B6 and D) found to be lower than RDAs. Omega 3-fatty acid consumption was also low.

Table 1.3: Childcare facility studies that have been conducted in South Africa from 2000-2017 continue

2. Faber, Phungula, Venter, Dhansay, Benade. 2002 Home gardens focusing on the production of yellow and dark-green leafy vegetables to increase the serum retinol concentrations of 2-5-year-old children in South Africa	2-5 year olds that attended the growthmonitoring sessions at the Isizinda in Ndunakazi village were studied	Socio-demographic questionnaire Blood samples Anthropometric measurements Dietary intake recorded	More home garden projects were implemented in the village. Frequent consumption of yellow and dark-green leafy vegetables increased the serum retinol concentration of 25-year-olds. Nutritional status of children improved and home gardens increased intake of vitamin A rich food.
3. Pietersen, Charlton, Du Toit and Sibeko. 2002 An assessment of the nutrient content of meals provided and facilities present at state-funded crèches in Cape Town.	Sample size of 1974 children older than 3 years and 1/3 older than 5 years old	Pre-tested questionnaire 9-item multiple choice test Krupps electronic food scale (denominator = 2 g) Computerized Food finder nutrient assessment package Anthropometric measurements were performed in 275 children (134 boys, 141 girls).	None of the meals sampled met one-third of the RDA for energy, calcium or iron for both age groups. Thiamin, riboflavin, vitamin D, vitamin E, folate and zinc content were also particularly low. Seventeen of 77.3% of the meals provided no vitamin D; 10 (45.5%) did not provide vitamin B12; 5 (22.7%) did not provide vitamin A; and 3 (13.6%) did not provide any vitamin C.
4. Kwinda, Van der Spuy, and Viljoen. 2011 Application of a foodbased dietary guideline as nutrition strategy in crèches to enhance vitamin A consumption.	20 operating crèches in Limpopo and 100 respondents (caregivers, managers, food handlers)	Self-administered questionnaires Observation checklist A vitamin A game and score card developed	Caregivers' nutrition knowledge had improved in Phase 3. Creche gardens were beneficial with consumption of vitamin A rich food. Phase 3 showed an increase in indigenous vegetables served with meals when compared to Phase 1.
5. Grobbelaar. 2014 Child and youth care workers were profiled it to nutrition knowledge and food safety and hygiene practices	Residential care setting randomly selected in Durban CCWs (n=40) employed on permanent and part-	Structured self-administered questionnaire was developed and tested and used to gather	Women aged 18-34 years' old Fair knowledge on general nutrition guidelines Not enough knowledge on the recommended fruit and vegetable

Table 1.3 Childcare facility studies that have been conducted in South Africa from 2000-2017 continue

	time basis were also included in the study	information on nutrition knowledge, food safety and hygiene practices.	intake, correct serving size, and variety of food intake Knowledge on food safety and hygiene were inadequately demonstrated
6. Faber, Van de Hoeven, Osei, Kruger and Smuts. 2015 Effects of African leafy vegetables on the micronutrient status of mildly deficient preschool children in South Africa: a randomized controlled study	239 Learners from Grade R to Grade 4 from two farm schools participated Parents or guardians of learners were also encouraged to participate.	Nutrients composition of African leafy vegetables (ALV) 24-hour recall Blood samples and EDTA coated tube Anthropometric measurements	All ALV dishes were rated as good or super foods ALV contributed 11.6g15.8g Fe and 1.4-3.7 mg Zn No estimated intervention was found.
7. Nzama. 2015 Nutritional adequacy of menus offered to children 2 to 5 years in registered child-care facilities in Inanda	CCFs (n=10) at Inanda were randomly selected Boys (n=91) and girls (n=109) of ages 2 to 5 years old	Socio-demographic questionnaire Menu analysis using a Food Finder version 3 software Anthropometric measurements to measure weight and height of children Interviews done with food handlers.	For children: 79% came from extended families headed by a female 1.74% displayed severe stunting 5.42% displayed stunting 13.79% were overweight 2.46% were obese 34.48% were possiby overweight Top 20 foods served were all cereal based, rice and maize meal consumed more than meat Dairy products and fruit and vegetables were served less frequently. 60% of daily requirement for energy, fibre, calcium and vitamin C were not met by all the CCFs. CCFs were wellequipped, and had designated kitchen for storage, preparation and serving of food and had good hygiene practices. Highest form of education for caregivers: 48% had standard 10. 54.27% were employed permanently 64.71% were employed informally

Table 1.3: Childcare facility studies that have been conducted in South Africa from 2000-2017 continue

8. Laurie, Faber and Maduna. 2017 Assessment of food gardens as nutrition tools in primary schools in South Africa	Ten primary schools were selected in each of the nine provinces in South Africa. Garden administraters (n=66) and workers (n=55), educators (n=687), learners (n=2547) participated in the study	Questionnaire Five-point hedonic scale Checklist for school garden	Learners' attitude towards food gardening and eating vegetables and fruit were positive. More than 80% of the gardens had spinach, carrot, beetroot, cabbage, and onion growing in them. The role of gardens in school is to teach children about eating healthily and nutritiously. 84.1% learners, 81.8% educators agreed that vegetables and fruit (89.9% learners and 92.3% educators) taste good and that it is important to eat a variety of coloured vegetables and fruit daily. School gardens can increase the vegetable intake of meals prepared in schools.

1.6 Research aim and objectives

1.6.1 Study aim

The DSD's mandate was to develop guidelines for all ECD centres in SA which they would need to adhere to. Apart from emphasising the important aspects of a child's early developmental needs, these guidelines also focused on the safety and hygiene of the facility, and nutrition and menu planning (Department of Social Development 2006a: 2). The assumption was that registered ECD centres should follow and adhere to these guidelines; however, it was uncertain whether non-registered ECD centres also needed to conform to these guidelines.

The research aim of this study was therefore to determine the food safety practices and nutrition knowledge of ECD practitioners as well as the nutritional adequacy of menus served to children in nonregistered ECDs.

1.6.2 Specific objectives

- To determine the food safety and hygiene practices of ECD practitioners by means of a food safety knowledge and practice questionnaire
- To observe food handling and hygiene practices of ECD practitioners by using an observation checklist
- To determine the current nutrition knowledge of the ECD practitioners by means of a nutrition knowledge questionnaire
- To assess the menu adequacy of meals in ECD centres by means of a weighed food record survey and nutrient analysis of the menus
- To obtain and analyse microbial swabs to assess the bacterial count in respect of the food preparers' hands and food preparation work areas
- To make practical recommendations to the ECD managers with regard to any shortcomings observed and identified.

1.7. Relevance of the study

The South African government has provided funding to registered ECD centres; however, this did not mean that all ECD centres registered with the DSD would receive funding in the form of per-child subsidies (Berry, Jamieson and James 2011:48). The authors stated that this subsidy would be paid to ECD centres provided they had proof of attendance for each child that they had requested a subsidy for but this subsidy was not paid in full so ECD centres were required to find other means to cover the rest of the costs at their centres by charging monthly school fees to parents.

Early childhood development centres needed to provide children with meals that were nutritionally adequate to meet their daily nutrition needs. However, high food costs and the high unemployment rate effectively determined a child's eating plan since they limited the availability of food at the time (Kuzwayo 2008: 164). Food gardens and government funded feeding schemes were two of the interventions that have been implemented to assist in addressing inadequate nutrition intake in ECD centres (Atmore 2013: 156) and reduce childhood poverty especially in informal settlements.

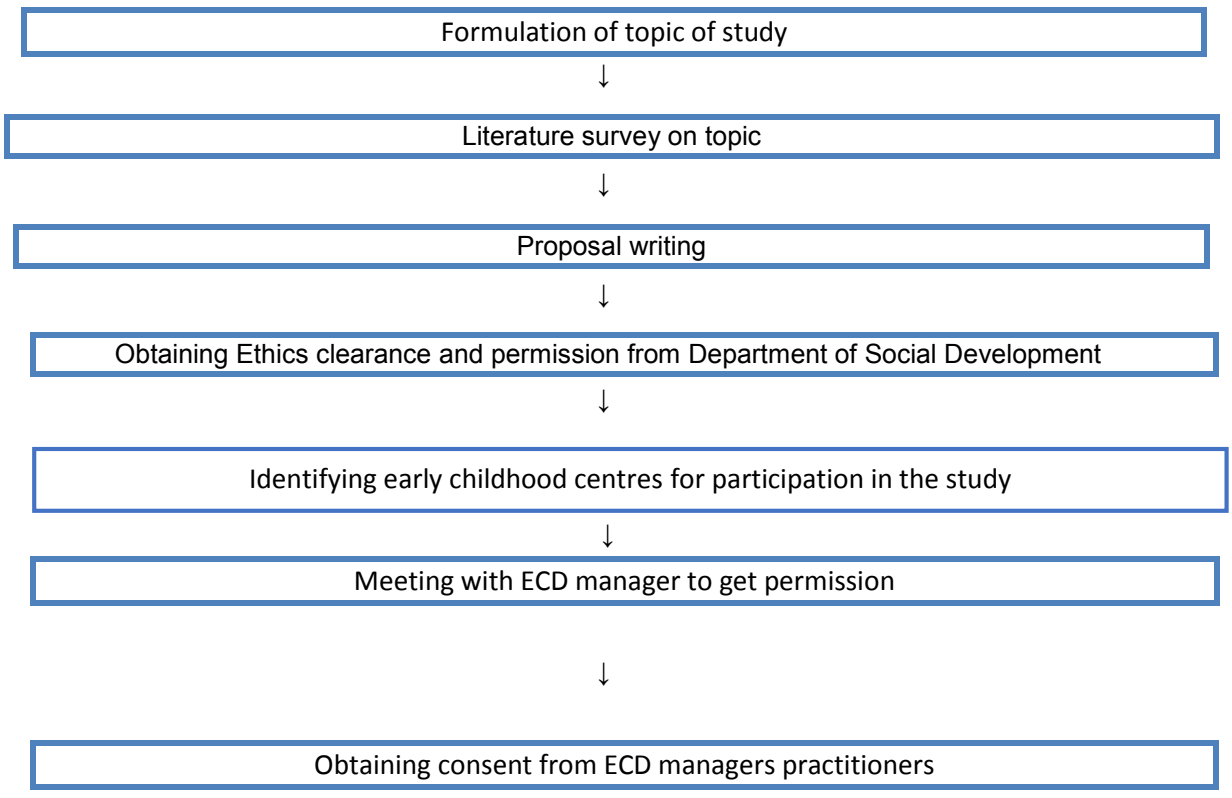
ECD centres were part of a community and staff employed at these centres were usually community members who had no formal qualification or ECD related training. This made it extremely difficult for the centres to run effectively as managers and practitioners might have inadequate knowledge on nutrition and food safety practices. The non-registered ECD centres were mostly found in informal settlements where the parents were socially and economically challenged and in need of affordable child minders to look after their children while they were at work. However, these centres might have poor facilities, might not have good hygiene practices and might serve meals that were nutritionally inadequate. This inevitably meant that the majority of the children might be malnourished and less likely to advance academically than their counterparts attending well-resourced registered faciltiies (Mbarathi, Mthembu and Diga 2016: 19).

This study was conducted in non-registered ECD centres in the Ntuzuma area of Durban, KZN. Ntuzuma township alone had a population size of 125 394 and more than 29 988 households (Frith 2011). Furthermore, Frith reported that 18% of the population in Ntuzuma had no source of income and therefore may have had to rely on social grants for financial support due to the high unemployment rate and inadequate investment from foreign countries (Gray 2006: 53). The unemployment rate for Ntuzuma was 50%, contributing to low levels of income a high level of poverty (Urban - Econ: Development Economists 2006: 11). This created concern in the Ethekwini municipality as they needed to invest in programmes to encourage economic growth in this area.

The DSD developed a set of guidelines for registered ECD centres to follow; however, it was uncertain whether these guidelines were known and followed by non-registered ECD centres. The reason for conducting this study in the Ntuzuma area in Durban was because no study on non-registered ECD centre was found to exist, creating a research gap requiring further investigation.

Undoubtedly, positive change had been seen in respect of ECDs in South Africa since 1994 but more still needed to be done in terms of infrastructure and the implementation of nutrition programmes and on-going training offered to ECD practitioners (Atmore 2013:155) at centres that were both registered and not registered with the government body. The poor facilities and lack of sanitation especially at nonregistered ECD centres posed a health and safety risk to those children attending these facilities since it was clear that an unsafe learning environment exposed children to illnesses and diseases which could be detrimental to their long-term life (Mbarathi, Mthembu and Diga 2016: 14).

1.8 Plan of research activities



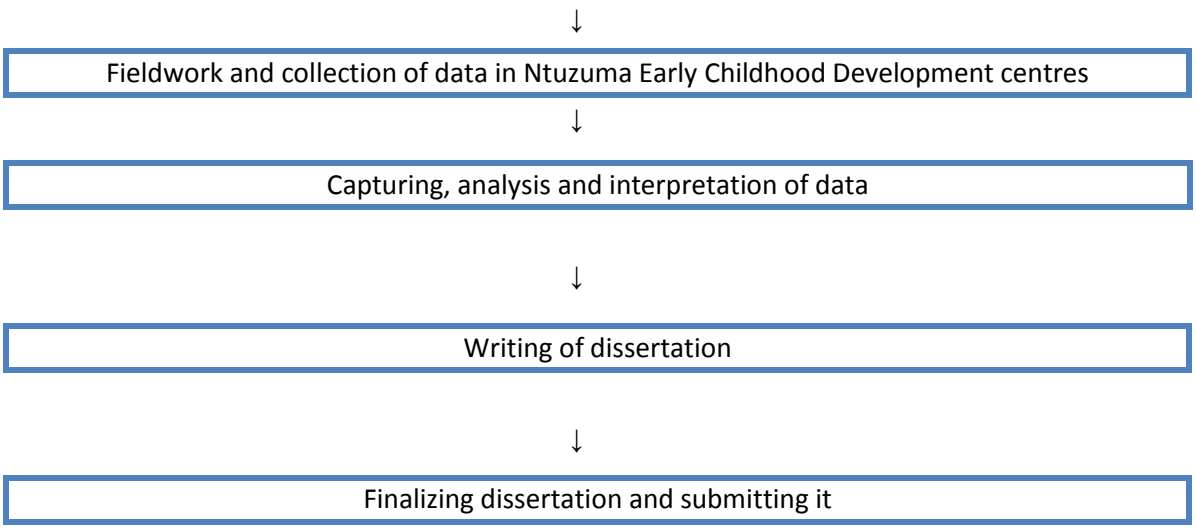


Figure 1.1: Plan of Research activities

1.9 Structure of the dissertation

Chapter One: Background and Motivation for the Study

Overview of legislation and guidelines for early childhood development centres set by the Department of Social Development, and the burden of malnutrition, worldwide and in South Africa.

Chapter Two: Literature Review

Review of studies on malnutrition causes and factors affecting the food intake of children; strategies to address these are explored. Food safety and hygiene practices are also discussed with special reference to child mortality.

Chapter Three: Methodology

Methods used during the study to collect and analyse data are explained.

Chapter Four: Results and Discussion

Interpretation and discussion of the results of the study

Chapter Five: Conclusion and Recommendations

The chapter draws conclusions on findings of the study and makes recommendations for future research.

1.10 Conclusion

Malnutrition has remained a growing concern among young children, especially in their early development stages because of the severe physical effects this has had (Atmore 2013: 156). It was also evident that poor nutrition at an early age has led to undernourished children whose low cognitive development and performance levels would put them at a distinct disadvantage in adulthood and which would affect both their social and economic productivity (Akombi, Agho, Hall, Wali, Renzaho, and Merom 2017: 1). Implementation of policies, laws and ECD programmes from all sectors involved in children's developmental rights and safety needs to happen in order to ensure a brighter future for all young children by introducing nutrition-based interventions to help children in rural communities to benefit and escape malnutrition and poverty.

Therefore, it is imperative that practitioners at ECD centres attempt to bridge this gap by making sure that adequate nutrition is provided to the young children at these centres in a bid to reduce the rising child poverty statistics in South Africa − and with government involvement surely this war can be won.

In Chapter 2, the literature reviewed describes the double burden of malnutrition in children, and strategies and interventions to address childhood malnutrition will be explained in greater detail. Romieu, Dossus, Barquera, Blottiere, Franks, Gunter, Hwalla, Hursting, Leitzmann, Margetts and Nishida (2017: 249) elaborated that obesity in children has coexisted with under-nutrition (macro- and micro nutrient deficiencies) and over-nutrition (high consumption of energy dense food) in the sense that they were both due to the quality of the diet being poor, and an imbalanced intake of energy, which increased the risk of non-communicable diseases in both low and middle income countries. In a study by Sartorius, Sartorius, Green, Lutge, Scheelbeek, Tanser, Dangour and Slotow (2020:6) the findings suggested that there was an increasing prevalence of obesity among children under 2 years in South Africa. It was therefore seen as important that everyone needed to join in fighting this epidemic.

Chapter 2: Literature review

2.1 Introduction

The purpose of this research study was to report on the food safety practices, nutrition knowledge and dietary diversity of non-registered ECD centres in the Ntuzuma area, Durban. This chapter will analyse the literature on malnutrition in children aged between zero and five years and the factors that influence malnutrition. The consequences of childhood malnutrition amongst children in this age category and the strategies required to be implemented in addressing childhood malnutrition will also be investigated. The chapter will further review the food safety and hygiene practices evident among food handlers in non-registered ECD centres, their nutrition knowledge and the dietary diversity of children aged zero to five years.

2.2. Nutritional needs of children under five years old

Malnutrition and food insecurity remained a huge burden, particularly in sub-Saharan Africa, with an increased amount of individuals becoming hungry and more than 795 million people being undernourished in the years 2014 to 2016 (FAO, WFP and IFAD 2015: 8). According to Fanzo, Hawkes, Udomkesmalee, Afshin, Allemandi, Assery, Baker, Battersby, Bhutta, Chen and Corvalan (2019: 16) the 2018 Global Nutrition Report indicated that less than half of children aged 6 to 23 months do not consume the recommended meals while a third of the school-aged children do not consume any fruit each day. Furthermore, research showed that a 69% of packaged food products were of poor nutrient quality in low and middle income countries.

In a study conducted by Madiba, Chelule and Mokgatle (2019: 6) on children attending informal preschool and day-care centres, it was reported that 20.5% of the children under five years nationally were underweight. In the majority of cases, when households faced food insecurity, the breadwinners, who were mostly mothers, relied on cheaper food to feed their families. The food consumed was usually served in larger portion sizes that were considerably high in energy but low in other essential nutrients (Drewnowski and Darmon 2005: 901). This then led to the limitation of essential nutrient absorption in low income households.

According to Hirvonen, Hoddinott, Minten and Stifel (2017: 303), it was important that caregivers knew which foods they needed to give to their young children in order to improve their nutritional status while eliminating infectious diseases that could hinder growth. In Ethiopia, about 7% of children 6 - 23 months old consumed a diet that was inadequate (Ayana, Hailu, Kuche, Abera, Eshetu, Petros, Kebede, Tessema, Allen, Salasibew and Dangour 2017: 2). In a study by USAID (2011: 9), it was reported that the majority of Ethiopian mothers held the belief that children under two years should not consume any vegetables as they felt that their stomachs would not be able to digest vegetables properly. Beliefs like this highlighted the importance of nutrition education to create awareness of the consequences of their actions and beliefs. In another study conducted by Meshram, Rao, Balakrishna, Harikumar, Arlappa, Sreeramakrishna and Laxmaiah (2019: 113) on Indian village mothers, it was reiterated that the nutritional status of children could be improved if mothers were educated about proper feeding practices

for young children. Furthermore, the nutritional status of children in Tajik was seen to have improved significantly as the prevalence of stunting dropped from 36.0% to 17.5% in 2005 (Barth-Jaeggi, Zandberg, Bahruddinov, Kiefer, Rahmarulloev and Wyss 2019: 7).

Children in childcare facilities spent most of their formative years in such settings so the food they received contributed significanty to the total diet, thus exposing them to as many food choices as possible made them more knowledgeable about making long-term (eating) decisions (Lucas, Patterson, Sacks, Billich and Evans 2017: 12) Therefore, it would be advisable to target improving dietary habits and preferences at preschool rather than later at home. According to Belew, Ali, Abebe and Dachew (2017: 5-8), if mothers were uneducated it might not be easy for them to understand the consequences of not being aware of the nutritional requirements of infants and young children and the importance of consuming a diversified diet. Mothers who attended monthly growth monitoring follow-ups were more informed on meal frequency and the recommended dietary intake. These follow-up programmes were supported by counselling and complementary demonstrations on food preparation. Furthermore, it was revealed that children who came from wealthy middle class to upper class families residing in urban areas were more likely to receive their daily recommended intake as they were more food secure compared to their poorer counterparts.

2.2.1 Diet Reference Intakes (DRIs)

The Food and Nutrition Board published the diet reference intakes (DRIs), which were the dietary recommendations used to plan and assess dietary intake and were currently used (Bier and Willett 2016: 1195). Four nutrient based reference values were used to refer to the DRIs. These nutrient based values included Adequate Intake (AI), Estimated Average Requirement (EAR), Recommended Dietary Allowance (RDA), and Tolerable Upper Intake Level (UL). These referred to the average daily intakes of essential nutrients and were used globally to gauge the average daily nutrient intake over time and accommodate deviation from the average value over a number of days (Meyers, Hellwig and Otten 2006: 23).

The aim of the DRIs was to help individuals or groups to optimize their health and eliminate deficiencies or diseases while preventing over-consumption of nutrients (Meyers, Hellwig and Otten 2006: 17). The DRIs were also used to measure whether an individual or group was meeting their daily recommended intake needs. Therefore, it was important to conform to the DRIs for accurate monitoring of diets for individuals and groups and to be aware that doing so ensured that such a diet provided adequate nutrient levels (Meyers, Hellwig and Otten 2006: 24).

2.2.1.1 Recommended Dietary Allowance (RDA)

This was the estimated daily dietary intake that satisfied the nutrient necessities of all healthy persons in a specific gender in their human life cycle (IoM 2006:10). The Recommended Dietary Allowance (RDA) was derived from the EAR and on average a sample of 97 ─ 98% of the population would be sufficient to measure the daily nutrient intake (Meyers, Hellwig and Otten 2006: 8).

2.2.1.2 Estimated Average Requirement (EAR)

This was the term used in group studies to measure the mean intake of nutrients of a group of people (IoM 2006: 10). The daily consumption value of EAR was met when 50% of a group of people at a specified life stage were well-nourished. EAR was useful when working with groups and was used in setting the RDA (Whiting and Calvo 2005: 8).

2.2.1.3 Estimated Energy Requirement (EER)

EER was used to evaluate the dietary-related energy intake necessary to sustain the body's energy levels. It was also used to maintain an adult's current body weight and activity levels. The EER included the needs associated with tissue growth (in young children and the secretion of milk among pregnant women and lactating mothers to make sure that they were in good health (Woodruff, Hanning and Barr 2009: 104).

2.2.1.4 Tolerable Upper Intake Level (UL)

This was used to estimate the population percentage at risk from high nutrient intake (Trumbo and Shimakawa 2011: 271) but which would not be harmful to the health of the whole group. The UL was set with the aim of increasing the use of dietary supplements by people in large groups and fortifying food with nutrients, other non-food sources and water (Meyers, Hellwig and Otten 2006: 12).

2.2.1.5 Adequate Intake (AI)

This was used if no sufficient scientific evidence was used to set the EAR. AI was expected to meet the needs of a sample of healthy individuals and if RDA was not available then AI was used to guide an individual's nutrient intake (Meyers, Hellwig and Otten 2006: 11).

2.3 Causes of malnutrition and factors affecting food intake among children under five years

2.3.1 The Conceptual Framework on Malnutrition

Malnutrition remains a growing health pandemic particularly in sub-Saharan Africa. This is caused by inadequate dietary intake and socioeconomic and environmental factors. Other factors will be illustrated by the UNICEF Conceptual Framework on Malnutrition which will be discussed later in this chapter.

A Conceptual Framework on Malnutrition (Figure 1.1) was developed in 1990 by The United Nations Children's Fund (UNICEF) as part of the UNICEF Nutrition Strategy to address the causes of childhood malnutrition. The two immediate causes of malnutrition were infectious diseases like pneumonia and diarrhoea that could be treated and inadequate dietary intake (UNICEF 2012: 3). The causes of malnutrition were influenced by multi-sectoral underlying factors classified as (i) household food security, (ii) maternal and child care and (iii) health services and the environment. In turn, the basic causes stemmed from political, social, economic, cultural and environmental factors such as natural

disasters that affected the households those children came from. An undernourished child would have poor academic performance due to poor cognitive development and as they grew older they would be unhealthy workers who would likely be absent from work because of illness, causing a strain on the economic status of the country. The determinant of a child's nutritional status was food security, adequate health care and a healthy environment (Malongane and Mbhenyane 2017:11; Black, Lutter and Trude 2020: 766). However, if these multisectoral factors were not achieved then this could result in low socioeconomic structure and productivity, and insufficient health services (UNICEF 1990).

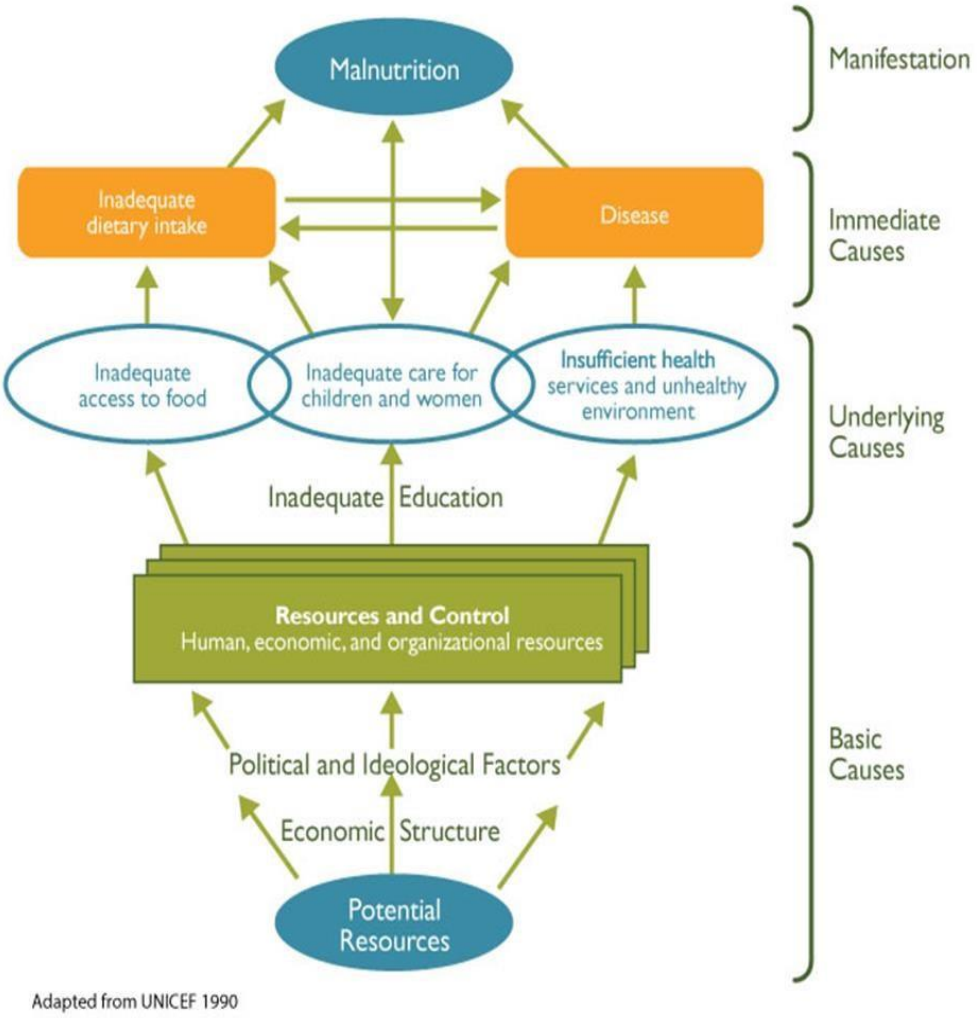


Figure 2.1: The Conceptual Framework on Malnutrition

The nutritional knowledge of caregivers would affect what children consumed on a daily basis and consequently affect their nutritional status. According to UNICEF (1990) and Black, Lutter and Trude (2020: 766), inadequate education had an effect on factors such as unhygienic health services and the environment, poor dietary intake and inadequate care. The type of food served, inadequate amounts and irregular frequency of meals could all result in inappropriate feeding practices, which could contribute to the poor nutritional status of children under five years if caregivers had inadequate knowledge and lack of awareness.

The underlying causes that affected child malnutrition were factors such as insufficient health care, food insecurity and an unhealthy environment. The findings amongst informal day-care centres were that these centres were poorly funded, which posed a risk factor with managers being unable to provide the children with a high quality, nutritious and well balanced diet. Furthermore, it was revealed that 30% of the children studied lived in poor environments with poor sanitation and only had access to an unsafe water supply (Rammohan, Pritchard and Dibley 2019: 12). This made them more vulnerable to diseases and infections which could manifest (Madiba, Chelule and Mokgatle 2019: 10). For young children to be healthy they needed to consume nutrient-dense meals to build a strong immune system. However, this was not the case in a study by Mathivha, Olorunju, Jackson, Dinh, Du Plessis and Goga (2019: 3) that revealed that 24% of caregivers in South Africa had to cut meal sizes and limit their daily intake due to food shortages. The findings by Nyathela and Oldwage-Theron (2017: 11505) on primary school children were that household food insecurity was still dominant in rural communities of Gauteng province and drastic measures would need to be implemented to lower this. Sanders and Reynolds (2017: 68) reported that although there was a decrease in inadequate access to food from 24% to 22% in 2016 in an attempt to minimize food insecurity in South Africa, this was still cause for great concern. In an initiative to enhance dietary diversity in rural Myanmar, home gardens were established in a bid to improve household food insecurity. The findings were positively received by the focus group as these gardens improved the intake of food and promoted diversity during meal times (Rammohan, Pritchard and Dibley 2019: 12).

About 2.1 million children were infected with the human immunodeficiency virus (HIV) but there has since been a decrease in children who were infected in the year 2016 (Mathivha, Olorunju, Jackson, Du Plessis and Goga 2019: 2). It was crucial for caregivers to have some background knowledge about caring for children, to be able to provide a nutritiously balanced diet, and to be able to handle food with care to avoid any form of foodborne diseases. Mamba, Napoles and Mwaka (2019: 3) revealed in their study that learners showed inadequate nutrition knowledge of the different food groups and of a balanced diet when questioned; however, the majority (72.7%) of them could make themselves breakfast in the morning thus displaying good nutrition practices. Access to a clean environment would reduce the high risk of infections so it was important especially for food handlers to always practice good personal hygiene and keep food safe and free from microorganisms at ECD centres.

2.3.2 Inadequate dietary intake

The term dietary intake simply means a set of guidelines for the daily intake of nutrients for the recommended dietary allowance (RDA). An adequate intake of nutrients as part of a balanced diet was important when children were still young and developing. An assessment of infants' and young children's dietary intake needed to be evaluated to ensure adequate nutrient intake was met (Swart and Dhansay 2008: 400). Nutrition education programmes needed to be targeted mostly at mothers and other women preparing food in particular as they decided what would be eaten during meal times and how the food would be prepared (Hongo 2003: para. 8 line 2). The growth and development of infants and young children depended on adequate nutrition and healthy eating habits. Children attending early childcare centres needed to be taught to enjoy a variety of foods to prevent inadequate nutrient intake.

In Nigeria young children attending early childcare centres were found to be consuming more carbohydrates with no proper balance of proteins and vegetables, leading to protein-energy malnutrition (Obarisiagbon, Omuemu and Okojie 2018: 155).

A study in KwaZulu-Natal (KZN) reported that the majority of the children in that province lacked dietary diversity as they consumed a diet low in animal products, fruit and vegetables rich in vitamin A and legumes because of the cost of living being high (Govender, Pillay, Siwela, Modi and Mabhaudhi 2017: 14). Nzama (2015: 141) also found in her study that the menus served at registered ECD centres at Inanda lacked essential nutrients such as vitamin E and dietary fibre due to low quantities of fibre-rich foods and vegetables being served. This was because of the lack of a variety of food items. In addition, children under five years attending informal preschools and daycare centres in poor communities in South Africa were undernourished as the quality of meals provided to these children was inadequate. These informal daycare centres were poorly funded, making it extremely difficult for managers to provide the children with nutritionally adequate food (Madiba, Chelule and Mokgatle 2019: 10). In contrast, in a study done in the rural areas of Limpopo of children aged 3-5 years old in daycare centres, it was revealed that maize meal and bread was predominantly consumed with all meals thus increasing their intake of iron and folate due to the fortification of these staple foods. Furthermore, the meals provided to the children were diverse as most foods included protein, starch and vegetable-rich foods, leaving no room for improvement (Mushaphi, Dannhouser, Walsh, Mbhenyane and Van Rooyen 2017:103, 107).

A menu could be defined as a detailed list of food items served in a single meal. Each meal should include more than one food from the same food group. The early childhood stage was the perfect time for children to start learning about the basics of healthy eating (Department of Health 2016: 10); however, ECD practitioners also needed to ensure that the food prepared in these centres was nutrientdense, appealing to the eye, tasty and enjoyable. This was also evident in a study by Fox, Gearan, Cannon, Brifel, Deming, Eldridge and Reidy (2016: 67) where it was mentioned that eating and taste preferences and patterns were developed very early on in a child's life, therefore introducing the correct food intake was critical to give insight into food choices that might contribute to under- and overconsumption of nutrients as their bodies were rapidly developing. Furthermore, Fox *et al.* (2016: 6) noted that 90% of the children in the US did not meet the recommended intake of vegetables even when they consumed food items like potato chips and ketchup. A study by Gerritsen *et al.* (2017: 350) also reported that children's menus in NZ had low servings of vegetables making it difficult for the children to meet their daily intake requirements. Moreover, the recommended dietary intake of vegetables was not met by 3-5 year olds attending childcare centres in Nebraska (Hasnin, Dev and Tovar 2020: 1727). The adequate consumption of fruits and vegetables by young children could be measured by the availability and accessibility of this food group so it was the responsibility of caregivers to ensure that they were frequently included in the preschoolers' diets (Ramsay, Shriver and Taylor 2017: 115). This in itself signalled the urgent need to increase vegetable and fruit consumption in children's diets at ECD centres.

2.3.3 Illnesses/diseases that may contribute to malnutrition

When the nutrient intake for normal body functioning was not met then malnutrition occurred, which led to adverse consequences in the growth and development of children. Malnutrition continued to contribute to deaths among children under five years old in poor urban slums in Faridabad. About 56.9% of these children were reported to have suffered from respiratory illness, 26.2% from fever, 22.3% from vomiting and 15.3% from diarrhoea. There was a relatively high proportion of stunting, wasting and underweight among children aged 1-5 years residing in these urban slums (Goyal, Lukhmana, Dixit and Singh 2019: 21). In the year 2020 there were globally 144 million stunted children, 38 million were overweight and 47 million were wasted. Chronic illnesses in children could be due to environmental or genetic factors, which allowed for exposure to infectious diseases because children who were wasted had weak immune systems which could lead to death if untreated (UNICEF, WHO, International Bank for Reconstruction and Development and The World Bank 2020: 1-2). Children who were malnourished become more susceptible to illnesses. It was these illnesses that weakened the immune system of a young child, which in turn caused this vicious cycle of infections and vulnerability to illness. South Arica had seen a decline in the rate of mortality from 37 908 in 2011 to 31 938 in the year 2015 and has continued to see a reduced death rate (Bamford, McKerrow, Barron and Aung 2018: S27).

2.3.3.1 Diarrhoea

Diarrhoea was an illness that accounted for more morbidity and mortality among children than any other disease. It was associated with three or more stool movements of a looser consistency than normal or regular bowel movements (Hany, Mohamad, Qubaisy and Mahmoud 2018: 36). The world had seen a decline in deaths due to diarrhoea; however, in a study by Anteneh, Andargie and Tarekegn (2017: 17), this problem had worsened as 21.5% of Ethiopian children were affected by diarrhoea. The possible risk factors associated with diarrhoea among children under five years in Egypt were reported by Hany *et al.* (2019: 6,8) to be children consuming unsafe water or food that had been left uncovered for an extended period of time with flies being present in the kitchen as well as improper food hygiene practices on the part of caregivers. To help prevent the contraction of waterborne diarrhoeal diseases, practising safe storage of food, hand washing and treatment of drinking water has proven to reduce diarrhoea among individuals as these measures would make a household resilient to challenges associated with diarrhoea in young children. The contribution to malnutrition made by diarrhoea was through inadequate absorption of nutrients and reduced food intake. Gavhi, Kuonza, Musekiwa and Motaze (2020: 1, 3) reported that 30.9% of South African children younger than five years died in 2018 due to severe acute malnutrition (SAM). The most common factor attributing to this high death rate was diarrhoea with over 63.8% of children succumbing to this disease.

2.3.3.2 HIV and AIDS

According to Ncube, Shackleton, Swallow and Dassanayake (2016: 1135), HIV and AIDS was a pandemic in sub-Saharan Africa affecting millions of people, including those in South Africa. People living with HIV and AIDS had an increased demand for nutrients for their bodies, making it important for them to eat the right types of food that would directly affect their health in a positive way. The relationship

between HIV and AIDS and nutrition in children younger than five was of serious concern because HIV compromised their nutritional status, contributing to a weak immune system that could not fight infections and causing malnutrition. Breastfeeding was essential for infants and young children for development and survival. Children born to mothers infected with HIV were at risk of mother-to-child HIV transmission. However, the risk could be eliminated through replacement feeding but this later led to malnutrition, diarrhoea and respiratory illnesses because the infant was not receiving protective antibodies from breast milk. An antiretroviral (ARV) drug was used as an approach to prevent the transmission of HIV from mothers to infants by reducing the viral load in breast milk (WHO 2017: 2; Nyoni, Sweet, Clark and Ward 2019: 2). Therefore, the use of ARVs and exclusive breastfeeding could promote child survival and reduce transmission in the process (Chege, Ndungu and Gitonga 2016: 2; Lawani, Onyebuchi, Iyoke, Onoh and Nkwo 2014: 379).

The WHO guidelines on HIV and infant feeding recommended breastfeeding for all infants, whether the HIV status was positive or negative, as long as the HIV positive mothers were compliant in taking their ARVs daily to prevent transmission. However, South African HIV positive mothers were concerned that exclusive breastfeeding would transmit the virus to their infants. Other concerns raised were insufficient breast milk, which would lead to mother's mix-feeding their infants before six months and the early introduction of complementary feeding. This raised concerns of an early introduction to complementary feeding (Chaponda, Goon and Hoque 2017:4). A similar study by Walsh, Robb and Nel (2020: 24, 26) reported that 85% of mothers agreed that HIV positive mothers could breastfeed their babies, while 80% of mothers agreed that mixed feeding in the first six months was unsafe for infants. Therefore, it was crucial that mothers infected with HIV were informed on safe breastfeeding practices and other possible feeding options (such as formula) as they were not adequately counselled on their HIV status and breastfeeding. Women needed to be encouraged and empowered so that they they were able to make informed decisions that would lower the risk of infection and diarrhoea among infants and young children.

2.3.4 Food security and its contribution to malnutrition

Although South Africa was food secure for now, this did not necessarily mean that every household had adequate food to eat every day. In order to measure whether the right to adequate food and water was met, one needed to see whether people had enough money to purchase food and whether there was availability of food at all times. However, if food prices continued to increase this would then compromise the quality and quantity of food consumed daily particularly in low income households (Mkhawani, Motadi, Mabapa, Mbhenyane and Blaauw 2016: 69). In female-headed homes in Limpopo, 53% of their monthly income was spent on food. They might have had purchasing power but were restricted from purchasing other household goods because of their limited income. This contributed directly to the poor nutritional status of everyone in that household. The poor became more vulnerable to food price increases because the higher the dietary quality, the costlier the food items became (Mkhawani *et al.* 2016: 69, 74).

Mbhenyane (2017: 5) stated that indigenous foods could be a powerful source of nutrient requirements. Furthermore, Mbhenyane (2017: 6) reiterated that traditional food crops such as fruits, vegetables, roots and tubers could play an important role in providing sufficient micronutrients that were diverse and of good quality while eliminating food insecurity as these plants grew spontaneously and had been around for many years serving mankind, particularly in rural communities.

About 1.2 billion of the global population had no access to clean, safe water for drinking which was detrimental to their health as it might increase the prevalence of water related diseases like diarrhoea and cholera (Waziri, Nor, Hook and Hassan 2018: 279). Unsafe water was a health hazard as it could be polluted, which then caused illness among those who drank it, affecting their health so better management of safe clean water was needed to overcome food insecurity. In an attempt to increase food production, irrigation management would need to be implemented so that the world could be food secure and have a diverse dietary intake (Zhang and Shen 2019: 1). It was estimated that each year one million people died due to foodborne diseases and 1.5 million children died from diarrhoea (Pal, Ayele, Hadush, Panigrahi and Jadhav 2018: 2); such high estimations could not be overlooked but needed to be addressed urgently.

Twenty-one point forty-two percent (21.42%) of children under the age of five in Ethiopia were food insecure and mothers or caregivers had to come up with ways of coping with these challenges. Some of these strategies were getting children to skip their meals or selling household items to buy food. However, these strategies had worsened food insecurity among these poor households and could have contributed to the possibility of these young children being malnourished (Tebeje, Biks, Abede and Yesuf 2020: 12).

The NFCS reported that the majority of households in South Africa (SA) were food insecure which had led to the high prevalence of stunting (Labadarios *et al.* 2008: 536). According to Govender, Pillay, Siwela, Modi and Mabhaudhi (2017: 5-6), KZN had a serious problem of stunting and would need to address this by improving the nutritional status of children in this area. This action might also help in breaking the cycle of poverty for children under five years as limiting the nutritional diversity of foods still posed a major threat. One way of addressing the problem of food insecurity was to adopt agriculture as a viable option for safeguarding food and nutrition security although this might only be part of the solution.

2.3.5 Childhood poverty

The global problem of poor nutrition was deeply rooted in poverty (UNESCO 2015:50). In developing countries, awareness of childhood development was gaining momentum because one death was seen as one too many (Engle, Black, Behrman, De Mello, Gertler, Kapiriri, Martorell and Young 2007: 229). An estimated 689 million children living in multidimensional poverty (Bessell, Siagian and Bexley 2020: 3) had not reached their optimum developmental due to poverty, inadequate nutritional intake and low cognitive stimulation (Walker, Wachs, Grantham-McGregor, Black, Nelson, Huffman, BakerHenningham, Chang, Hamadani, Lozoff and Gardner 2011: 1325).

The Sustainable Development Goals (SDG 1) were urgently introduced as a call for action across all countries to end poverty in all forms while improving the health and education and other deprivations of those who were vulnerable (Roelen, Morgan and Tafere 2019: 12). Poverty in South Africa in the year 2015 was on the rise even when the upper-bound poverty line (R992 per person per month) was applied. This was evident as more than 30.4 million South Africans were reported to be living in poverty (StatsSA 2017: 14) with 3 969 000 being young children and with the Eastern Cape, KwaZulu-Natal and Limpopo provinces ranking highest (Pretorius 2016: 20). In the rural areas of Limpopo child poverty continued to increase (78.7%) with poor economic growth and urbanization on the rise, exposing the poorest children to multiple environmental health risks (Mathee, Barnes, Naidoo, Swart and Rother 2018: 284). Poverty was not only measured based on income but also on the impact HIV and AIDS had on family members who were household breadwinners and the resulting lack of unemployment (Martin and Rosa 2002:1-2).

This was the reason the South African government declared war on poverty and vowed to fight until the end by introducing the Child Support Grant in 1998, which was the biggest poverty alleviator to date, to curb the poverty experienced by children in South Africa (UNICEF 2007: 5). This social grant was welcomed by many (11.9 million beneficiaries) to improve food consumption but yet people were still food insecure. According to Waidler and Devereux (2019: 682-684), the child support grant (up to 18 years) payout was R400 per month to those who had been approved to receive this grant. Furthermore, they concluded that there had been no significant effect on the improvement of food and nutrition security as money alone could not change the current status of malnutrition and much more needed to be done.

2.3.6 Unhealthy environment

Environmental problems have played a significant part in the burden of disease in South Africa. According to the WHO, in the year 2012, 12.6 million deaths worldwide were attributed to an environment that was unhealthy (WHO 2016: para1). One of the countries with a challenging environmental problem was South Africa due to poverty and high levels of inequality. These risk factors included inadequate sanitation and hygiene, contaminated water, climate change and air pollution (Wright, Dominick, Kunene, Kapwata and Street 2017: 915, 920).

Children's right to a clean and safe environment was undoubtedly seen as fundamental as these children were living in poor conditions where the environment that surrounded them was unsafe. The South African government had improved some of the risk factors to improve the lives of the less fortunate by building RDP houses, introducing feeding schemes and providing the basic necessities, with these developments contributing to a decrease in preventable illnesses and deaths amongst young children. A study by Prüss-Ustün, Wolf, Corvalán, Neville, Bos and Neira (2017: 469) confirmed that unsatisfactory environmental factors had contributed significantly to the burden of communicable diseases.

Childhood mortality and morbidity in Senegal was caused by diarrhoea, particularly in children under five years old and affecting girls more than boys. Diarrhoeal occurrence was strongly associated with socioeconomic status and poor household conditions (Tian, Zhu, Chen, Liu, Li, Yu, Zhang, Xiang and Sun 2016: 2, 8). Wasihun, Dejene, Teferi, Marugan, Negash, Yemane and McGuigan (2018: 2) reiterated that areas in Ethiopia where there was unsafe water, poor sanitation and low socioeconomic status contributed to diarrhoeal deaths as well.

The National Integrated ECD policy (2015) stated that ECD programmes should aim at providing support, day-care and early learning to children attending ECD centres. However, this sector was faced with challenges which made it difficult to bring about change especially to those living in disadvantaged communities. The skills gap and inadequate knowledge and training on the care of children were some of the stumbling blocks that needed to be resolved (Baloyi and Makhubele 2018:10774).

2.3.7 Insufficient health services

An unhygienic environment and inadequate health services were seen as some of the underlying causes of malnutrition among children. In 2014 the government of Kenya and UNICEF reported that 2.1 million children under two years were stunted while 1.1 million had missed their routine vaccinations (Roelen, Morgan and Tafere 2019: 26). Immunization was seen as a cost-effective way of driving the child mortality rate down and was introduced by the public health sector worldwide; however, 23 million children missed their recommended vaccine schedule in spite of easy access to healthcare facilities and parents being more educated (Restrepo-Mendez, Barros, Wong, Johnson, Pariyo, Wehrmeister and Victora 2016: 1-3). Some of the strategies mentioned by Bright, Felix, Kuper and Polack (2017:14) were to increase healthcare services for children by providing them closer to their homes and texting reminder messages about the children's immunization programmes.

2.3.8 Education of caregivers at ECD centres

The education and preparedness of caregivers was essential in improving the quality of caregiving, but ongoing training was critical in raising the standards of childcare workers (Gable and Hansen 2001: 39). The DSD (2006: 35, 42) regulations required all practitioners to undergo training on early childhood development and management of programmes and facilities. It further stated that first aid training should be undertaken by all staff members in the ECD. The development of a training programme could create better educated and skilled caregivers who would be more child oriented and take better care of children (Totenhagen, Hawkins, Casper, Bosch, Hawkey and Borden 2016: 586). However, Baloyi and Makhubele (2018: 10777) reiterated that this sector was faced with bigger challenges and the government needed to relook at the conditions surrounding these ECD centres as that would ultimately improve their overall quality and service standards specifically. It was of paramount importance to understand the effect that limited space and infrastructure, and the lack of nutrition knowledge and support that surrounded these centres had on them. Short skills programmes and full diplomas should be made available by the government to both registered and non-registered ECD caregivers so as to allow for improved ECD service delivery. The training provided should include practical instructions and demonstrations as well as support onsite by DSD officials (Baloyi and Makhubele 2018: 10780).

Mothers of children attending ECD centres also needed to be educated on the importance of providing their young children with essential nutrients needed for growth and development. Smit, Kassier and Koen (2017: 131- 134) revealed in their study conducted in the Western Cape province that basic nutrition knowledge for schoolgoing mothers was important to allow them to make wise decisions as they had buying power. The main determining factor affecting food choices amongst these mothers was the high cost of food. Furthermore, mothers from lower socioeconomic backgrounds expressed the view that fruit and vegetables were costly and they preferred buying from informal vendors who were more affordable. Sweets and chips were also a more affordable alternative to fresh fruit or healthy food options. This clearly proved that empowering mothers with more knowledge would allow them to make better choices and more easily identify foods with a high nutritional value while working on their children's perception on differentiating between junk and healthy foods. Teachers could also advocate and influence the children's attitude to make healthy choices which would then spill over into their home environment.

In another study on mothers of school going children it was observed that these mothers had gained a significant amount of knowledge on nutrition after undergoing training on nutrition knowledge and awareness. This emphasized the importance of educating mothers on proper nutrition so that they could better take care of their children's nutritional needs as well as those of their families (Rani and Sangwan 2016: 297-298). Furthermore, Angeles-Agdeppa, Monville-Oro, Gonsalves and Capanzana (2019: 8) reiterated that mothers with good nutrition education were responsible for creating an environment that could foster healthy eating behaviours.

2.3.9 Nutrition knowledge of caregivers at ECD centres

Healthy feeding was essential in a child's life cycle (Sousa, Javorski, Sette, Pontes, Santos and Leal 2017:3) Empowering and supporting caregivers was an important factor that would be demonstrated in the child care they were likely to provide (Kreader, Ferguson and Lawrence 2005: 2). Caregivers played a pivotal role in the children's overall experience since these children spent the majority of their time at daycare centres. Therefore, most of their dietary nutrient intake should come from the meals consumed at these centres daily. This is why emphasis on the education of caregivers on nutrition was so important so that they too could engage on topics based on healthy meal planning (Looby, Frost, Gonzalez-Nahm, Grossman, Aoki and Benjamin-Neelon 2020: 122). Optimum nutrient-dense meals were needed by preschool children for growth and development and they relied on caregivers to provide for them (Sisson, Kiger, Anundson, Rasbold, Krampe, Campbell and Hoffman 2017: 37).

In Nairobi it was observed that caregivers had poor hygiene and feeding practices as they did not practice washing their hands or the hands of the children in their care with soap and water before feeding. The meals consumed by the children consisted of bean soup and rice; however, the beans were not visible in the soup. This indicated that the childrens' diet should consist of a variety of fruits and vegetables, from green leafy vegetables and other protein rich food sources (Mwase, Mutoro, Owino, Garcia and Wright 2016: 50). In another study in Brazil it was revealed that mothers and caregivers had inadequate feeding practices with children under two years old (Sousa, Javorski, Sette,

Pontes, Santos and Leal 2017: 7). Furthermore, the intake of almost all food groups was less than 50% of the recommended average daily intake amount in most of the childcare centres in New York. These results suggested that providing nutrition education to primary caregivers and parents of young children was significantly important as the home meals offered might be less healthy than those offered at childcare centres (Dixon, Breck and Khan 2016: 2453-2455). The introduction of food gardens and government funded feeding schemes were some interventions that Atmore thought could assist in addressing inadequate nutrition in ECD centres in South Africa (Atmore 2013: 156). A study in the UK proposed that daily eating plans and recommended portion sizes should be implemented for preschool children with the aim of providing a healthy balanced diet (Crawley 2011: 7).

Nutrition education was an intervention that contributed to nutrition knowledge and might lead to the improved nutritional status of the poor. In Poland it was observed that childcare managers were responsible for menu planning although they held no professional nutrition qualification. This resulted in the majority of the preschools not complying with the model food ratio (MFR) which was used to assess adequate supply of nutrients when planning a menu. However, after training it was revealed that more childcare centres had met the MFR recommendations for vegetables, fruit, milk, cheese, eggs and meat (Myszkowska-Ryciak and Harton 2018: 2, 5). According to Spronk, Kullen, Burdon and O'Connor (2014: 1713), research indicated that nutrition education programmes were important in educating people and giving them and their community sound knowledge on nutrition and dietary intake. Hongo (2003: para 8: line 1) reported that one needed to establish existing knowledge and observe practices of nutrition first before implementing such programmes as tools to create awareness within communities. Spronk *et al*. (2014: 1713) further elaborated that food security, or the cost of food and other related factors, which included beliefs, culture, income and availability, were what influenced the type or choice of food consumed. Research conducted amongst early childhood education and childcare teachers in New Zealand revealed that the basic concept of nutrition knowledge among preschoolers (2-5 years old) was far less than ideal. It was important that caregivers understood basic dietary guidelines and healthy portion sizes to create healthy food habits for children (Rapson, Conlon and Ali 2020: 10-11). Helmerhorst, Riksen-Walraven, Fukkink, Tavecchio and Deynoot-Schaub (2017: 430) recommended that amongst the caregivers they interviewed there were challenges in terms of practices and knowledge questions, revealing that there was a definite urgency for training of caregivers.

2.4 Early childhood development (ECD) in South Africa

In South Africa ECD was implemented in an effort to protect, support and improve human development, particularly young children, and give them the ability to reach their fullest potential (Richter, Tomlinson, Watt, Hunt and Lindland 2019: 295). In 2001 the country's White Paper 5 on Early Childhood Development made reference to the fact that "it is the State's responsibility to subsidize quality ECD services". There were three national departments that looked after early childhood development, namely the Department of Social Department, which provided the registration services and support to all registered ECD centres, the Department of Education for legislative direction and the Department of Health (Tshishonga 2020: 251-252). The role and responsibility of the DSD (Mbarathi, Mthembu and

Diga 2016: 23) was to register and monitor ECD centres, provide funding to ECD centres and develop policies, standards and norms for regulating the registration of ECD centres. The DSD also stated (2006: 19) that it was responsible for providing a budget for ECD services through Parliament's annual budget vote. However, there were still concerns surrounding funding as Mbarathi, Mthembu and Diga (2016: 18) reported that funding for maintenance and upgrading of these facilities was not being provided by the department, which created a burden in respect of the upkeep of the building infrastructure at these centres, as they were in no state for teaching and learning to take place.
A commitment was made by the South African government ensuring that every young child living in a poor settlement would have access to a good quality ECD service package by 2030. However, achieving this commitment has been a challenge due to rising poverty (Azzi-Lessing and Schmidt 2019: 1). The State of the Nation Address in 2019 given by President Cyril Ramaphosa stated that a second year of ECD would be introduced for all children before they registered for Grade 1 (Bamford, Martin, Slemming and Richter 2019: 149).

The Department of Social Development functioned under certain guidelines that included requiring ECD centres to have quality infrastructure to provide a safe and healthy learning environment, safe and clean water, proper sanitation and nutrition programme training of ECD staff (South Africa. Department of Social Development 2006: 46-50). Baloyi and Makhubele (2018: 10777) mentioned that during a discussion with one of the participants it was said that the issue of poor infrastructure restricted ECD managers from registering with the DSD. The DSD (2006: 33, 41) regulations emphasized the importance of a safe building and infrastructure which should comply with the national building and safety regulations to avoid unsafe hazards such as walls collapsing on the children and possibly leading to permanent closure of an ECD facility. A study by Mbarathi, Mthembu and Diga (2016: 17) also emphasized that the infrastructure of ECD centres needed to be in good condition. Another requirement by the DSD was that caregivers should undergo training; however, in reality many of the caregivers who worked at these ECD centres did not receive any form of training on early childhood development to better equip themselves to improve the quality of care for all the children. Richter, Tomlinson, Watt, Hunt and Lindland (2019: 304- 305) made reference to the fact that it was the environment these young children lived in that shaped and moulded their development. Furthermore, they suggested that for ECDs to foster critical brain development of the children, key ingredients such as love, safety, nutrition and discipline needed to be evident.

It was up to the government of South Africa to ensure that adequate training, skills, knowledge and support were provided at ECD centres for the wellbeing of the children, and it was suggested that government and other stakeholders come together in an effort to help generate income for the sustainability of ECD centres (Baloyi and Makhabele 2018:10778, 10781). Early childhood centres should be productive sites where young children could experience a safe environment, where they could be free to play and learn, and benefit from good nutrition and responsible caregiving (Richter *et al.* 2019: 306). According to the DSD (2006: 13), there were many challenges that faced young children and their families as the majority of South African children and their families lived in poverty with no access to quality ECD services. This put pressure on government departments to come up with solutions that

would support early childhood development services so that they could be more affordable and accessible to all families.

2.5 Food safety practices in ECD centres

2.5.1 Food safety regulations in South Africa

Food was crucial for life and food safety was the basic right of humans yet millions of people still died each year due to the consumption of unsafe food (Fung, Wang, Menon 2018: 88). The contamination of food by microorganisms caused serious economic distress and health problems globally and could occur at any stage from farm to table (Yang, Lin, Aljuffali and Fang 2017: 811). So it was important that consumers were protected against the risks associated with food and appropriate regulatory systems were put in place. The Department of Agriculture, Forestry and Fisheries (DAFF), the National Department of Health (DoH) and the Department of Trade and Industry (DTI) were the bodies responsible for food legislation that ensured all foodstuffs were safe for human consumption. They examined and approved products before they reached the end user and if there were products that didn't meet the standards, they were confiscated or destroyed (Gordon-Davis 2011: 8-9).

Jointly, these departmental authorities aimed to:

- Protect consumers from contaminated, harmful, mislabelled, unclean and adulterated food
- Protect the public by reducing food-borne disease incidences
- Provide a good regulatory basis for national and international trade of food
- Maintain consumer confidence in the food system by supporting economic development.
  (Gordon-Davis 2011: 8-9).

The DoH, through the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No 54 of 1972), established food regulations which controlled the manufacture, sale and importing of food. The DAFF, through the Disease Act, introduced laws affecting the animal and agricultural industry to ensure that animal and agricultural products were safe. This Act was able to reduce the incidence of public health threats such as Bird flu and Foot and Mouth Disease which could be introduced to the public by controlling the import and export of products (Gordon-Davis 2011: 9-10). Regulation R918 governing the Hygiene Requirements for Food Premises and the Transport of Food at district and local level was enforced by the DoH. Hygiene Regulation R918 ordered the environmental health offices at district level to assist with issues of food transportation and food control, and the application and issuing of Certificates of Acceptability for food establishments as they were qualified to do so (Gordon-Davis 2011: 11-12). The Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972) regulated the hygiene requirements for food premises.

a. Standards and requirements for food premises in South Africa

Food establishments must be designed and constructed in a safe location without any health hazards (DoH 2015: 10-12). The food on these premises and facilities should be hygienically handled to prevent food from being contaminated. The interior of premises such as ceilings, walls and surfaces of floors

must be easy to clean and not contribute to food contamination. Food premises must be able to open windows to allow for ventilation.
Food establishments should:

- Have adequate storage space to facilitate the separate storage of food, chemicals, equipment and waste.
- Have handwash-basins installed with running cold and hot water for staff and visitors.
- Have handwash-basin facilities with running hot and/or cold water for washing of hands and cleaning.
- Have effective pest control for the prevention of rodents and insects.
- Have waste/rubbish bins designed with closable lids.

The DSD (2006: 39-40) presented a set of guidelines for ECD managers on the requirements of food preparation areas for children:

- They should be separated from other areas, and be clean and safe for the preparation and serving of food to children.
- Storage areas for perishable food items must be cool at all times.
- The kitchen should be clearly designated and be out of bounds to the children.
- Clean safe water for drinking should be available and cleaning agents should be stored separately from food products.
- Food containers which store prepared food should be sealed at all times.

b. Standards and requirements for the display, storage and temperature of food

According to the DoH (2015: 16-17), storage shelves should be installed and kept clean, and food was not permitted to be stored on the floor. Food had to be kept at the correct temperature throughout preparation.

c. Standards and requirements for protective clothing

Appropriate protective gear was to be worn at all times by food handlers before entering the food premises and had to be kept neat and clean. People visiting the food premises had to wear protective clothing at all times and protective clothing was to be designed so that with the exception of the hands, the body did not come into contact with food (DoH 2015: 17).

d. Duties of the person in charge of the food premises and the duties of the food handlers

The responsibility for compliance was bestowed upon the owner of the establishment to ensure that the below-listed rules were in place. The food handler, on the other hand, was responsible for protecting the food from contamination and ensuring that demonstrated food handling practices did not create risks that could make food unsafe for consumption. Food handlers were to minimize risks and control food hazards (Gordon-Davis 2011: 17).

Table 2.1: Duties of the person in charge of the premises and the duties of the Food Handlers (DoH 2015: 18-21)

Duties of the person in charge of the food premises	Duties of the Food Handlers
All FHs are trained on food hygiene	Practice good personal hygiene behaviour by keeping finger nails short, hands clean and wearing clean clothes, regularly washing hands with water and soap at the beginning of each task and in-between tasks, after using the toilet, after touching the face and other parts of the body, after cleaning duties, after handling money, etc.
Effective pest control system in place	
Designated and hygienic waste storage areas with clean disinfected waste bins and regular and frequent waste collection schedules	
Effective waste removal	Not handling food when suffering from any illness
Overall cleanliness of the establishment	Refraining from smoking, spitting, blowing air into equipment or food, coughing, sneezing, sleeping and sitting on food and using the hand-wash basin for purposes other than for washing hands
Responsible for the standard of personal hygiene practice demonstrated by Food Handlers	
Establishment's compliance with all food regulation requirements	

2.5.2 ISO 22000:2005, HACCP principles and SABS standards in South Africa

The International Organization for Standardization developed the ISO 22000 standards that were globally accepted food safety management standards which might be applied to any sector within the food chain. For companies to show their consumers that they had a food safety system in place they had to be certified with ISO 22000. These standards were in line with the Codex Alimentarius Commission which allowed for hazard control systems to be established, thus ensuring safe food consumption. The Codex Alimentarius Commission, also known as the CAC Codex Alimentarius or "Food Code" in Latin, was introduced by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). Its purpose was to ensure that consumers received good products that were safe for every individual everywhere in the world. Furthermore, it sought to ensure that food was of an acceptable quality and that it did not present a health hazard to consumers. In addition, it aimed to guide consumers to make an effective choice of products whether of national or international origin (WHO 2018: 37). Additionally, with ISO 22000:2005, HACCP could be easily implemented by companies, making it more flexible. Unlike other food safety management systems, ISO 22000 was not

subject to specific requirements to meet compliance so companies could develop their own food safety programmes to suit their suppliers and consumers (Gordon-Davis 2011: 21).

Hazard Analysis and Critical Control Points (HACCP) was a management system used as a preventative approach to food safety. Food service organizations in South Africa also implemented the HACCP system because the local and international food supply chain required certification (GordonDavis 2011: 22). Management and employees needed to be 100% committed to the HACCP system for it to be a success. However, in a study by Sibanyoni and Tabit (2017: 670) only 40% of the food service managers in Mpumalanga knew what the HACCP programme entailed, indicating that a lack of knowledge was hindering food service delivery.

The mandate of the South African Bureau of Standards (SABS) was to promote, develop and maintain South African national standards, which in turn promoted quality services and products that conformed to the required standards. These standards were important guidelines in achieving appropriate food storage and handling practices applicable to the food industry, and were, namely, the Code of Practice for Food Hygiene Management, South African Bureau of Standards SABS No 10049:2001. The Code of Practice for the Handling of Chilled and Frozen Foods, South African Bureau of Standards SABS No. 10156: 2007 provided guidelines for the handling and processing of the cold chain, including good manufacturing practices, good hygiene and the application of HACCP (Gordon-Davis 2011: 21-22).

In order to control and maintain good hygiene there were five critical elements that needed to be in place (CAC/RCP1 2003: 11-12).

1. Time and temperature

It was important for temperature to be controlled during cooking, cooling, holding and storage to avoid undesirable food spoilage. The control of temperature was associated with time and therefore when controlling temperature, the time at which that temperature was achieved and maintained had to be taken into account.

2. Processing steps

These steps included the chilling, drying and chemical preservation of food.

3. Microbiological and other specifications

The HACCP approach was the most effective in controlling this element as a sound scientific method was vital.

4. Microbiological cross-contamination

Agents of contamination were transferable, therefore raw food and cooked food/ ready-to-eat food had to be kept separate. Access to processing areas should be restricted, and high risk areas needed to be controlled by the washing of hands and the wearing of protective clothing before entering the food preparation area.

5. Physical and chemical contamination

Food had to be protected from dust, metal, glass and other foreign objects. Control measures like screening devices should be in place as needed (CAC/RCP1 2003: 11-12).

All raw materials should be free from harmful substances that included pesticides, chemicals and toxins as the food handler was responsible for ensuring that all ingredients were of good standard for consumption.

2.5.3 Foodborne diseases

Lack of food safety was a global concern that mostly affected developing countries, particularly Africa and South-East Asia (Ijabdeniyi, Naraindath and Ajayeoba 2019: 1725). Devleesschauwer, Haagsma, Mangen, Lake and Havelaar (2018: 107) shared that foodborne diseases were an ever-present threat to public health, causing 600 million illnesses and 420 000 deaths globally. According to Van Cauteren, Le Strat, Sommen, Bruyand, Tourdjman, Da Silva, Couturier, Fournet, De Valk and Desenclos (2017: 1488), there had been 4.9 million cases of illnesses and 368 deaths of which 1.5 million were foodborne pathogenic related each year in France. More than four million cases were reported each year in Canada and Tiawan recorded 53% cases related to foodborne pathogens of which some were caused by the three leading microorganisms, salmonella, norovirus and vibrio parahaemolyticus (Lai, Chung, Wu, Fang and Chen 2020: 4). The WHO defined food-borne disease as an illness caused by consumption of food or water that was unclean or that had been infected or poisoned (Bogdanovičová, Necidová, Haruštiaková and Janštová 2017: 2; Bintsis 2017: 530). Unsafe food could be food contaminated by harmful substances, whether chemical, physical or biological, that could easily cause illness to an individual's health (Ijabadeniyi 2013: 976). The term cross-contamination was defined as the direct or indirect transfer of bacteria from one food item that was contaminated to another food item that was not contaminated, causing illnesses and infections. This was likely to occur if the food handler did not practise safe food handling, proper washing of hands and regular cleaning and sanitizing of surfaces in contact with food. The food prepared at ECD centres needed to be safe for consumption to reduce the contamination of microorganisms (Department of Health 2016: 11).

Special precautions needed to be taken during food preparation because direct contact with food might lead to food being contaminated with foodborne pathogens such as Staphylococcus aureus and E. Coli. These pathogens originated from kitchen equipment and surfaces where raw fresh foods were being prepared and were responsible for food poisoning and food spoilage (Biranjia-Hurdoyal and Latouche 2016: 1-2). Harmful microorganisms could be hazardous to human beings as they could multiply rapidly in food and on hands if proper procedures were not in place. Good hygiene practices were important in food preparation irrespective of whether the hands were clean or dirty (Tan, Lee, Bakar, Karim, Rukayadi and Mahyudin 2013: 2973).

2.6 Causes of foodborne diseases

Food that was unsafe was caused by bacterial, parasitic and viral microorganisms and chemical hazards that could already be present in food or appear due to contamination (Michaelsen *et al.* 2000: 235). The cooking of food was one of the critical control points; however, this should be combined with the washing of utensils with soap and water at critical times and proper hand washing. In Malawi it was reported that the practice by the majority of the caregivers of washing hands and utensils without soap at critical times such as during food preparation was a risk factor for food contamination leading to diarrhoea in children (Chidziwisano, Slekiene, Kumwenda, Mosler and Morse 2019: 294, 300). In another study conducted in the urban slums of Nairobi on daycare centres, Mwase, Mutoro, Owino, Garcia and Wright (2016: 50) observed that all the centres visited had poor hygiene practices as neither the caregivers nor the children aged 6-24 months washed their hands before feeding. The plates on which they served the meals were placed on a cement floor and allowed to accumulate dust while some children used their unwashed hands to feed themselves as they struggled to use spoons. Malnutrition was relatively common amongst this age group which meant that they were easy targets for infection and illness. Some of the effective strategies put in place were good hygiene practices, the provision of clean safe water and the preparation of safe food to significantly prevent childhood diarrhoea. Food and water-borne diseases were the main causes of poor nutrition, diarrhoeal diseases, stunting and ill health in young children. Strategies for the prevention of these diseases, to name a few, were washing hands with soap and running water before touching or eating food and using sanitized utensils for food preparation and during serving (Department of Health 2016: 11). According to Uduku (2011: 59), it was important to have adequate space for food preparation and proper storage and hygienic sanitation facilities at these centres to eliminate any risk of contamination of food.

Pathogenic microorganisms were used in several food industries as food preservatives because of their ability to withstand different temperature conditions during preparation and storage. Despite this, there were major biological organisms associated with foodborne diseases like Salmonella spp, Listeria monocytogenes, Campylobacter spp. and Escherichia coli 0157:H7 and about 250 more different microbial agents (bacteria, viruses, toxins, parasites) (Barba, Koubaa, Do Prado-Silva, Orlein and De Souza Sant' Ana 2017: 21). The use of food additives that were not approved and food intolerance could cause food allergies and cross-contamination could also cause illnesses (Bari and Yeasmin 2018: 195).

Food poisoning occurred when a human being ingested food or drank water that contained bacteria or toxins that had multiplied and become harmful, causing illness. The contamination of food could take place at any stage of the food chain, be it in the processing, packaging or transportation phase. There were three main sources of contamination: (i) food handlers (ii) unsafe food sources and (iii) utensils and contact surfaces (Gordon-Davis 2011: 62). However, according to Sani and Siow (2014: 210, 214), inadequate temperature in the final stages of cooking and during holding time, unsafe food sources, poor personal hygiene and unclean kitchen utensils were believed to contribute to foodborne illnesses. According to Gordon-Davis (2011: 34), food poisoning presented as toxic (bacteria multiplied before food was ingested) or as infective (bacteria multiplied after food was ingested), causing a stomach

reaction which then led to immediate illness such as diarrhoea. Food that was unsafe for consumption should be discarded to prevent possible foodborne illnesses. Appropriate hygiene measures also needed to be in place to prevent the contamination of food during the different stages of the food chain. These procedures should include proper hygiene and sanitation and disinfectant practices from farm to fork (Hennekinne, De Buyser and Dragacci 2012: 829)

2.6.1 Microorganisms

Microorganisms were organisms that were so small they could not be seen with the naked eye. They were found on body parts, surfaces and in the air. They were divided into four different types of microorganisms; (i) mould, (ii) bacteria, (iii) yeast and (iv) viruses. The production of beer, bread and cheese depended largely on yeast and mould to ferment these products; however, they could also cause spoilage in food (Gordon-Davis 2011: 27-28). Viruses needed a host (animal, human, water or plant) to survive as they were carried by food. They did not cause food poisoning but when food infected with a virus was eaten, this allowed the host's cells to be infected and multiply (Gordon-Davis 2011: 29). The most common foodborne viral syndromes were the Hepatitis A and E viruses and the Norovirus which were found in food contaminants (Bosch, Pinto and Guix 2016: 110). In a study on the emerging role of foodborne viruses it was reported that the two viruses responsible for viral gastroenteritis worldwide were the Hepatitis A virus and the Norovirus and they were transmitted through the oral and faecal routes. To avoid the risk of contamination it was advisable to take stringent measures during food preparation by washing fruits and vegetables before preparation, taking a day off if you were unwell, using clean water on ready-to-eat vegetable gardens and always washing hands before and after a visit to the toilet and during food production (Pal and Ayele 2020; 1, 4).

Bacteria were dangerous, harmful microorganisms that could produce poisonous substances in food but were beneficial during wine and yoghurt fermentation. They were responsible for the slimy substance found on fruits, in the air, on the body, in water, in the mouth and in soil (Gordon-Davis 2011: 29). Biological hazards such as Shigella, Vibrio parahaemolyticus, Bacillus cereus, Cryptosporidium Campylobacter jejuni, Salmonella, Clostridium botulinum, Cyclospora cayetanensis, E-coli 0157:H7, Listeria monocytogenes, Shigella, Staphylococcus aureus (*S. aureus*), Vibrio parahaemolyticus, Vibrio vulnificus Hepatitis A, and Clostridium perfringens have been reported to be the deadliest organisms to humans if found to be in contact with food (Ijabadeniyi 2013: 967). Furthermore, Bintsis (2017: 530) and Hennekinne (2018: 129) revealed that Salmonella, Campylobacter app and Staphylococcal were the most common foodborne causes of deaths.

S. aureus was an anaerobic bacterium which was an opportunistic pathogen among humans as it was able to multiply on a food handler's skin and on the mucous membrane. This pathogen could cause gastroenteritis if found in foods such as dairy, poultry and beef products and could adhere to food contact surfaces and multiply to form biofilms. Biofilms were diverse microorganisms formed by one or more species that could grow on food matrixes which were known as fungi and bacteria. *S. aureus* biofilms were enhanced by incorrect cooking temperatures and poor sanitation in the food preparation process and could cause detrimental illnesses such as diarrhoea and vomiting. *S. aureus* could survive

on food contact surfaces and end up contaminating other foodstuff in the food preparation areas (Schelin, Susilo and Johler 2017: 1, Galie, Garcia-Gutierrez, Miguelez, Villar and Lombo 2018: 1, 5). There were other ways in which *S. aureus* could cross-contaminate food surfaces such as talking, laughing and sneezing while preparing or serving meals. It was vital that food handlers were knowledgeable about and made aware of such information.

E. coli was a noxious pathogen which could pose a health risk to humans. This pathogen could be transmitted by consuming raw or uncooked meat, water contaminated with faeces, or eating unwashed fruit and vegetables. If school children were to consume food contaminated with E. coli they could suffer from haemorrhagic colitis and haemolytic uremic syndrome. These were severe foodborne diseases which caused acute diarrhoea, fever and abdominal cramps in children under five years (Zhou, Zhu, Hou, Lu, Yu, Mao, Mao and Sun 2018: 3). Sibanyoni and Tabit (2019: 96-97) reported that *S. aureus* (25.5%) was detected as the second highest pathogen followed by *E. coli* (15.6%), particularly on food contact surfaces. Young children in particular were vulnerable to these pathogenic bacteria and therefore frequent and effective cleaning of surfaces in contact with food before, during and after preparation could lower the risk of cross-contamination from one surface area to the next.

One of the largest peanut product recalls in the US was due to contamination by Salmonella spp. This saw more than 200 companies recalling foodstuffs with ingredients containing peanuts used in foods like candy, cakes, pies, brownies, cereals, cookies, snacks, pet foods and prepackaged meals. The major reservoir for Staphylococcus aureus was humans as they contaminated food either directly or indirectly; however, most cases were traced to food contamination in the production phase. This was due to improper cooking practices, low heating temperatures and inadequate hygiene practices (Bintsis 2017: 543-545).

Ready-to-eat salads are convenient to millions of people; however, in Italy they were found to harbour high microbial content during transportation and storage. This was why temperatures were frequently checked to ensure no high risk hazards were associated with these convenience foods. The study then concluded that rinsing salads before eating them and keeping them at a low temperature would be considered safest for those with weak immune systems and children (Calonico, Delfino, Pesavento, Mundo and Nostro 2019: 432).

2.7 Symptoms of food-borne diseases

Food products such as meat, eggs, dairy and poultry contaminated with Salmonella have been associated with clinical symptoms like fever, headache, diarrhoea, vomiting, nausea and abdominal pain or cramps (Lubis, Amelia, Arrasyid and Rozi 2019: 3304; Motladiile 2019: 1). Gordon-Davis (2011: 33) mentioned that symptoms such as headaches, abdominal cramps, vomiting and diarrhoea were caused by food poisoning illnesses. These symptoms could begin to manifest immediately depending on the bacteria type and might even lead to death. Every individual has suffered a foodborne illness whether knowingly or not because of contaminated food being consumed and the effects might have been mild to severe.

On the 5th of October 2018 more than 300 primary school children in Ninh Binh province experienced an outbreak of food poisoning. They suffered symptoms such as vomiting, nausea, headaches and abdominal pain, and it was believed that S. aureus could have been the reason for the outbreak with the laboratory test confirming it (Le, Dalsgaard, Andersen, Nguyen, Ta and Nguyen 2021: 48).

In a study on food safety of food handlers it was revealed that training programmes needed to be designed to address the nature of the food and its ability to spoil, the likelihood of contamination and the method of food handling, the extent of processing and food storage conditions. Management should periodically assess the effectiveness of training provided by assessing the demonstrated practices of FHs. Furthermore, training material would need to be evaluated and updated regularly to make sure that food handlers conformed to the established food safety procedures in order to keep food safe (CAC/RCP1 2003: 20).

2.8 Conclusion

As highlighted in the literature reviewed, malnutrition has been associated with an inadequate intake of nutrients that allow for optimal health. It encompasses both over- and undernutrition that have negative consequences in adulthood. There were a host of underlying factors that formed part of malnutrition, which included food insecurity, poverty, lack of clean, safe water to drink, poor sanitation and lack of adequate healthcare. Long-term health has been associated with good quality nutrition which started at an early age (Symington, Gericke, Nel and Labadarios 2016: 65). Children younger than five were more vulnerable to the prevalence of malnutrition, particularly in middle and low-income countries. This led to severe wasting and stunting in the later years of the child's life and was detrimental to their health. Childhood obesity has continued to be an epidemic that has gone on for far too long and urgent interventions needed to be implemented to minimize this prevalent public health problem. According to Lee and Yoon (2018: 658), obesity among children had increased with over 100 million affected in 2015 alone. In a study done by Symington *et al.* (2016: 67), one in ten children was overweight or obese, with Gauteng ranking higher than Mpumalanga. Furthermore, the implications of childhood obesity have resulted in many short-term health consequences such as type 2 diabetes, cardiovascular disease, gallstones, impaired glucose tolerance, respiratory morbidity, hepatic steatosis and hypertension. The long-term effects for children who have gained excessive weight were that they were more likely to become overweight or obese in adulthood. To tackle the pandemic among children, it was important that they adapted to a healthy lifestyle and became more physically active. Malnutrition was preventable provided the right interventions such as correcting unbalanced nutrition and discouraging the consumption of high energy foods at an early age were implemented (Symington *et al.* 2016: 68). The consumption of a diet low in saturated fats as well as sugary foods, and rich in green leafy vegetables would assist in increasing the diversity of meals consumed by these children and would lower the risk. According to Ahmed, Prendiville and Narayan (2016: 1), micronutrient deficiency caused more than one million deaths among children, with iron deficiency contributing to 115 000 of these deaths each year. Vitamin A, iodine, iron, vitamin D and zinc were essential nutrients needed by a child's body from an early age. If these vitamins were inadequately consumed it would be detrimental to a child's growth and

development. The SA government has played an important role in alleviating essential nutrient deficiencies, such as the fortification of staple foods as they are mostly consumed by the majority of the population. The introduction of community and home gardens was also a significant initiative in the increasing of household food basket diversity as well as promoting good quality vegetable intake. Furthermore, it was reported that the fruit and vegetable intake in KZN was poor due to the associated high cost and home gardens would help to increase their intake. (Govender, Pillay, Siwela, Modi and Mabhaudhi 2017: 8, 14).

The role that food safety practices among food handlers working in a children's institution played was important, for example, in ensuring that proper handwashing and sanitation was adhered to at all times. Safe food handling in the preparation area was pivotal especially when the food being prepared was for immediate consumption. This was essential to prevent the outbreak of foodborne disease caused by the contamination of foods, posing a danger to the health of others (Akabanda, Hlortsi and OwusuKwarteng 2017: 1). Therefore, educating food handlers on the necessity of practising proper handling of food in the kitchen, proper hand washing and proper storage of food was vital to prevent any possible illnesses. The WHO reiterated that foodborne illness deaths were likely to decrease due to the impact that food safety legislation has had. In order for this to be a success large food production companies together with the WHO needed to work together to reduce contamination of food throughout the food chain, ensuring that pathogens did not pose a health risk to humans (WHO 2015: 3).

Chapter 3: Research Methodology

3.1 Introduction

The key goals of this study were to determine the food safety and hygiene practices, and the nutrition knowledge of food handlers in selected non-registered ECD centres, while assessing the adequacy of the menus offered to the children in these ECD centres, and lastly to observe the food safety practices of the food handlers and analyse the food workspaces for bacterial count.

This chapter will focus on the planning and administration of the study, the study design, the study population, data collection procedures, and the sampling process and the instruments used will also be discussed. The data capturing process and the method of data analysis will be explained. The legal and ethical aspects of the study will also be covered. All these data were collected at non-registered ECD centres in the Ntuzuma area, Durban. The research methods were appropriately selected to meet all the research objectives.

3.2 Permission and consent to conduct the study

The study was approved by the Faculty Research Committee (FRC) at the Durban University of Technology. Ethical permission was obtained from the Institutional Research Ethics Committee (IREC) at the Durban University of Technology (Ethics number IREC 074/18).

Permission to conduct the study was obtained from ECD centre managers by means of a letter of information (Annexures A and B) outlining the purpose of the study and their expectations should they agree to participate. The managers were required to sign a manager's consent form (Annexures C and D) to give their written permission to conduct the study in the ECD centres and to approach the food handlers on the premises. After permission was obtained from the managers, practitioners and food handlers in each ECD centre were approached by the researcher. At a face-to-face meeting, the researcher explained the study to the food handlers with specific reference to their role in the study by referring to the practitioner's letter of information (Annexures E and F). The food handlers were allowed to ask questions and once they agreed to participate, a consent form (Annexures G and H) was signed indicating their written permission to participate in the study. The results would be made accessible to all participants at the conclusion of this study.

The participants were informed that there would be no monetary gain for taking part in this study. It was emphasised that participation was voluntary; therefore, participants could withdraw from the study at any time and without any adverse consequences. Participants were assured that the findings would be kept confidential and that neither their jobs nor their service levels would be affected by their participation or by declining to participate in the study.

All informative discussions and observations made would be held strictly confidential and no names (of the managers, practitioners or ECD centres) would be disclosed during the study. Data would be collected on the ECD premises during working hours by the researcher. All personal information and data collected would be stored in a locked cabinet in a room in the Department of Food and Nutrition

Consumer Sciences and would be disposed of by shredding after a period of five years, and electronic data would be password protected. Only the researcher and the supervisor would have access to this information.

3.3 Research design

The designing of the research is one of the important steps in conducting a research. The research is designed to help collect relevant and necessary information, and analyse this information (Abutabenjeh and Jaradat 2018: 238). According to Asenahabi (2019: 78) research design is defined as the structure to help answer research questions and objectives that have been previously outlined in the study to be able to provide a solution. The study was a cross sectional study which is a type of observational or descriptive research study that analyses data that has been collected at one given point in time across a sample population (Kumar 2011: 94) of nine ECD centres, to answer the following research question: what are the food safety practices, nutrition knowledge and menu adequacy at the sample ECD centres? This study was of a quantitative nature and data was generated through structured research measuring instruments that have been tested for their validity and reliability to ensure accuracy in measurements.

A number of research measuring instruments were applied to ensure that a better understanding of the research problem under investigation is obtained. The data in this study was generated through food safety and nutrition knowledge questionnaires, microbial swabbing, a plate waste study and a food safety practice checklist (observation checklist). These measuring tools were used to assess the food safety, nutrition knowledge and menu adequacy at the non-registered ECD centres.

3.4 Flow of the study

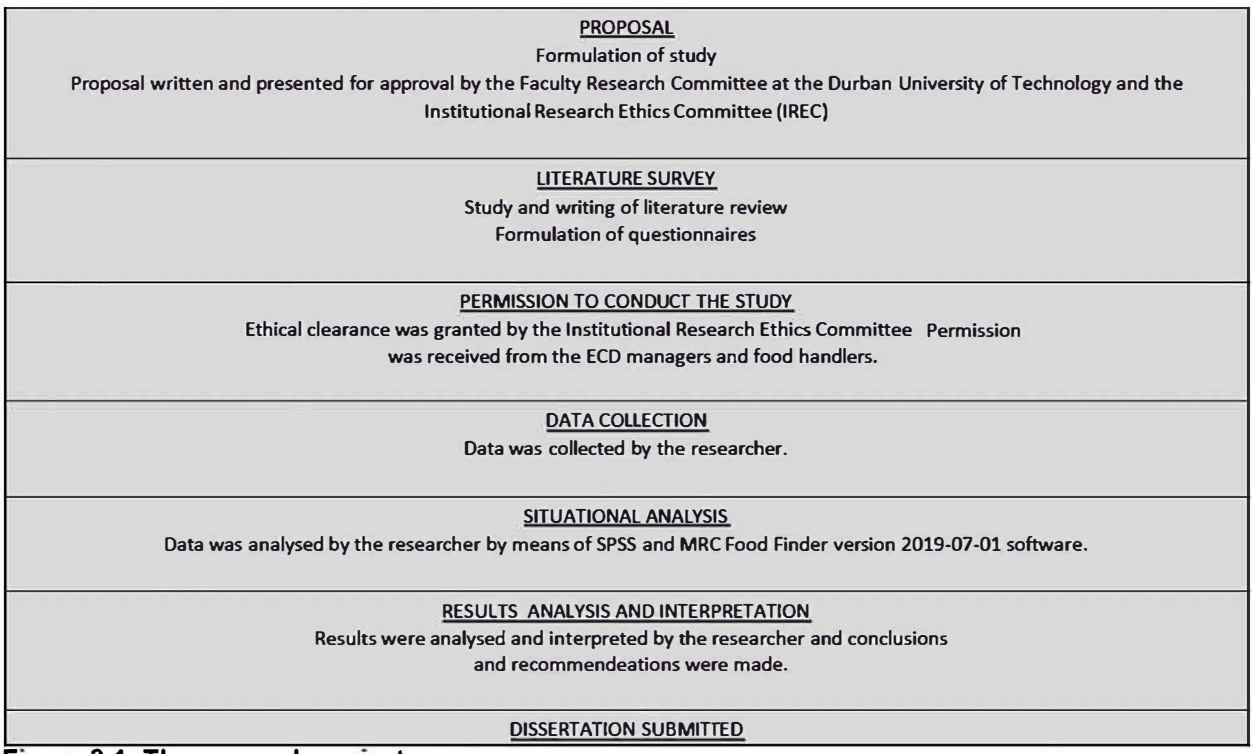


Figure 3.1: The research project process

3.5 Study setting

The study was conducted in ECD centres not registered with the Department of Social Development (DSD) in the Ntuzuma area near Durban. Ntuzuma fell within the jurisdiction of the Ethekwini Metropolitan Council. It was the newest of the three INK townships (Inanda, Ntuzuma and KwaMashu) built in 1970 and situated 12 km away from the Durban Central Business District. Ntuzuma township alone had an estimated population size of 125 394, with 99.5% being black African people, 11.8% being young children aged 0-4 years and with more than 29 988 households (Frith 2011: 1).

The researcher approached the Durban offices of the Department of Social Development to obtain a list of non-registered ECD centres (Appendix 2). The term 'not-registered or unregistered' means that owners who operate these centres do so illegally and therefore would need to comply with the provisions and requirements set out by DSD. Failing to do so they could be found guilty of committing an offense (Ndengo and Richard 2022: 157). At the time of the study, the ECD centres on the list provided by DSD were approached as not being registered, non compliant or had not met the requirement at that point in time and therefore would not receive the benefits from DSD as registered ECD centres.

The list indicated that there were 10 non-registered ECD centres within the Ntuzuma area and each of these centres agreed to participate in the study. Each centre had a centre manager and food handlers who participated in the study. The qualifying criterion was that each ECD centre should prepare meals on site. Furthermore, since these centres were not registered with the DSD, it was difficult for the government department to monitor whether the food prepared in these centres was nutritionally adequate and safe to consume.

3.6 Sampling procedure

A typical group of individuals were approached conveniently to take part in the study; therefore, the sampling method was convenience sampling (Etikan and Babtope 2019: 052). Convenience sampling or typically known as "accidental sampling" is non-random sampling whereby participants just happen to be within the geographic vicinity where data collection will be conducted, or because they are easily available or accessible and willing to partake in the study (Etikan, Musa and Alkassim 2016: 2).

This study focused on ECD food handlers working at each of the ECD centres in the Ntuzuma area that were easily accessible, and who agreed to participate. All the participants who were on the list were willing to take part in the study were all included. A list of only 10 non-registered ECD (n=10) centres based in Ntuzuma was provided to the researcher by the DSD's Durban office to assist in the sampling process. All ten of the centres were approached by the researcher and they all agreed to participate.

The questionnaires were piloted at one of the identified centres with a sample group to establish their suitability and were adapted, and the remaining ECD centres formed part of the study (n=9). Therefore, the final sample size was nine ECD centres with 1-2 participants at each centre. Eleven participants in total, of which two were food handlers who assisted the managers when they were not available and nine who were both managers and food handlers, formed part of the study.

This sampling procedure was implemented to achieve the aim of this study which was to determine the food safety practices and nutrition knowledge of ECD practitioners as well as the nutritional adequacy of menus served to children in non-registered ECDs.

3.6.1 Inclusion and exclusion criteria

The following were included in the study:

- Non-registered ECD centres in the Ntuzuma area according to the list obtained from DSD
- Managers and ECD practitioners 18 years and older involved in food preparation in the abovementioned centres.

The following were excluded from the study:

- Cleaners employed at the ECD centres
- Children attending the ECD centres
- ECD practitioners younger than 18 years involved in food preparation in the above-mentioned centres
- Parents of the children attending the ECD centres.

3.7 Fieldwork administration

Fieldwork was carried out by the researcher at each ECD centre. The researcher spent 2-3 days at each centre in order to conduct interviews with the managers, assist the food handlers with the completion of questionnaires, and conduct a plate waste study. All the observations of food handling and hygiene practices by practitioners and food handlers over and above those included in the checklist were noted down to assist in the data analysis and interpretation.

3.8 Administration of questionnaires

3.8.1 Data collection

There were various measuring instruments used to collect data for the study. The instruments were selected based on the specific objectives of the study as indicated in table 3.1.

Table 3.1: The objectives of the study with variables and statistical methods

OBJECTIVES	INSTRUMENT	VARIABLES	STATISTICAL ANALYSIS
1. To determine the food safety and hygiene practices of ECD practitioners	Food handler's questionnaire and manager's questionnaire	Food handler's experience and training, food preparation, holding and serving temperatures, hygiene practices	Statistical Software for Social Sciences (SPSS) version 24 for descriptive statistics
2. To observe food handling and hygiene practices of ECD practitioners	Observation checklist	Observation, receiving, storage, food preparation, holding, serving, waste hygiene	Statistical Software for Social Sciences (SPSS) version 24 for descriptive statistics
3. To obtain and analyse swabs from food preparation and serving workspaces for bacterial count	Microbial swabbing	Hand and food preparation surface swabbing for micro organisms	Durban University of Technology Biotechnology and Food Technology laboratory
4. To determine the current nutrition knowledge of the ECD practitioners	Nutrition knowledge questionnaire	Food based dietary guidelines, food safety and hygiene practices	Captured on an Excel spreadsheet and analysed for descriptive statistics
5. To assess the menu adequacy of meals served to the children in ECD centres.	Weighed food record survey	Menu items, plate waste	Food Finder 3 software to conduct a nutrient analysis and compare the menu contribution to the daily requirements for children zero to five years old in relation to the DRI.

3.8.2 Piloting of questionnaires

A nutrition knowledge questionnaire (Annexure I), manager's questionnaire (Annexure J), and a food handlers' questionnaire (Annexure K) were all piloted in a sample group from one ECD centre to establish suitability. Comments received were that the participants did not understand some of the words used in the manager's questionnaire (Annexure J). For example, in Question 38 participants (managers) did not understand the term "non-perishable" so the word was changed to "dry". In Question 39 participants (managers) did not understand the word "perishable" so the word was changed to "meat, fish, dairy products and cooked left-overs".

3.8.3 Data Collection Tools

Food safety and nutrition knowledge questionnaires, microbial swabbing, a plate waste study and a food safety practice checklist (observation checklist) were used to collect data of food practitioners in the non-registered ECD centres. The instruments used in this study were selected to achieve the objectives of the study or the hypothesis. These instruments have been used and tested in other similar studies. This is to ensure that each question in the instruments stems from the research question and hypothesis of the study. Permission was granted from the original source of the questionnaires (Meaker 2008: A2, 8 and 23).

3.8.3.1 Food safety questionnaire

The questionnaire was adapted from Meaker (2008) and certain sections relating to food safety issues, hygiene knowledge and training as well as a small sociodemographic section at the end of the questionnaire were used. The study variables covered personal details of the FHs such as training and work experience, as well as knowledge of food safety and hygiene practices, storage, preparation, holding and serving, wastage, cleaning and hygiene, and purchasing and receiving. The questionnaire was completed by the ECD food handlers and managers of the centres. This process was carried out using two different questionnaires, namely the manager's questionnaire (Annexure J) and the food handler's questionnaire (Annexure K) during the managers' and the food handlers' interviews which were scheduled separately.

The food safety and hygiene practices were assessed through the manager's questionnaire. This questionnaire was in English as all the owners/managers were fluent in English. An appointment was scheduled with the manager of each centre for a specific date and time, preferably at a time when the manager was not busy and they were then requested to complete the questionnaire. The manager's questionnaire was self-administered in a quiet place within the ECD centre and in the presence of the researcher. A total number of nine (n=9) manager's questionnaires were completed in full by all the ECD managers and included in the study.

A food handler's questionnaire was completed by all the food handlers in each ECD centre in the presence of the researcher. The questionnaire was translated into isiZulu to assist food handlers who were not fluent in English. The researcher read each question out in both English and in IsiZulu to the food handlers so that they fully understood what was being asked and the participants would then respond on their own questionnaire. This took place in a quiet place within the ECD centre once the food handlers were free and available to answer the questionnaires. A total number of two (n=2) food handler's questionnaires were fully completed and used as part of the study.

3.8.3.2 Nutrition knowledge questionnaire

One of the objectives of this study was to determine the current nutrition knowledge of the ECD practitioners by means of a nutrition knowledge questionnaire (Annexure I). The nutrition knowledge questionnaire was developed by Grobbelaar (2011) to evaluate Child Care Workers' (CCWs') nutrition

knowledge in Child and Youth Care Centres. The questionnaire has been tested for validity and reliability. The nutrition knowledge questionnaire was available in both English and isiZulu to assist those who might not be fluent in English.

The questionnaire was selected to suit the Food Based Dietary Guidelines (FBDGs) for children under five years old by establishing the current nutrition knowledge of ECD food handlers and piloted in the sample group to establish suitability and adapted as necessary since the questions were nutrition related. The knowledge of the ECD practitioners on the nutrients of food sources linked to the FBDGs was also tested.

The nutrition knowledge questionnaire was self-administered by the managers and food handlers at the ECD centres at a scheduled date and time once they had completed their duties. This process was conducted in the presence of the researcher who assisted them with any queries they might have had. The questionnaire included a total of 25 multiple choice questions. The majority of the questions were based on the FBDGs with a section on personal data included at the end of the questionnaire. A total number of eleven (n=11) questionnaires were completed in full and used as part of the study.

3.8.3.3 Observation sheet to observe the cleanliness of food handlers during food preparation

The researcher completed an observation checklist (Annexure L) in each ECD centre to assess the cleanliness of the food facility of the ECD centre, receiving and storing procedures, food preparation, holding and serving, waste and hygiene practices. The observation checklist was used and tested by Meaker (2008). The observation checklist had 71 questions and each question was answered by making either a tick or a circle at the appropriate answer, being “Yes”, “No” or “N/A” and where applicable a comment was made. The researcher was able to fully complete a total of nine (n=9) observation checklists for the ECD centres which were included in the study.

3.8.3.4 Plate waste study

Plate waste study is the study of left over food on a plate that is subsequently discarded if not eaten (Lonska, Zvaigzne, Kotane, Silicka, Litavniece, Kodors, Deksne and Vonoga 2022 :3). Wu, Tian, Li, Yuan and Lui (2019: 152) also defined plate waste as the disposing of good quality portions of edible food that has been left on a plate by students. Plate waste is measured through physical measuring discarded or left over food on a plate. An aggregate non-selective plate waste is used whereby left over food on all plates are combined into one weight (Buzby and Guthrie 2002: 1, 7). The purpose of a plate waste study is to assess effectiveness of dietary intake adequacy and meal acceptance (Connors and Rozell 2004: 94-96).

A Digi DS 708 electronic kitchen scale was used to weigh all the menu items served to children individually to determine the portion size. Food intake to evaluate menu adequacy was established through a weighed food record (Andersen, Solvoll, Johansson, Salminen, Aro and Drevon 1998: 75) and the data was recorded using a standard form as showed in Annexure M, where all menu items were

listed according to the order in which the food was served. A weighing station was set up in each kitchen where the researcher observed and weighed all food portions.

An electronic kitchen scale was used to weigh an empty plate/bowl to get the actual weight of the plate/bowl. Food items were served on an empty 50g plastic bowl which was weighed separately. The weight of the empty plate/bowl was recorded and the scale was reset to zero. Thereafter the following procedures were followed:

- The first food item served for breakfast (cereal) was weighed and recorded and the scale reset to zero
- The second food item served for lunch (starch) was dished up and weighed, the scale was reset to zero; then a protein dish (for example, chicken curry) was added and the weight was again recorded and lastly, any other food item (for example, vegetables) offered was added and the weight was again recorded. The total portion size of each meal component or item was recorded using this method.
- Once the plate/bowl was returned to the kitchen after the child had finished eating, the plate/bowl was weighed with the leftover food on it and the weight recorded.

This was done for one breakfast and one lunch at each ECD centre. At each of the ECD centres the researcher spent the duration of the serving period supervising and ensuring that no food was thrown away or shared with another child so as to record accurately the waste for the day.

A total of seven plates for the stated meals were weighed in each of the 10 ECD centres. The researcher populated a template (Annexure 1) which was used to record the food weights on an Excel spreadsheet which was able to calculate the average plate waste per ECD centre. The average portion size was used to analyse the nutrient and energy content of each meal consumed by the children at these nonregistered ECD centres. All the meals eaten by the children were analysed for menu adequacy using the web-based MRC® Food Finder version 2019 software of the South African Medical Research Council (SAMRC).

3.8.3.5 Analysis of microbial swabs

A microbial swabbing was performed on all food handlers' hands, food preparation surfaces and chopping boards. A total of 20-24 sterile cotton-tipped bud swab sticks were used per ECD centre and clearly labelled on the cap of the sterile swab with the name of the centre, the area in which the swabbing took place and whether the swabbing took place before or after the area was washed. This routine was performed in each ECD centre that the researcher visited (Okareh and Erhahon 2015: 24). All media used for the swab analyses were purchased from MercK Ltd., Gauteng, South Africa (Mkhungo, Oyedeji and Ijabadeniyi 2018: 127). The sterile cotton-tipped swab sticks were dipped into a falcon tube containing 10 mL of maximum recovery diluent (Merk) to moisten the swab tip (Lee, Halim, Thong and Chai 2017: 3). A microbial analysis of at least a 10 cm^2 dimension (Campos, Cardonha, Pinheiro, Ferreira, Azevedo, Stamford 2008: 808) over the palm of the food handler's hand, the food preparation surface area and the chopping board was conducted at each ECD centre. The swabs were collected

from each FH by the researcher from 06:00 am to 10:00 am in the morning, that is, before and during food preparation. Once the swabs were collected, they were immediately stored in a cooler box containing ice before being taken away for laboratory analysis. In a case where the swabs were not tested the same day, they were kept in a refrigerator at the laboratory and analysed later.

A total of four sterile cotton swabs were used on the hands of both the managers and/ or food handlers before they washed their hands. This process was repeated after the managers and/ or food handlers had washed their hands with soap and water and rinsed them well.

The surface area was divided into three sections: the left-hand side, the middle section and the righthand side. Two swabs were used on each section before and after sanitising the surface area. The food preparation surface area saw a total of 12 sterile cotton swabs being used.

The chopping boards that were used to prepare meals in the kitchen were also swabbed for any microbial organisms. Two sterile cotton swabs were used before the chopping board was soaked in soapy water and two more were used after it had been washed, bringing the total of sterile swabs used to four.

3.9 Data analysis and statistics

The data analysis was aimed at assessing each of the objectives set for the study as seen in Table 3.1. The researcher ensured that all the measuring tools were completed by all the managers and food handlers at all the non-registered ECD centres. All the responses to the nutrition knowledge questionnaire, the manager's questionnaire and the food handler's questionnaire were captured on Excel® spreadsheets by the researcher and analysed for descriptive statistics using the Statistical Package for the Social Sciences (SPSS) version 26.0 for descriptive analysis.

3.9.1 Food safety questionnaire

The manager's and food handler's questionnaires were completed in the presence of the researcher (Wisker 2007: 187), checked for completeness and corrected if there were any errors. The completed questionnaires were captured on an Excel spreadsheet by the researcher and analysed using the SPSS version 26.0 for descriptive statistics and presented in tables and graphs. Comparisons were drawn between the FHs' responses and the researcher's observational findings and are presented in tables in Chapter 4.

3.9.2 Nutrition knowledge questionnaire

The completed nutrition knowledge questionnaires were checked. The data was captured on an Excel spreadsheet and analysed for descriptive statistics by the researcher by using SPSS version 26.0.

3.9.3 Observation checklist

The observation checklists were captured on an Excel spreadsheet by the researcher and transferred to the statistical software known as SPSS version 26.0 for descriptive data analysis.

3.9.4 Plate waste study

All the menu items served to the children on each of the researcher's visits were weighed and recorded using Annexure M and portion sizes were calculated. The food intake was measured on two occasions and observed during breakfast and lunch time. All the meals served to the children were analysed using the web-based MRC® Food Finder version 2019 software of the South African Medical Research Council (SAMRC) to compare the menu contribution to the daily requirements for children zero to five years old in relation to the DRIs (NICUS 2003). The nutritional contribution of meals at each ECD centre was presented in macronutrients, vitamins and minerals for the comparison of dietary reference intake and dietary guideline recommendations (NICUS 2003).

3.9.5 Microbial swabbing

The surface area swabs were thoroughly mixed with 10mL buffered peptone water (BPW) before dilution and enrichment. Serial dilution was prepared using BPW and 0.1 mL of the diluent which was decanted onto Baird Parker agar (Oxoid media) plates which had egg yolk tellurite solution on them, and then incubated at 37˚C for 24 hours (h). The microbial analyses were performed to test for microorganisms, which was Staphylococcus aureus and the results were reported as log cfu/mL. In the analyses for the presence of Escherichia coli, 9 mL of lauryl sulphate broth (Fluka) and 1 mL of swab solution were combined and incubated at 37˚C for 24 hours. Once incubation was completed, 1 mL of culture mixture was transferred to the *E.coli* broth and incubated again at 37˚C for 24h. A 3M pathogen detector was conducted on the positive *E.coli* broth and the results reported as log cfu/mL (Mkhungo, Oyedeji and Ijabadeniyi 2018: 128).

3.9.6 Role of the researcher

The role of the researcher was to ensure that ethical research procedures were followed and consent forms explained prior to the participants' signatures being given. It was also to collaborate and build relationships with community members, leaders and stakeholders to initiate the research project (Johnson 2017: 40). Furthermore, the researcher had to be open-minded and respectful and value community members' input, as well as being non-judgemental, unbiased and humble.

3.9.7 Reliability and validity

Reliability referred to how the research would be carried out in terms of making sure that all the assessment tools that would be used in the study produce stable and consistent results (LoBiondoWood and Haber 2014: 290). According to Joubert and Ehrlich (2008: 119) reliability is ensured by calibrating and standadisation of measuring instruments before weighing. In this study reliability was achieved through the plate waste study whereby all the empty plates were weighed first to assess and compare standard weight of each plate.

Accoding to Joubert and Rhrlich (2008: 120) validity is evaluated through different concepts such as face validity and inconsistent validity. These would include making sure that the researcher is asking the participants questions that are easily understood by the participants, that the questions make sense and are in their home language. In this study validity was assessed by piloting the questionnaires (Annexure I, J, K) to a sample group of a manager and a food handler (n=2) at the Nkazimulo creche which was situated in the Ntuzuma area to measure the extent to which the target audience would understand the material. This test was self-administered as all the participants were literate. Changes were made to the questionnaires as discussed in the above data collection section.

These processes assisted in checking that the appropriate methods and techniques were aligned with the study so that the findings could be as valid as possible (Wisker 2007: 322).

3.10 Conclusion

In this chapter an overview of the research methodology used to monitor food safety practices and assess the nutrition knowledge and menu adequacy of ECD practitioners in non-registered ECD centres was discussed in detail. All the methods and instruments utilized in the study and the results of the data collected will be interpreted and discussed in chapter four.

Chapter 4: Results and Discussion

4.1 Introduction

This study has investigated the knowledge of food safety, nutrition and dietary diversity that managers and food handlers (FHs) displayed in non-registered ECD centres in the Ntuzuma area in Durban. In this chapter the results of the managers and food handler's questionnaires, the nutrition knowledge questionnaires and the menu analysis will be discussed and demonstrated in graph and table format. Furthermore, the findings from the observational checklist will also be presented.

4.2 Results

4.2.1 Demographic data – Managers

A demographic profile of the manager's questionnaire was included under the following categories: personal information, level of education, food service experience and number of years in the business. The socio-demographic characteristics of the participants are shown in Table 4.1.

Table 4.1: Demographic profile of managers

Variables	**Number (n=nine)**
Gender	
Male	1
Female	8
Total	**9**
Age	
30 years and above	9
Total	**9**
Level of education	
Primary school	1
Secondary/ High school	7
College/ University/ Diploma/ Degree	1
Total	**9**
Job title	
Owner	9
Previous food service experience	
Yes	1
No	8
Length of time in the business	
Less than a year	2
1-2 years	2
2-3 years	1
3 or more years	4

Table 4.1: Demographic profile of managers continue

Variables **Total**	**Number (n=nine)** **9**
No. of staff employed at centre	
2 employees	1
3 employees	5
4 emplyees	**3**
Total	**9**

According to Table 4.1 the total number of non-registered ECD centres that participated in the study was nine (n=9). Table 4.1 indicates that eight (n=eight) of the centres were female-owned with only one (n=1) being male-owned. All the owners were 30 years of age and older. A remarkable seven (n=7) of the ECD managers had completed their highest level of education (matric) while one (n=1) had completed their primary school education and one (n=1) had a college certificate. Out of the nine managers who participated in the study, only one (n=1) had previously worked in the food service industry and eight (n=8) had no experience at all. More than four (n=4) of the respondents had been in the business for more than three years, two for less than one year and three between one-three years. There were five ECD centres that had created employment for three workers, with only three who had four or more employees and only one centre had created jobs for two employees.

4.2.2 Demographic data – Assistant Food Handlers (FHs)

Table 4.2 below indicates the demographic data of assistant FHs in non-registered ECD centres who were appointed to support the manager. They were also there to ensure that the centres were well maintained and that everything ran smoothly in the manager's absence.

Table 4.2: Demographic data of assistant Food Handlers in non-registered ECD centres

Variables	**Number (n=2)**
Gender	
Female	2
Age	
>25 years old	2
Level of Education	
Matric/ Grade 12	1
College	1
Total	2
No. of years in th ECD centre	
<1 year	1
>1 year	1
Total	**2**

The results in table 4.2 indicate that only two (n=2) female assistant FHs were employed within the ECD centres that were visited. One of the FHs was employed as a cook while the other was a teacher who

assisted the manager occasionally when she had to attend meetings away from the ECD centre. The FHs were both above the age of 25 years and both had completed their matric and acquired post-matric certificates from varies colleges. One of the FHs had been with the ECD centre for two years and had previous experience in the food industry, while the other had been a cook for less than a year and had previously worked as a beauty therapist.

4.2.3 Business premises

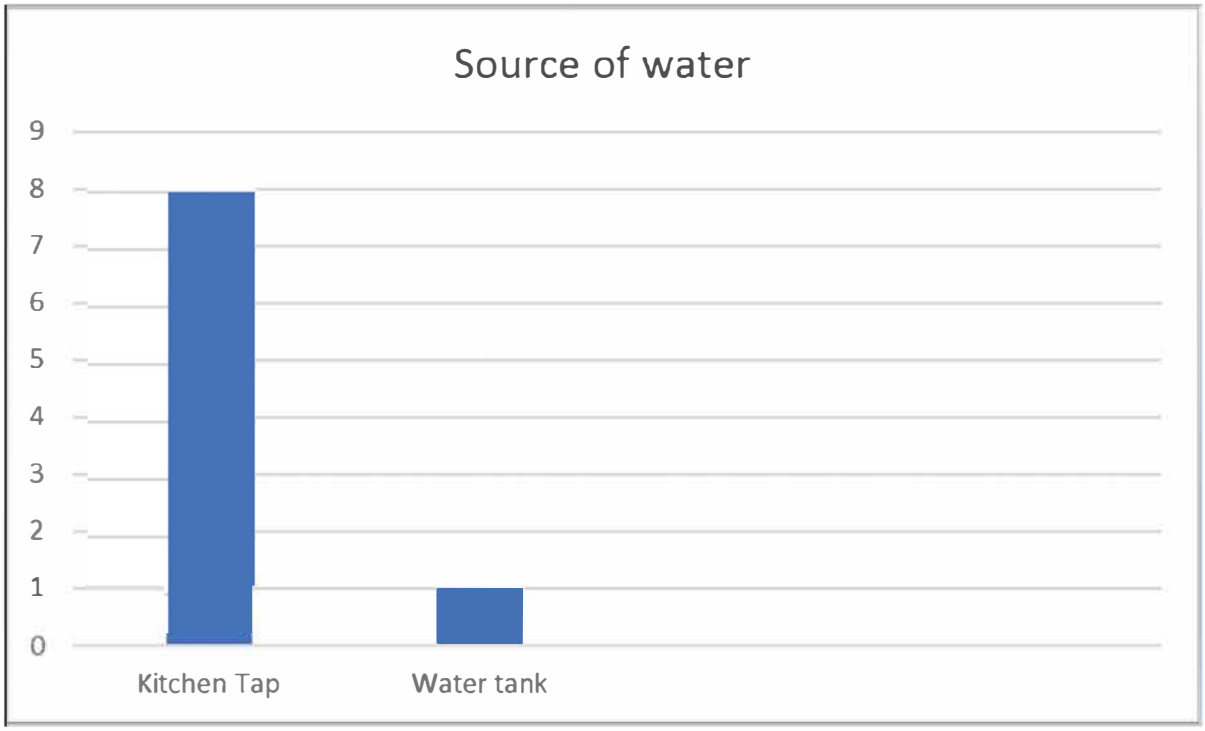


Figure 4.1: Water supply used by ECD centres

Eight out of the nine of the ECD centres' water supply was obtained from inside the kitchen premises while one ECD centre obtained water by fetching it in a bucket from the neighbour's outside tap. Only cold water was available for food preparation and washing of hands.

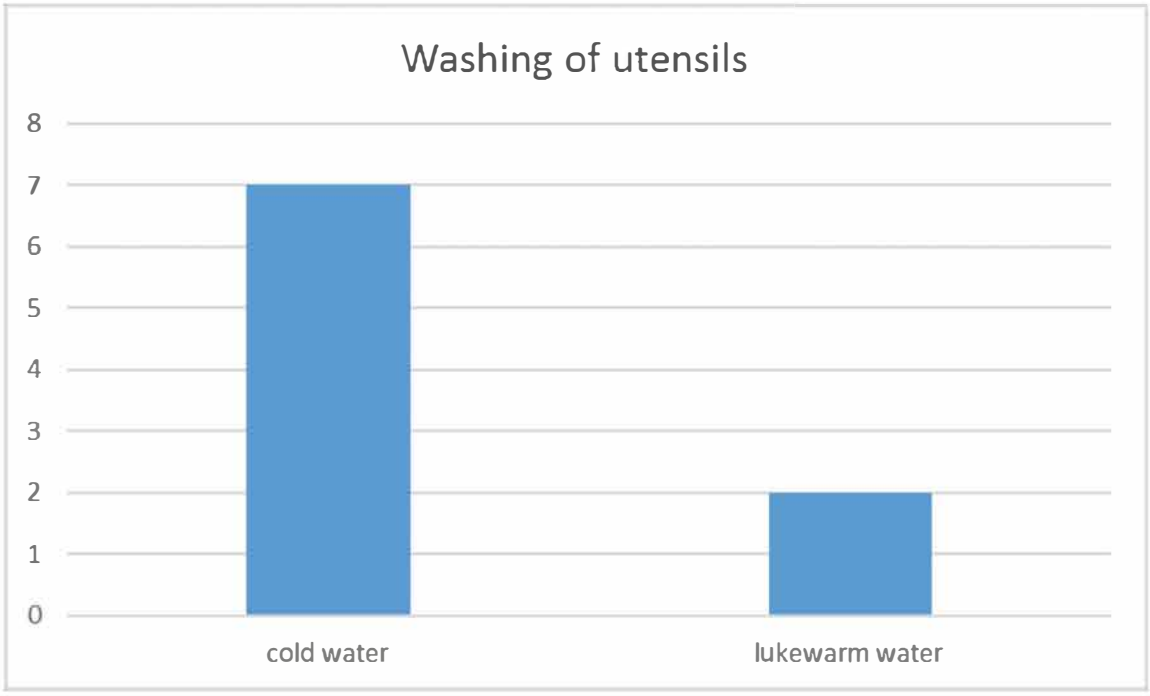


Figure 4.2: **Water used for washing of cooking utensils at ECD centres**

Figure 4.2 reveals that seven out of the nine ECD centres washed their cooking utensils with cold water and detergent while the remainder two used hot water by boiling the water in a kettle.

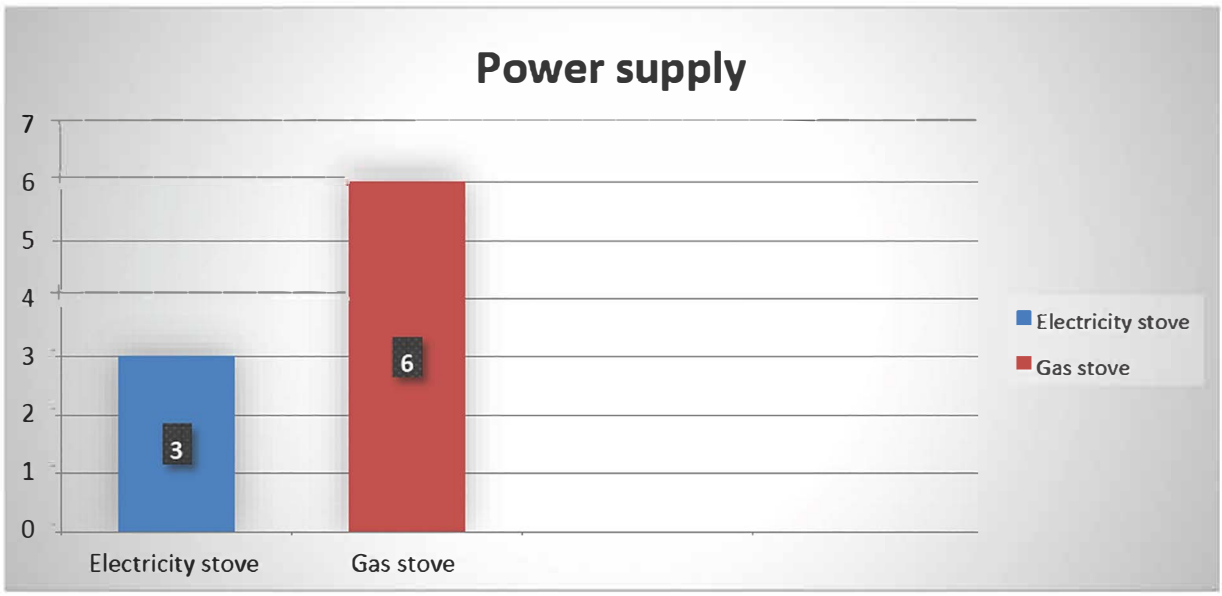


Figure 4.3: Power supply used by ECD centres to prepare meals

The results displayed in figure 4.3 indicate that six out of nine ECD centres used a gas stove as their main source of power in the preparation of meals while three centres used a two-plate electric stove.

4.2.4 Food safety practices and hygiene knowledge

This section reports on the food storage, food preparation and holding, serving of meals and food waste. It specifically addresses food safety training and hygiene knowledge. To obtain the data, a food handler's (including the managers as they were also food handlers) questionnaire was used in each ECD centre.

Table 4.3 Food safety knowledge

Variables	Food handlers (n=11)
Do you use separate utensils and containers for raw and cooked foods?	
Yes No	9 (n=9) 2 (n=2)
How are cooking utensils washed?	
Hot water and detergent	6 (n=6)
Cold water and detergent	5 (n=5)
When should you wash your hands?	
After a visit to the toilet and before preparing food Not sure	10 (n=10) 1 (n=1)
Wiping cloths can spread microorganisms.	
Yes No	9 (n=9) 2 (n=2)
The same cutting board can be used for raw foods and cooked food provided it looks clean.	
Yes	11 (n=11)
Raw foods need to be stored separately from cooked foods.	
True	11 (n=11)
Cooked foods do not need to be thoroughly reheated.	
Agree Disagree	6 (n=6) 5 (n=5)
Cooked meat can be left out of the fridge to cool overnight before refrigerating.	
True	5 (n=5)
False	6 (n=6)
Cooked foods should be kept very hot before serving.	
True False	6 (n=6) 5 (n=5)
Wash fruits and vegetables before eating or preparing.	
True	11 (n=11)
Safe water can be deemed safe by the way it looks.	
True False	7 (n=7) 4 (n=4)
Frequent hand washing during food preparation is worth the extra time.	
Agree	11 (n=11)
Keeping kitchen surfaces clean reduces the risk of illness.	
Agree	11 (n=11)
Thawing food can be done on the counter.	
Agree Disagree Not sure	6 (n=6) 4 (n=4) 1 (n=1)
I think it is unsafe to leave cooked food out of the refrigerator for more than two hours.	
Agree	11 (n=11)

Table 4.3 Food safety knowledge continue

Variables	Food handlers (n=11)
I separate raw and cooked food during storage.	
Agree	11 (n=11)
I inspect food freshness to ensure quality ingredients.	
Agree	11 (n=11)
I think it is important to throw away food items that have reached their expiry date.	
Agree	11 (n=11)

Table 4.3 illustrates that nine (n=9) of the FHs admitted to using separate utensils and containers for raw and cooked food while ten (n=10) of the FHs correctly indicated that they stored cooked and raw food separately to prevent cross-contamination. Six (n=6) of the respondents washed their cooking utensils with hot water that was boiled using a household kettle, while five (n=5) used cold water and detergent. Ten FHs (n=10) agreed that hand washing should be done after a visit to the toilet and before preparing food. The spread of microorganisms could be caused by using a wiping cloth was agreed to by nine (n=9) of the respondents. Eleven (n=11) FHs incorrectly agreed that the same cutting board could be used for raw and cooked food provided it looked clean. The statement that food that had been cooked did not need to be thoroughly reheated was incorrectly agreed to by six (n=6) of the FHs. However, five (n=5) agreed that cooked meat could be left out of the fridge to cool overnight before refrigeration and six (n=6) disagreed with this statement. Six (n=6) of the FHs recorded that cooked food should be kept very hot before serving. Eleven (n=11) FHs agreed that it was important to wash fruits and vegetables before eating or preparing them.

Seven (n=7) of FHs incorrectly indicated that safe water could be deemed safe by the way it looked. All (n=11) the respondents agreed that it was important to wash hands frequently during food preparation as it was worth the extra time. Eleven (n=11) the FHs agreed that clean kitchen surfaces reduced the risk of illness. Six (n=6) of FHs said that they thawed frozen food on the kitchen counter. Eleven (n=11) the FHs agreed that it was important to inspect the freshness of food to ensure that they were quality ingredients and to throw away any food item that had reached its expiry date so that FHs did not accidentally use it to prepare meals for the children.

4.2.5 Storage area and stock rotation

Table 4.4: Storage area and stock rotation

Variable	Food Handlers (n=11)
Is there a cleaning schedule for the storage area?	
No	11 (n=11)
How often is the storage area cleaned?	
Once a week	7 (n=7)
Twice a week	1 (n=1)
Four times a week	1 (n=1)
Every day of the week	2 (n=2)
How often is stock checked for quality and expiry date?	
Not checked	1 (n=1)
Once a month	4 (n=4)
Three times a week	1 (n=1)
Every day of the week	5 (n=5)
How often is stock take done?	
Not done	9 (n=9)
Less than once a month	2 (n=2)
Is stock rotation in place?	
Yes No	10 (n=10) 1 (n=1)
If yes, how is it done?	
First in first out	10 (n=10)

According to Table 4.4, all the ECD centres did not have cleaning procedures in place; hence eleven (n=11) the FHs did not have any cleaning schedule for their storage area in place so therefore no regular cleaning took place in the store room. In terms of cleaning frequency, the store room was cleaned once a week by seven (n=7) of the FHs. The checking of stock for quality and expiry date was done every day of the week before food preparation by five (n=5) of the FHs, while four (n=4) of the FHs checked the quality once a month. This table also indicates that stock take was not done by nine (n=9) of the FHs because food purchases were mainly done once a month and by the end of the month most food items were depleted. However, ten (n=10) of the FHs indicated that stock rotation was in place by making sure that stock first in was stock first out (FIFO).

4.2.6 Purchasing and receiving

This section will report on the activities relating to food purchases in the ECD centres.

Figure 4.4: Places where raw material was purchased

Figure 4.4 indicates the different places where managers purchased food items for the ECD centres. As indicated in this figure, five of the FHs (n=5) purchased raw chicken from a formal retailer and four (n=4) purchased from wholesale stores. Five (n=5) of FHs purchased tinned fish from a formal retailer and four (n=4) from a wholesale store. Seven (n=7) FHs bought red meat, vegetables and fruits from formal retail stores while two (n=2) bought their meat from a wholesale store. Four (n=4) FHs purchased maize meal from a formal retailer and five (n=5) bought it at a wholesale store. Almost all the centres used bread and because it has a short shelf life, four (n=4) of FHs would purchase at formal retailers, one (n=1) at wholesale stores and four (n=4) at an informal business, which in this case was a tuckshop close by. Six (n=6) of the FHs indicated that most of their groceries were purchased at a formal retailer and three (n=3) indicated they bought at a wholesale store.

4.2.7 Food preparation

This section will report on the analysed data for food handlers on food preparation at each ECD centre.

Table 4.5: Food preparation (answers given by food handlers only)

Variables	Food handlers (n=11)
Place where food is prepared	
Designated kitchen outside Non-designated room	7 (n=7) 4 (n=4)
Person who prepares the food	
The manager/cook	9 (n=9)
The food handler	2 (n=2)
Is there adequate space for food preparation?	
Yes No	10 (n=10) 1 (n=1)

Table 4.5: Food preparation continue

Variables	Food handlers (n=11)
Is there enough water for food preparation?	
Yes No	10 (n=10) 1 (n=1)
Is there enough space for cooking?	
Yes	11 (n=11)
Are there enough food utensils (knives, serving spoons, mixing tools) for food preparation?	
Yes No	10 (n=10) 1 (n=1)
Are there enough chopping boards?	
Yes No	2 (n=2) 9 (n=9)
Are recipes available and used during food preparation?	
Yes No	1 (n=1) 10 (n=10)
Do you check the expiry date on food items?	
Yes No	8 (n=8) 3 (n=3)

The results presented in Table 4.5 indicate that seven (n=7) of FHs agreed that ECD centres had designated kitchen areas while the rest (n=4) had to use an outside building for food preparation. Nine (n=9) of the managers prepared the food while two (n=2) of the FHs assisted the manager if they had to attend meetings away from the ECD premises. Ten of the FHs (n=10) agreed that the centres had adequate space and utensils for the preparation of food and enough space for cooking in the kitchen. Nine (n=9) of the FHs indicated that the centres did not have adequate chopping boards as they only had one chopping board at five of the centres while four centres used plastic plates when chopping their raw ingredients. Ten (n=10) of the FHs indicated that the centres they worked in had enough food utensils, while ten (n=10) FHs revealed that their centres did not have any recipes available to use during the cooking process. The FHs were able to define the term "expiry date" and eight (n=8) agreed that the expiry date was checked on all food items.

4.2.8 Food safety training

This section will explain the information on training provided on employment for each FH at the ECD centres as per the responses presented in the managers and FHs' questionnaires.

Table 4.6: Food safety training

Variables	Food Handlers (n=11)
Has any training on food safety and hygiene been provided?	
Yes	2 (n=2)
No	9 (n=9)
Has training on menu planning been provided?	
Yes	2 (n=2)
No	9 (n=9)
Has training on food preparation been provided?	

Table 4.6: Food safety training continue

Yes	3 (n=3)
No	8 (n=8)
Has training on prevention of food contamination been provided?	
Yes	2 (n=2)
No	9 (n=9)
Has training on cross-contamination been provided?	
Yes	1 (n=1)
No	10 (n=10)
Has training on first aid been provided?	
Yes	4 (n=4)
No	7 (n=7)
Has training on personal hygiene been provided?	
Yes	4 (n=4)
No	7 (n=7)
Has training on hand washing been provided?	
Yes	6 (n=6)
No	5 (n=5)

The results in Table 4.6 indicate that nine (n=9) of the FHs were not trained in food safety and hygiene. Nine (n=9) of the FHs did not have any training on menu planning; training on food preparation for eight (n=8) of the FHs was not provided; training on prevention of food contamination was not received by nine (n=9) and ten (n=10) of FHs were also not provided with training on food cross-contamination. Four (n=4) of FHs had attended first aid training and personal hygiene training, with six (n=6) receiving training on hand washing.

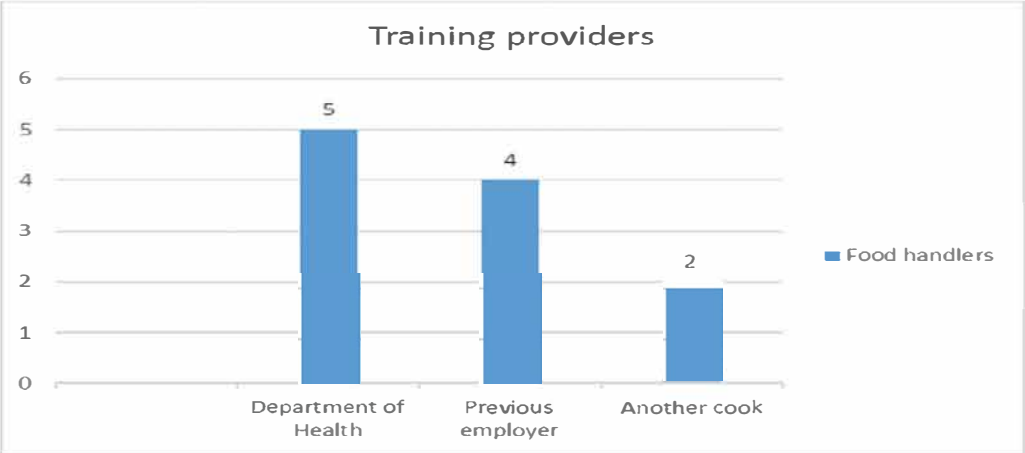


Figure 4.5: Training providers for Food Handlers in ECD centres

Figure 4.5 reveals that five (n=5) of FHs received training from the Department of Health, four (n=4) received training from previous employer while two (n=2) of the FHs received training from a colleague who was also a cook.

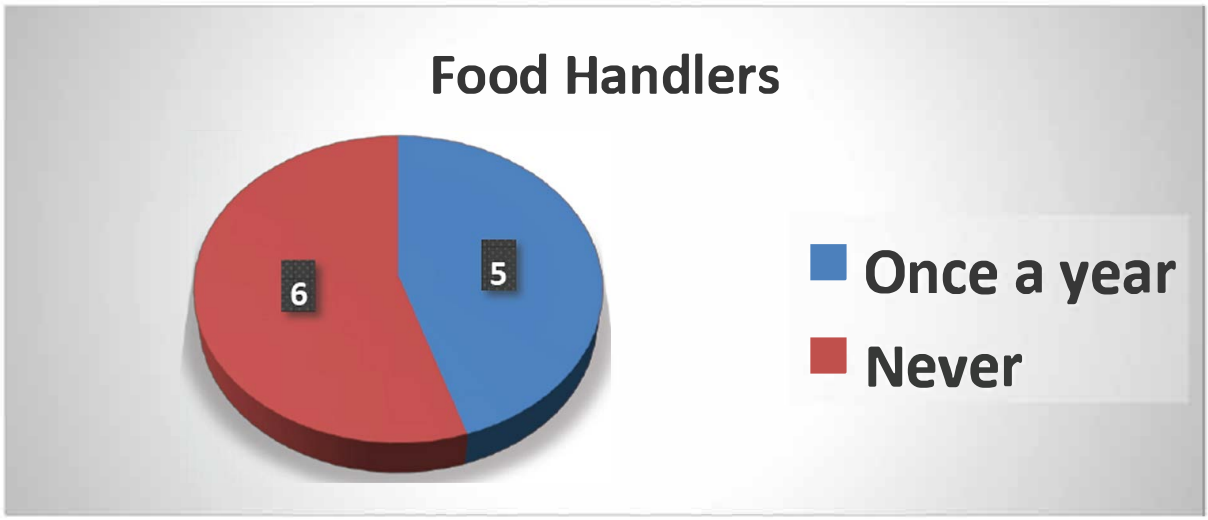


Figure 4.6: Frequency of food handler training

Figure 4.6 indicates that five (n=5) of FHs received training once a year and six (n= 6) have never had any food handlers training.

4.2.9 Food holding, serving and wastage

This section will present the data on food holding, food serving and wastage as presented in the food handlers' questionnaires.

Table 4.7: Food holding, serving and wastage

Variables	Food Handlers (n=11)
How is the food kept warm?	
Left in pot on the stove with lid tightly on	10 (n=10)
Wonder bag	1 (n=1)
How long is the food kept after cooking and before serving?	
15-30 minutes	6 (n=6)
30- 60 minutes	5 (n=5)
Are there enough food serving spoons (ladles)?	
Yes No	9 (n=9) 2 (n=2)
Are there enough serving utensils?	
Yes No?	8 (n=8) 3 (n=3)
Are there enough cups, plates and bowls?	
Yes	11 (n=11)
In your opinion, are the children happy with the portion sizes of their food?	
Yes	11 (n=11)
What happens to the food that is prepared but not finished by the children?	
Thrown away	11 (n=11)

Table 4.7: Food holding, serving and wastage continue

How much left-over food or food not served food is thrown away each day at each ECD centre?	
None	7 (n=7)
Minimal	2 (n=2)
Is left-over food reheated and served the following day at each ECD centre?	
Yes No Centres used stove to reheat	4 (n=4) 2 (n=2) 5 (n=5)
Is there a designated rubbish bin?	
Yes	11 (n=11)
If yes, where is it situated?	
In the kitchen preparation area	6 (n=6)
Outside the kitchen	5 (n=5)
Does the rubbish bin have a tight fitting lid?	
Yes	7 (n=7)
No	4 (n=4)

According to Table 4.7, six (n=6) of the FHs indicated that food was held for 15-30 minutes after cooking while five (n=5) of the FHs kept their food warm for 30-60 minutes. Ten of the FHs (n=10) indicated that food was kept warm by leaving it in the pot on the stove with the lid of the pot closed and only one (n=1) kept the food in a wonder bag to keep warm until the food was served. Nine of the FHs (n=9) revealed that the centres had enough serving utensils for serving, while eleven FHs (n=11) revealed that there were enough cups, plates and bowls for serving food to the children. Eleven FHs agreed that the children in the centres were satisfied with the portion sizes of the meals. With regard to the question of left-over food that the children did not finish, minimal food was thrown away in two (n=2) of the ECD centres while the remaining seven (n=7) served the food the next day. The food left in the pots after serving the children was then eaten by the FHs and other ECD practitioners working at the centre to try and avoid wastage and that is why minimal food was recorded as wasted.

4.2.10 Cleaning and sanitation

This section will present data on the cleaning and sanitation practices adopted by the FHs in the ECD centres.

Table 4.8: Cleaning and sanitation

Variables	**Food handler (n=11)**
Is the work area ever sanitized?	
Yes	11 (n=11)
How often is the preparation area cleaned and sanitized?	
Daily (every morning before preparation) After work is finished (every afternoon before home time)	6 (n=6) 5 (n=5)
How are cooking utensils washed?	
Hot water and detergent	6 (n=6)

Table 4.8: Cleaning and sanitation continue

Variables	Food handlers (n=11)
Cold water and detergent	5 (n=5)
How often is the rubbish bin removed and cleaned?	
Once a day	4 (n=4)
Once a week	7 (n=7)
How often is the storage area cleaned?	
Once a week Twice a week	7 (n=7) 4 (n=4)
Is there running tap water available for hand washing?	
Yes	11 (n=11)
Is there soap available for hand washing?	
Yes	5 (n=5)
No	6 (n=6)
How frequently are utensils washed?	
During food preparation	3 (n=3)
After food preparation	8 (n=8)
How frequently is the stove cleaned?	
During food preparation	2 (n=2)
After food preparation	9 (n=9)
Are the correct cleaning chemicals available to clean the kitchen?	
Yes No	8 (n=8) 3 (n=3)
Are there enough cleaning tools to clean the kitchen (broom, mop, dish cloths)?	
Yes No	10 (n=10) 1 (n=1)

Table 4.8 illustrates that eleven (n=11) FHs agreed about sanitizing their work area, with six (n=6) doing so every morning before food preparation, while five (n=5) did so after work was finished and before home time. Six (n=6) of FHs used hot water and detergent to wash cooking utensils while five (n=5) used cold water and detergent. The rubbish bin was removed and cleaned once a day by four (n=4) of the FHs while seven (n=7) removed the bin once a week. The storage area was cleaned once a week by seven (n=7) of the FHs and twice a week by four (n=4) of the respondents. Food handlers were asked if there was running tap water available for hand washing and eleven (n=11) the respondents agreed to this statement, while only five (n=5) had soap for hand washing and six (n=6) had no soap. Three (n=3) of the FHs washed the utensils during food preparation while eight (n=8) washed them after all the food preparation work was done. When asked about the frequency of cleaning the stove, nine (n=9) of the FHs cleaned the stove after food preparation, two (n=2) only cleaned it during food preparation. Furthermore, eight (n=8) of the FHs positively indicated the availability of correct cleaning chemicals to clean the kitchen while only three (n=3) had insufficient cleaning chemicals. Similarly, ten (n=10) of the FHs responded positively to the question pertaining to the availability of cleaning tools to clean the kitchen and one (n=1) did not have enough cleaning tools.

4.3 Observational checklist results

This section will outline the results of the observational findings of the researcher in the ECD centres. The results below will present mainly the positive feedback obtained from the observational checklist and where necessary negative feedback will also be highlighted per ECD centre.

Table 4.9: Observational findings on general management

Variables	Observation (Positive) Number of ECD centres as (n=9)
GENERAL MANAGEMENT	
Is there a menu? Are there recipes available?	9 (n=9) YES 9 (n=9) NO
Is there a service agreement between DUT and the ECD food handlers?	9 (n=9) YES

Table 4.9 presents the results from the observation checklist. It illustrates that nine ECD centres (n=9) that the researcher visited had a menu displayed on the premises. Menus were all displayed on the kitchen walls for officials and parents to see as per the DSD guidelines. The researcher observed that the FHs would sometimes not follow the menu because of the unavailability of food items. Others would alternate the menus because it was closer to month-end so certain stock would have run out therefore FHs would have to improvise which then resulted in certain menus being repeated at times. There was a signed service agreement between the ECD centres and the DUT at all of the centres in the form of a consent letter which allowed the researcher to conduct research. Furthermore, the researcher did not see, or was not shown any recipes at all the centres that were visited. When some of the FHs were asked where they got the recipes from, some said they either got the recipes from other managers when they had their monthly meetings/ forums or they were from their own knowledge of food preparation.

Table 4.10: Observational findings of the researcher on receiving and storage facilities

Variables	Observations Number of ECD centres as (n=9)
RECEIVING	
Is the delivery date written onto the product?	9 (n=9) YES
Are the delivery temperatures checked?	9 (n=9) NO
STORAGE	
Is the perishable food stored in a cold room/fridge?	9 (n=9) YES
Is the non-perishable food stored in a separate room?	4 (n=4) YES 5 (n=5) NO
Are cleaning items stored with food?	9 (n=9) NO

Table 4.10: Observational findings of the researcher on receiving and storage facilities continue

Variables	Observations Number of ECD centres as (n=9)
Are the storage areas kept locked?	5 (n=5) YES 4 (n=4) NO
Is there adequate light in the storage area?	9 (n=9) YES
Is there adequate space in the storage area?	9 (n=9) YES
Is the food stored in its original packaging?	8 (n=8) NO 1 (n=1) YES
Are the products clearly labelled?	5 (n=5) NO 4 (n=4) YES
Are there expiry dates on food items?	7 (n=7) YES 2 (n=2) NO
Have some foods passed the expiry date?	9 (n=9) NO
If a product is transferred to a storage container, is the expiry date recorded?	9 (n=9) NO
Are any foods that are past their expiry date used?	9 (n=9) NO
Are all containers covered?	9 (n=9) YES
Is any of the food old or stale?	9 (n=9) NO
Is there any evidence of decay in the fresh produce?	9 (n=9) NO
Are the storage areas cleaned?	9 (n=9) YES
Are the storage areas neatly arranged?	9 (n=9) YES
Is any food stored directly on the floor?	4 (n=4) YES 5 (n=5) No
Is the refrigerator in the storage area in working condition?	8 (n=8) YES 1 (n=1) No
Is the old stock of food used before the new stock (FIFO)?	9 (n=9) YES
Is there any evidence of pest infestation?	1 (n=1) YES 8 (n=8) NO
Are there any unpleasant odours in the storage area?	9 (n=9) NO

Table 4.10 indicates that nine (n=9) the ECD centres did not write down the delivery date on any of their products and the delivery temperature was also not written on any of the products. This was because the centres had no suppliers which delivered food items to them. The researcher observed that the managers were responsible for the buying of all groceries for the ECD centres. This was done once a month, generally at month-end when the contents of the original packaging with an expiry date were emptied into storage containers and no expiry date was recorded on any of these containers. This was done in eight (n=8) of the centres visited by the researcher. No food items that had passed their expiry date were used in nine (n=9) centres. Nine (n=9) of the centres stored the perishable food items in a

refrigerator, while four (n=4) of the non-perishable food items were stored separately – using ice cream containers, yoghurt tubs and 20 lt buckets with lids to cover the food items. In three (n=3) of the centres food containers observed were stored directly on the floor. Five (n=5) of the centres always kept their storage area locked. In nine ECD centres (n=9) cleaning items had a separate storage area (cupboard) away from the food items. There was no evidence of stale food or decay; however, there were flies and ants in one (n=1) of the centres, particularly near the bin area.

Table 4.11: Observational findings on food preparation, serving and wastage

Variables	ECD centres Observation Number of ECD as (n=9)
FOOD PREPARATION	
Is there adequate space for food preparation?	7 (n=7) YES 2 (n=2) NO
Is there adequate space for serving /portioning?	6 (n=6) YES 3 (n=3) NO
Are there recipes?	9 (n=9) NO
Are there adequate food preparation utensils?	7 (n=7) YES 2 (n=2) NO
Is water for cooking easily available?	9 (n=9) YES
SERVING AND WASTAGE	
Are there adequate food serving utensils?	7 (n=7) YES 2 (n=2) NO
Are there adequate eating utensils?	9 (n=9) YES
Are the portion size standardized?	9 (n=9) NO
Is all the prepared/ cooked food served?	9 (n=9) YES
Did the children finish all their food?	7 (n=7) YES 2 (n=2) NO
Is any plate waste/ food thrown away?	3 (n=3) YES 6 (n=6) NO
Is there a designated rubbish bin?	9 (n=9) YES
Are the dustbins covered?	7 (n=7) YES 2 (n=2) NO
Are the dustbins clean?	8 (n=8) YES 1 (n=1) NO
Is there waste lying outside the dustbins?	9 (n=9) NO

The results presented in table 4.11 reveal that seven (n=7) of the ECD centres had adequate space and utensils for food preparation. Nine (n=9) FHs informed the researcher that recipes were not available and they were not visibly displayed in the kitchen. Water for cooking was easily available in nine (n=9) centres. Six (n=6) of the centres had adequate space for portioning and serving of food.

During food serving it was observed that seven (n=7) of the centres had adequate food serving utensils whereas in nine of the centres (n=9) the children had adequate eating utensils. None of the ECD centres had any standardized recipes. The food that was prepared by the FHs was served to all the children in the centres (n=9), indicating minimal waste during serving. In seven (n=7) of the centres, older children were able to finish all their food while the younger ones were spoonfed by the assistant teacher but they still did not finish all the food on the plate. Three (n=3) of the centres experienced plate waste. There were designated rubbish bins for waste food in nine (n=9) of the centres. The dustbins were covered in seven (n=7) of the centres and cleaned in eight (n=8) of the centres and there was no waste lying outside the dustbins in nine (n=9) the centres.

Table 4.12: Observational findings on hygiene

Variables	Observation Number of ECD centres as (n=9)
HYGIENE	
Are the kitchen utensils clean?	8 (n=8) YES 1 (n=1) NO
Is the kitchen equipment clean?	7 (n=7) YES 2 (n=2) NO
Are the correct cleaning chemicals available?	7 (n=7) YES 2 (n=2) NO
Are there adequate cleaning supplies, cloths, scourers etc.?	9 (n=9)YES
Are the work areas clean?	7 (n=7) YES 2 (n=2) NO
Is the area cleaned frequently during food preparation?	5 (n=5) YES 4 (n=4) NO
Is the area sanitized following food preparation?	3 (n=3) YES 6 (n=6) NO
Is there water available for cleaning?	9 (n=9) YES
Do the food handlers wash their hands regularly?	7 (n=7) YES 2 (n=2) YES
Is there water available for the food handlers to wash their hands?	9 (n=9) YES
Is there soap available for hand washing?	2 (n=2) YES 7 (n=7) NO
Are the food handlers' overalls/ clothes clean?	9 (n=9) YES
Do the FHs wash their hands before serving food?	7 (n=7) YES 2 (n=2) NO

Table 4.12: Observational findings on hygiene continue

Variables	Observations Number of ECD centres as (n=9)
Do the children wash their hands before eating?	9 (n=9) NO
Is cooked food kept separately from raw food items?	9 (n=9) YES

Table 4.12 illustrates the results in response to hygiene practices. Eight of the centres (n=8) had visibly clean kitchen utensils and equipment, meaning that cleanliness was being observed. The correct cleaning chemicals were available at seven (n=7) of the centres. Nine (n=9) the centres had adequate basic cleaning materials such as a broom, a mop and a bucket. Seven of the centres (n=7) had work surface areas that looked clean; however, they were not sanitized as frequently as possible during food preparation at some centres. In five (n=5) of the FHs adhered to the "clean-as-you-go" principle during food preparation; however, only three (n=3) of the centres sanitized the preparation area while preparing meals. Water for cleaning and washing of hands was available at all the ECD centres visited. However, there was no hand basin area allocated for hand washing but on observation it was noted that instead a 5 lt bucket was used in seven (n=7) ECD centres by the FHs to rinse their hands before serving food. Furthermore, this bucket was used by the FHs in these ECD centres without the water being changed. It was also observed that in all the ECD centres that were visited by the researcher, hand-washing among children before they ate was not implemented. The researcher noted that only two of the food handlers washed their hands regularly, and seven (n=7) of the centres did not have an antibacterial soap available for hand-washing. This was of great concern as despite the availability of water, neither the children nor the FHs practised regular hand washing. The FHs' overalls and clothes were clean but hair nets were not worn during food preparation. Cooked food was kept separate from raw food items during food preparation and storage.

4.4 Nutrition knowledge of the food handlers

Table 4.13: Nutrition knowledge results from the food handlers

Variables	Food handlers response (n=11)
You should have starches or carbohydrates with every meal because: They are important for your health and should form part of your everyday meal They can cause weight gain in small amounts They cause diseases None of the above	 10 (n=10) 0 (n=0) 0 (n=0) 1 (n=1)

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres continue

Do you think the following foods are in the "starchy" or "carbohydrates" food group?	
Cheese	2 (n=2) TRUE
Samp	11 (n=11) TRUE
Stiff pap	11 (n=11) TRUE
Rice	11 (n=11) TRUE
Margarine	4 (n=4) TRUE
Tinned fish	1 (n=1) TRUE
Canned beans, peas or lentils are healthy choices to eat in place of meat or chicken.	
True	7 (n=7)
False	0 (n=0)
Not sure	4 (n=4)
How much water should you drink per day?	
1 to 3 glasses of water	0 (n=0)
4 to 6 glasses of water	10 (n=10)
7 to 9 glasses of water	1 (n=1)
From which food group should you eat most every day?	
Starchy food group	1 (n=1)
Fruit and vegetable group	10 (n=10)
Milk and milk group	0 (n=0)
Fats and oils group	0 (n=0)
Do you think these items below are a good or poor source of protein?	
Cheese	4 (n=4) POOR
Chicken	11 (n=11) GOOD
Stiff pap	0 (n=0) POOR
Rice	0 (n=0) POOR
Fruit	1 (n=1) GOOD
Tinned fish	10 (n=10) GOOD
How much pumpkin should be dished up per plate?	
1 Tablespoon	2 (n=2)
½ cup	9 (n=9)
1 cup	0 (n=0)
2 cups	0 (n=0)
Not sure	0 (n=0)
Which food group is the best source of energy?	
Starchy food group	5 (n=5)
Fruit and vegetable group	3 (n=3)
Milk and milk group	0 (n=0)
Meat and meat group	3 (n=3
An egg is a healthy choice to eat in place of meat or chicken. Agree	10 (n=10)
Disagree	1 (n=1)
Not sure	0 (n=0)
The key to a healthy way of eating is to:	
Eat many different kinds of foods	5 (n=5)
Eat some foods more than other foods	0 (n=0)
Eat certain kinds of foods in moderation, or small amounts	6 (n=6)
All of the above	0 (n=0)

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres continue

Adding a lot of sugar to your tea and coffee will give you energy. True False	 4 (n=4) 7 (n=7)

Tinned fish is a healthy choice to eat in place of meat or chicken. True False	 7 (n=7) 4 (n=4)
How many fruits and vegetables should be eaten per day? 1 to 2 servings of fruit and vegetables per day 3 to 4 servings of fruit and vegetables per day 5 or more servings of fruit and vegetables a day There is no need to eat fruit and vegetables daily	 2 (n=2) 9 (n=9) 0 (n=0) 0 (n=0)
A well balanced diet: Consists mostly of meat, with smaller amounts of starch, fruit, vegetables, and dairy. Consists mostly of vegetables and smaller amounts of meat and dairy. Consists mostly of starches, vegetables and fruits with smaller amounts of meat and dairy products. None of the above	 0 (n=0) 8 (n=8) 3 (n=3) 0 (n=0)
Which of the following nutrients are found in large amounts in fruits and vegetables? Fibre, vitamin A, vitamin C Starches, fat, vitamin D Fats, iron, calcium None of the above	 7 (n=7) 4 (n=4) 0 (n=0) 0 (n=0)
You should always add extra salt to cooked food at the table before you eat it. True False	 0 (n=0) 11 (n=11)
For a healthy immune system, you should eat a diet that: Consists mostly of meat, with smaller amounts of starch, fruits, vegetables, and dairy Consists mostly of vegetables and smaller amounts of meat and dairy Consists mostly of starches, vegetables, fruits with smaller amounts of meat and dairy products. None of the above	 7 (n=7) 4 (n=4) 0 (n=0) 0 (n=0)
Which food group has the most vitamin A? Starch food group Fruit and vegetables Fats, oils and sweets group None of the above	 4 (n=4) 7 (n=7) 0 (n=0) 0 (n=0)
Which of the following is a healthy snack? Cheese curls Peanuts and raisins Fried chips (hot chips) "Simba" chips	 0 (n=0) 9 (n=9) 2 (n=2) 0 (n=0)

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres continue

When I am not feeling well, it is ok to drink alcohol in moderation. True False	 0 (n=0) 11 (n=11)
If you are eating a healthy diet, there is no need for you to be physically active. True False	 2 (n=2) YES 9 (n= 9) NO
Fresh fruit and vegetables should always be washed thoroughly before peeling, cutting and eating: True False	 11 (n=11) 0 (n=0)
To prevent food from being contaminated during preparation, you should: Wash your hands regularly with hot, soapy water. Always use clean utensils, cutting boards and pots. Both of the above statements are correct.	 0 (n=0) 0 (n=0) 11 (n=11)
Being physically active means: Going to the gym Playing sports like soccer Walking a lot All of the above Drinking wine, beer and cider every day is acceptable as long as it is in moderation. True False	 0 (n=0) 1 (n=1) 0 (n=0) 10 (n=10) 2 (n=2) YES 9 (n=9) NO

The results displayed in Table 4.13 reveal that ten FHs (n=10) agreed that starches or carbohydrates were important for your health and should form part of your everyday meal. Eleven (n=11) the FHs also agreed that samp, stiff pap and rice belonged to the starchy food group while seven (n=7) agreed that canned beans, peas or lentils were a healthy choice to eat in place of meat or chicken. Ten (n=10) of the FHs were aware that 7-9 glasses of water should be drunk per day. The starchy food group should form part of your everyday meals; however, only one (n=1) of the respondents agreed with this statement, while ten (n=10) disagreed with this statement, saying that fruit and vegetables should form part of everyday meals. Seven of the food handlers (n=7) knew that canned beans, peas or lentils were a healthy choice to eat in place of meat or chicken. The majority of the FHs responded correctly that chicken and tinned fish were good sources of protein while only four (n=4) agreed that cheese could be a poor source of protein. Two (n=2) of the eleven FHs were able to identify the correct serving of a vegetable such as pumpkin per plate. Five (n=5) of the FHs knew that the best source of energy was from the starchy food group. Ten (n=10) FHs agreed that an egg was a healthy choice to eat in place of meat or chicken, while five (n=5) were aware that the key to healthy eating was to eat as many different kinds of food from all the food groups. The statements that adding a lot of sugar to your coffee or tea would give you energy and tinned fish was a healthy choice to eat in place of meat or chicken, was agreed to by seven (n=7) of the respondents

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres continue

Two (n=2) of the FHs were able to identify the correct fruit and vegetable intake per day while only three (n=3) knew about the concept of a well-balanced diet. That nutrients were found in large amounts in fruits and vegetables was known by seven (n=7) of the food handlers. Eleven respondents (n=11) agreed that extra salt should not be added to cooked food, while only four (n=4) knew what to eat to maintain a healthy immune system. Surprisingly, seven (n= 7) of the FHs were aware that green leafy vegetables and fruits were a good source of Vitamin A. Nine of the FHs correctly responded (n=9) to peanuts and raisins being a healthy snack compared to the other snacks such as fried chips and cheese curls. Ten (n=10) of the FHs were aware of the importance of being physically active and that eating a healthy diet did not necessarily mean that you need not be physically active. The guideline on consuming alcohol in moderation was well understood by nine (n=9) of the FHs. Eleven (n=11) of the respondents correctly agreed that fresh fruit and vegetables needed to be washed thoroughly with water before peeling or cutting and eating them, and all the FHs agreed with both statements that to prevent food from being contaminated during preparation, hands should be washed regularly with hot, soapy water and that clean utensils, cutting boards and pots should always be used.

4.5 Dietary analysis

A five-day menu cycle was analysed for nutrients as well as energy intake. In order to establish plate waste, the average portion sizes for breakfast and lunch were calculated per ECD centre as there was no existing standardization for portion sizes served to the children. All the children were served the same amount of food that was cooked on the day. A dietary intake analysis was conducted by the researcher using the web-based MRC® Food Finder version 3 software of the South African Medical Research Council (SAMRC). The data was then exported to Excel for comparison with the DRIs recommendations for children under six years old.

4.5.1 Menu analysis

All the ECD centres started their daily operations at 6 am and closed between 4 pm and 5 pm. They all had five-day menu cycle used to prepare meals for the children. Table 4.14 shows some of the menus for both meals served at these non -registered ECD centres.

As seen on the menus, meals were served with either rice or maize meal at breakfast and lunch time. Maize meal porridge was served at the majority of the centres with maltabella and amabele porridge being an option in one of the centres. There was an option of adding either margarine, peanut butter or powdered milk to the maize meal porridge depending on the available funds. These extra ingredients were mixed in a pot just before serving. The milk used in the breakfast porridge was in the form of powdered milk which was sprinkled over the porridge while it was in the pot.

The chicken cooked for lunch was shredded into pieces after it was cooked and a soup powder was added for thickening. Chicken was served more than once in a week and beef or mince once a week or sometimes not at all in a particular week. This was because red meat was expensive so the managers

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres continue

would look at cheaper alternatives. Tinned fish was served occasionally at four of the ECD centres. Vegetable soup, comprised of cabbage, carrot and butternut, was served at six of the ECD centres. Samp and beans was served at ECD centres 4, 6 and 9 only and phutu and maas was served at ECDs 3, 6, 7, 8 and 9. Macaroni or spaghetti was served with mince at ECD 4 and lentil curry at ECD 3. There were no snacks offered at all the ECD centres visited.

During food preparation it was observed that in all the curries and stews, onions were sautéed in sunflower oil until golden brown. Vegetables were incorporated into each meal during preparation. Vegetables that were mostly used in curries, stews and soups were onions, potatoes, cabbage and carrots, as well as frozen mixed vegetables which included carrots, green beans and sweetcorn.

Vegetable soup was served at seven ECDs. No fruit was served during the observations.

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres

ECD 1 MENU **Time**	**08:30 - 09:00**	**12:30 - 13:00**
Weekdays Monday	**Breakfast** Maize meal porridge with milk and peanut butter	**Lunch** Minced meat with rice and butternut
Tuesday	Maltabella with milk	Phutu and maas
Wednesday	Maize meal porridge with milk and margarine	Tinned fish curry with rice
Thursday	Maize meal porridge with milk and margarine	Vegetable soup with rice
Friday	Maize meal porridge with milk and peanut butter	Macaroni with chicken
ECD 2 MENU		
Time	**08:00 - 09:00**	**12:00 - 13:00**
Monday	Maize meal porridge with sugar	Chicken curry and rice
Tuesday	Maize meal porridge with sugar	Sugar beans curry and rice
Wednesday	Maize meal porridge with sugar	Vegetable soup with rice
Thursday	Maize meal porridge with sugar	Beef curry with stiff pap
Friday	Maize meal porridge with sugar	Chicken curry with rice
ECD 3 MENU		
Time Monday	**08:00 - 09:00** Maize meal porridge	**12:00 - 13:00** Sugar beans with rice
Tuesday	Maize meal porridge	Chicken curry and phutu
Wednesday	Maize meal porridge	Lentil curry with rice
Thursday	Maize meal porridge	Phutu and maas
Friday	Maize meal porridge	Chicken stew with rice
ECD 4 MENU		
Time	**08:00 - 09:00**	**12:00 - 13:00**
Monday	Maize meal porridge with peanut butter	Macaroni or spaghetti with mince

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres continue

Tuesday	Maize meal porridge with milk	Tinned fish curry and baked beans with rice
Wednesday	Maize meal porridge with margarine or milk	Samp and beans
Thursday	Maize meal porridge with peanut butter	Chicken stew and rice
Friday	Maize meal porridge with margarine or milk	Vegetable soup and phutu
ECD 5 MENU		
Time	**08:00 - 09:00**	**12:00 - 13:00**
Monday	Maize meal porridge with peanut butter	Beef curry and rice
Tuesday	Maize meal porridge with milk	Vegetable soup and rice
Wednesday	Maize meal porridge with margarine	Chicken curry and stiff pap
Thursday	Maize meal porridge with milk	Sugar beans curry and rice
Friday	Maize meal porridge with margarine	Chicken stew and phutu
ECD 6 MENU		
Time	**08:00 - 09:00**	**12:00 - 13:00**
Monday	Maize meal porridge	Tinned fish curry and rice
Tuesday	Amabele porridge	Chicken stew and rice
Wednesday	Maize meal porridge with margarine	Samp and beans
Thursday	Maize meal porridge	Phutu and maas
Friday	Maize meal porridge with margarine	Chicken stew and rice
ECD 7 MENU		
Time	**08:00 - 09:00**	**12:00 - 13:00**
Monday	Maltabella	Vegetable soup with rice
Tuesday	Maize meal porridge with milk	Chicken curry with rice
Wednesday	Maize meal porridge with milk	Vegetable soup with rice
Thursday	Maltabella	Chicken curry and phutu
Friday	Maize meal porridge with margarine	Phutu and maas
ECD 8 MENU		
Time	**08:00 - 09:00**	**12:00 -1 3:00**
Monday Tuesday	Maize meal porridge Maize meal porridge	Mince curry and rice Chicken curry with stiff pap
Wednesday	Amabele porridge	Vegetable soup with rice
Thursday	Maize meal porridge	Chicken stew with phutu
Friday	Maize meal porridge	Phutu and maas
ECD 9 MENU		
Time	**08:00 - 09:00**	**12:00 - 13:00**
Monday	Maize meal porridge	Chicken stew with rice

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres continue

Tuesday	Maize meal porridge with milk	Phutu and maas
Wednesday	Maize meal porridge with margarine	Tinned fish curry with stiff pap
Thursday	Maize meal porridge with milk	Samp and beans
Friday	Maize meal porridge	Vegetable soup with rice

4.5.2 Plate waste study

Table 4.15 illustrates the average portion sizes established through the plate waste study. These portion sizes were used to analyse the dietary adequacy of the menus. The data from the plate waste study was used to illustrate the portion sizes served for breakfast and lunch with no snack being provided. A total number of nine ECD centres were observed and each centre had a meal prepared for the day. Maize meal porridge was consumed at the majority of the centres (Centres 1, 3, 4, 5, 6, 8 and 9) with the average portion sizes ranging between 132g and 198g respectively. Maltabella porridge was prepared by ECD centres 2 and 7 with average portion sizes of 134g and 217g. A starch dish (rice) was prepared for lunch by ECD centres 2, 4, 5, 6 and 8, pap by ECD centre 3 and phutu by ECDs 1, 7 and 9. ECD centres 2, 3, 6 and 8 prepared chicken more often than the others, with vegetable curry being prepared by ECD centres 1 and 5, and mince curry, beef curry and phutu with maas prepared by ECD centres 4, 7 and 9 respectively. There was no portion size recorded for a vegetable side dish as all the vegetables were incorporated into the protein dish during preparation.

Table 4.15: Average portion sizes of menu items established through plate waste studies

ECD centres	Number of plates n=10	Average portion size of menu item (breakfast)	Average portion size of menu item (lunch starch dish)	Average portion size of menu item (lunch protein dish)	Average portion size of lunch meal
ECD 1	10	**158g Maize meal porridge**	**88g Phutu**	**68g Vegetable curry**	**156g**
ECD 2	10	**217g Maltabella porridge**	**104g Rice**	**135g Chicken curry with vegetables**	**239g**
ECD 3	10	**153g Maize meal porridge**	**170g Pap**	**168g Chicken curry with vegetables**	**338g**
ECD 4	10	**132g Maize meal porridge**	**145g Rice**	**158g Mince-meat curry**	**286g**
ECD 5	10	**177g Maize meal porridge**	**128g Rice**	**180g Vegetable curry**	**333g**
ECD 6	10	**181g Maize meal porridge**	**224g Rice**	**120g Chicken curry**	**344g**
ECD 7	10	**134g Maltabella porridge**	**113g Phutu**	**99g Beef curry**	**212g**

Table 4.14: Menus for meals served at Ntuzuma non-registered ECD centres continue

ECD 8	10	**198g Maize meal porridge**	**215g Rice**	**97g Chicken stew**	**312g**
ECD 9	10	**153g Maize meal porridge**	**169g Phutu**	**104g Maas**	**272g**

Table 4.16: Average portion sizes of menu items for starch dishes served for breakfast and lunch

ECD centres	**Number of plates (n=10)**	**Average portion size of menu item**	**Average portion size of menu item**
		Maize meal porridge	**Rice**
ECD 1	10	158g	-
ECD 2	10		104g
ECD 3	10	153g	-
ECD 4	10	132g	145g
ECD 5	10	177g	128g
ECD 6	10	181g	224g
ECD 8	10	198g	215g
ECD 9	10	153g	-
Average portion size		**165g**	**163g**

The average portion sizes for the starch dish served during breakfast and lunch (Table 4.16) showed that 165g was the average portion size for maize meal porridge and it was 163g for rice.

4.5.3 Nutrient analysis

The average portion sizes of menu items established through the plate waste studies were analysed and compared to the DRIs for children aged one to three and four to eight respectively compiled by the IoM in 2003. Tables 4. 17 and 4.18 reveal the contribution of the daily nutrient intake of children aged one to three years old and four to eight years old at non-registered ECDs in the Ntuzuma area. The nutrient adequacy of meals cooked at these ECD centres was compared to the 60% daily nutrient requirements of children within this age group.

Table 4.17: Nutrient intake analysis for children 1-3 years old at ECD centres 1 - 9 (breakfast and lunch)

Nutrient/ day	DRIs age group 1 to 3 years	ECD 1 menu mean intake ±SD	% contribution of ECD 1 menu to daily needs of the children (DRIs)	ECD 2 menu mean intake ±SD	% contribution of ECD 2 menu to daily needs of the children (DRIs)	ECD 3 menu mean intake ±SD	% contribution of ECD 3 menu to daily needs of the children (DRIs)	ECD 4 menu mean intake ±SD	% contribution of ECD 4 menu to daily needs of the children (DRIs)	ECD 5 menu mean intake ±SD	% contribution of ECD 5 menu to daily needs of the children (DRIs)	ECD 6 menu mean intake ±SD	% contribution of ECD 6 menu to daily needs of the children (DRIs)
Energy(kJ) (EER)	4393 Boys	992 ±165.85	22.58%	1262 ±211.85	28.73%	858 ±236.47	19.53%	1303 ±209.59	29.66%	1010 ±144.57	23.00%	±98.26	33.14%
	4166 Girls	992 ±165.85	23.81%	1262 ±211.85	27.24%	858 ±236.47	20.60%	1303 ±209.59	31.28%	1010 ±144.57	24.24%	±98.26	34.95%
Total protein(g) (RDA)	13	7.40 ±0.71	56.92%	9.40 ±0.67	**72.31%**	11.20 ±1.10	**86.15%**	14.00±0.97	**107.69%**	10.80 ±1.02	**83.08%**	8.40 ±0.99	**64.62%**
Carbohydrate, total(g) (EAR)	100	32.40 ±1.41	32.40%	34.60 ±1.54	34.60%	35.10±1.73	35.10%	34.10 ±1.40	34.10%	38.40± 2.64	38.40%	49.50 ±2.82	49.50%
Total dietary fibre (g) (AI)	19	0.70 ±0.46	3.68%	1.60 ±0.73	8.42%	1.70 ±0.95	8.95%	1.70 ±0.88	8.95%	1.70 ±0.85	8.95%	2.70 ±1.20	14.21%
Calcium (mg) (AI)	500	18.00 ±33.61	3.60%	49.00 ±13.11	9.80%	96.00 ±23.54	19.20%	25.00 ±17.90	5.00%	88.00 ±31.37	17.60%	7.00 ±12.45	1.40%
Iron (mg) (EAR)	3.0	0.80 ±0.52	26.66%	1.20 ±0.94	40.00%	0.90 ±1.20	30.00%	1.40 ±0.78	46.66%	2.20 ±0.91	**73.33%**	1.60 ±1.02	53.33%
Phosphorus (mg) (EAR)	380	87.00 ±42.87	22.89%	127.00 ±40.76	33.42%	162.00 ±39.50	42.63%	103.00 ±28.45	27.11%	171.00 ±40.39	45.00%	61.00 ±25.69	16.05%
Zinc (mg) (EAR)	2.2	0.74 ±0.90	33.64%	1.42 ±0.89	**64.55%**	1.11 ±1.00	50.45%	2.04 ±1.52	**92.73%**	2.17 ±0.97	**98.64%**	1.36 ±0.79	**61.82%**
Iodine (mg) (EAR)	65	2.00 ±0.89	3.08%	3.00 ±1.04	4.62%	0.00 ±1.59	0.00%	4.00 ±0.67	6.15%	3.00 ±0.86	4.62%	2.00 ±0.90	3.08%

Table 4.17: Nutrient intake analysis for children 1-3 years old at ECD centres 1 - 9 (breakfast and lunch) continue

Nutrient/ day	DRIs age group 1 to 3 years	ECD 1 menu mean intake ±SD	% contribution of ECD 1 menu to daily needs of the children (DRIs)	ECD 2 menu mean intake ±SD	% contribution of ECD 2 menu to daily needs of the children (DRIs)	ECD 3 menu mean intake ±SD	% contribution of ECD 3 menu to daily needs of the children (DRIs)	ECD 4 menu mean intake ±SD	% contribution of ECD 4 menu to daily needs of the children (DRIs)	ECD 5 menu mean intake ±SD	% contribution of ECD 5 menu to daily needs of the children (DRIs)	ECD 6 menu mean intake ±SD	% contribution of ECD 6 menu to daily needs of the children (DRIs)
Vitamin A (RE) (mcg) (EAR)	210	76.00 ±26.95	36.19%	71.00 ±31.45	33.81%	183 00 ±29.50	**87.14%**	37.00 ±33.85	17.62%	73.00 ±28.90	34.76%	265.0 0 ±54.1 7	**126.19%**
Vitamin C (mg) (EAR)	13	3.00 ±1.24	23.08%	1.00 ±0 32	7.69%	4.00 ±1.94	30.77%	3.00 ±1.34	23.08%	5 00 ±2.57	38.46%	2.00 ±0.97	15.38%
Vitamin D (mcg) (AI)	5	0.41 ±0.76	8.20%	0.15 ±1 04	3.00%	2.08 ±0.45	41.60%	0.23 ±0.59	4.60%	0 34 ±0.65	6.80%	0.37 ±0.88	7.40%
Vitamin E (mg) (EAR)	5.0	0.35 ±0.41	7.00%	0.85 ±0.62	17.00%	0.50 ±0.41	10.00%	2.83 ±1.13	56.60%	0 09 ±0.11	1.80%	2.44 ±1.12	48.80%
Vitamin K(mcg) (AI)	30	4.48 ±1.52	14.93%	2.71 ±0 94	9.03%	1.79 ±0.99	5.96%	1.74 ±1.03	5.80%	2.69 ±0.75	8.96	3.53 ±1.66	11.77%
Thiamine (mg) (EAR)	0.4	0.12 ±0.50	30.00%	0.09 ±0.10	22.50%	0.15 ±0.45	37.50%	0.15 ±0.33	37.50%	0 25 ±0.40	**62.50%**	0.21 ±0.37	52.50%
Riboflavin (mg) (EAR)	0.4	0.06 ±0.58	15.00%	0.09 ±0.43	22.50%	0.16 ±0.12	40.00%	0.10 ±0.17	25.00%	0.19 ±0.20	47.50%	0.12 ±0.43	30.00%
Niacin (mg) (EAR)	5.0	3.40 ±1.41	**68.00%**	2.50 ±1 97	50.00%	2.30 ±1.65	46.00%	2.90 ±1.35	58.00%	2 30 ±1.00	46.00%	3.20 ±1.80	**64.00%**
Vitamin B6 (mg) (EAR)	0.4	0.17 ±0.54	42.50%	0.21 ±0.43	52.50%	0.27 ±0.12	**67.50%**	0.27 ±0.27	**67.50%**	0.15 ±0.31	37.50%	0.38 ±0.22	**95.00%**
Vitamin B12(mcg) (EAR)	0.7	0.00 ±0.37	0.00%	0.50 ±0.45	**71.43%**	0.70 ±0.71	**100.00%**	0.50 ±0.65	**71.43%**	0 50 ±0.60	**71.43%**	0.00 ±0.00	0.00%
Folate, total (mcg) (EAR)	120	0.84 ±0.39	0.70%	0.07 ±0.12	0.06%	1.04 ±0.71	0.87%	0.00 ±0.19	0.00%	1 24 ±0.56	1.03%	0.56 ±0.90	0.47%

EAR: Estimated Average Requirement
EER: Estimated Energy Requirement
SD: Standard Deviation
AI: Adequate Intake
RE: Retinol equivalent
RDA: Recommended Dietary Allowance
kJ: Kilojoules
g: grams

Less than 60% of DRIs | Above 60% of DRIs | Excee

Table 4.17 presents the nutrient adequacy of meals served at all nine of the ECD centres for children within the age group one to three years old. Meals served at ECD 1 did not meet 60% of the DRIs for energy, carbohydrates and protein required by children one to three years of age. The energy contributed by this menu was 992kJ (±165.85) and contributed 22.58% and 23.81% to the daily requirement for boys and girls respectively in this age group and the total carbohydrate contribution was 32.40g (±1.41; 32.40%) and protein at 7.40g (±0.71; 56.92%). Furthermore, none of the meals served at ECD 1 met the DRI for dietary fibre 0.70g (±0.46; 3.68%), calcium 18.00mg (±33.61; 3.60%), iron 0.80mg (±0.50; 26.66%), phosphorus 87.00mg (±42.87; 22.89%), zinc 0.74mg (±0.90; 33.64%), iodine 2.00mcg (±0.89; 3.08%), vitamin A 76.00mcg (±26.95; 36.19%), vitamin C 3.00mg/day (±1.24; 23.08%) vitamin D 0.41mcg (±0.76; 8.20%) vitamin E 0.35mg (±0.41; 7.00%), vitamin K 4.48mcg (±1.52; 14.93%), thiamine 0.12mg (±0.50; 30.00%), riboflavin 0.06mg (±0.58; 15.00%), vitamin B6 0.17mg (±0.58; 42.50%), vitamin B12 0.00mg (±0.37; 0.00%) and folate 0.84mcg (±0.39; 0.70%). Niacin 3.40mg (±1.41; 68.00%) was the only nutrient to reach above 60% of the DRIs.

At ECD 2 three nutrients were above the 60% of the DRIs from both the meals served at this centre. These were protein 9.40g (±0.67; 72.31%, zinc 1.42mg (±0.89; 64.55%) and vitamin B12 0.50mg (±0.45; 71.43%). The majority of the nutrients did not meet the DRI. These were energy at 1262kJ (±211.85; 28.73% and 27.24%), carbohydrates 34.60g (±1.54; 34.60%), dietary fibre 1.60g (±0.73; 8.43%), calcium 49mg (±13.11; 9.80%), iron 1.20mg (0.94; 40.00%), phosphorus 127mg (±40.76; 33.42%), iodine 3.00mcg (±1.04; 4.62%), vitamin A 71.00mcg (±31.45; 33.81%), vitamin C 1.00mg (±0.32; 7.69%), vitamin D 0.15mcg (±1.04; 3.00%), vitamin E 0.85mg (±0.62; 17.00%), vitamin K 2.71mcg (±0.94; 9.03%), thiamine 0.09mg (±0.10; 22.50%), riboflavin 0.09mg (±0.43; 22.50%), niacin 2.50mg (±1.97; 50.00%), vitamin B6 0.21mg (±0.43;52.50%) and folate 0.07mcg (±0.12; 0.06%).

ECD 3 served meals that were below 60% of the daily recommended intake except for protein 11.20g (±1.10;86.15%), vitamin A 183mcg (±29.50; 87.14%), vitamin B6 0.27mg (±0.12;67.50%) and vitamin B12 0.70mg (±0.55;100.00%). The carbohydrate intake of the meals consumed was low at 35.10g (±1.73; 35.10%), followed by energy levels of 858kJ (±238.47; 19.53% and 20.60%). Dietary fibre recorded an intake of 1.70g (±0.95; 8.95%), calcium recorded a low intake of 96mg (±23.54; 19.20%), while iron was 0.90mg (±1.20; 30.00%), phosphorus was 162.00mg (±39.50; 42.63%), zinc 1.11mg (±1.00; 50.45%), iodine 0.00mcg (±1.59; 0.00%), vitamin C 4.00mg (±1.94;30.77%), vitamin D 2.08mcg (±0.45;41.60%), vitamin E 0.50mg (±0.41; 10.00%), vitamin K 1.79mcg (±0.99; 5.96%), thiamine 0.15mg (±0.45; 37.50%), riboflavin 0.16mg (±0.12;40.00%), niacin 2.30mg (±1.65; 46.00%) and folate 1.04mcg (±0.71; 0.87%).

At ECD 4 the only nutrients that met the DRIs were protein 14g (±0.97; 107.69%), zinc 2.04mg (±1.52; 92.73%) vitamin B6 0.29mg (±0.27; 67.50%) and vitamin B12 0.50mg (±0.66; 71.43%). Carbohydrate was 34.10g (±1.40; 34.10%) and met half of the DRIs as well as the total energy which was 1303kJ (±209.59; 29.66% and 31.28%), and thiamine 0.15mg (±0.33; 37.50%), while niacin was close to

meeting the DRIs at 2.9mg (±1.35; 58.00%) as well as vitamin E 2.83mg (±1.13; 56.60%). The total dietary fibre was relatively low at 1.70g (±0.88; 8.95%), calcium 25.00mg (±17.90;5.00%), iron 1.40mg (±0.78; 46.66%), phosphorus 103mg (±28.45; 27.11%), iodine 4.00mcg (±0.67; 6.15%), vitamin A 37mcg (±33.85;17.62%), vitamin C 3.00mg (±1.34; 23.08%), vitamin D 0.23mcg (±0.59; 4.60%), vitamin K 1.74mcg (±1.03; 5.80%), riboflavin 0.10mg (±0.17;25.00%) and folate 0.00mcg (±0.19; 0.00%).

The total protein contributed at ECD 5 was 10.80g (±1.02; 83.08%), with iron 2.20mg (±0.91; 73.33%), zinc 2.17mg (±0.97; 98.64%), thiamine 0.25mg (±0.40; 62.50%) and vitamin B12 0.50mg (±0.60; 71.43%). All these nutrients met above 60% of the DRIs. However, the rest of the nutrients met half of the recommended intake. These nutrients were carbohydrates 38.40g (±2.64; 38.40%), phosphorus 171mg (±40.39; 45.00%), vitamin A 73mcg (±28.90; 34.76%), vitamin C 5.00mg (±2.57; 38.46%), riboflavin 0.19mg (±0.20; 47.50%), niacin 2.30mg (±1.00; 46.00%) and vitamin B6 0.15mg (±0.31; 37.50%). The lowest intake of nutrients was energy 1010kJ (±144.57; 23.00% and 24.24%), dietary fibre 1.70g (±0.85; 8.95%), calcium 88mg (±31.37; 17.60%), iodine 3.00mcg (±0.89; vitamin D 0.34mcg (±0.65; 6.80%), vitamin E 0.09mg (±0.11; 1.80%), vitamin K 2.69mcg (±0.75; 8.95%) and folate 1.24mcg (±0.58; 1.03%).

Meals served at ECD 6 provided an exceedingly low intake of several nutrients. The nutrients were dietary fibre 2.7g (±1.20; 14.21%), calcium 7.00mg (±12.45; 1.40%), phosphorus 61.00mg (±25.69; 16.05%), iodine 2.00mcg (±0.90; 3.08%), vitamin C 2.00mg (±0.97; 15.38%), vitamin D 0.37mcg (±0.88; 7.40%), vitamin K 3.53mcg (±1.66; 11.77%), vitamin B12 0.00mg (±0.00; 0.00%) and folate 0.56mcg (±0.90; 0.47%). The results also indicated that nutrients which met more than half of the recommended intake were energy 1456kJ (±98.26; 33.14% and 34.95%), carbohydrate 49.50g (±2.82; 49.50%), protein 8.40g (±0.99; 64.62%), iron 1.60.00mg (±1.02; 53.33%), vitamin E 2.44mg (±1.12; 48.80%), thiamine 0.12mg (±0.37; 52.50%), riboflavin 0.12mg (±0.43; 30.00%). The nutrients that met more than the recommended intake were protein 8.40g (± 0.99; 64.62%), zinc 1.36mg (±0.79; 61.82%), vitamin A 265.00mcg (±54.17; 126.19%), niacin 3.20mg (±1.80; 64.00%) and vitamin B6 0.38mg (±.0.22mg; 95.00%).

The contribution of nutrients at ECD 7 was relatively low except for protein 8.70g (±0.81; 66.92%), vitamin A 399mcg (±62.09; 190.00%), niacin 3.30mg (±2.50; 66.00%) and vitamin B6 0.24mg (±0.19; 60.00%). Nutrients with low intake were energy 1140kJ (±88.22; 25.95 and 27.36%), dietary fibre 1.6g (±0.98; 8.42%), calcium 16.00mg (±22.50; 3.20%), iron 0.80mg (±0.23; 26.66%), phosphorus 69.00mg (±23.70; 18.16%), iodine 2.00mcg (±0.85; 3.08%), vitamin D 0.09mcg (±0.11; 1.80%), vitamin K 1.57mcg (±0.55; 5.23%), riboflavin 0.08mg (±0.22; 20.00%), vitamin B12 0.00mg (±0.00mg; 0.00%) and folate 0.63mcg (±0.50; 0.53%). Carbohydrates met only half of the 60% DRIs of 36.40g (±1.94; 36.40%), zinc 0.78mg (±1.04; 35.45%), vitamin C 5.00mg (±2.04; 38.46%) and thiamine 0.12mg (±0.31; 30.00%).

All the meals served at ECD 8 were below 60% of the DRIs for both meals. The energy contribution was 1056kJ (±84.62; 24.04% and 25.35%), protein was 5.40g (±1.17; 41.54%), carbohydrates 27.70g (±0.99; 27.70%), dietary fibre 1.3g (±0.78; 6.84%), calcium 11mg (±13.60; 1.60%), iron 1.10 (±0.52; 36.60%), phosphorus 54.00mg (±17.29; 14.21%), zinc 1.03mg (±0.27; 46.82%), iodine 4.00mcg (±1.20; 6.15%), vitamin A 57.00mcg (±42.76; 27.14%), vitamin C 1.00mg (±0.22; 7.69%), vitamin D 0.53mcg (±0.43; 10.60%), vitamin E 0.58mg (±0.35; 11.60%), vitamin K 0.68mcg (1.02; 2.27%), thiamine 0.10mg (±0.23; 25.00%), riboflavin 0.08mg (±0.19; 20.00%), niacin 2.20mg (±1.11; 30.00%), vitamin B6 0.19mg (±0.25; 47.50%), vitamin B12 0.00mg (±0.29; 0.00%) and folate 0.00mcg (0.25; 0.25%).

At ECD 9 the majority of the meals served had a high nutrient intake. These were protein 8.00g (±0.71; 61.54%), carbohydrates 66.60g (±0.78; 66.60%), iron 2.90mg (±0.75; 96.66%), zinc 1.83mg (±1.05; 83.19%), thiamine 0.30mg (±0.19; 75.00%) and vitamin B6 0.28mg (±0.19; 70.00%). Nutrients that were below 60% of the DRIs included energy 1347kJ (±186.91; 30.66% and 32.33%), dietary fibre 4.90g (±0.25; 25.80%), calcium 20.00mg (±21.34; 4.00%), phosphorus 127.00mg (±43.45; 33.42%), iodine 0.00mcg (±0.05; 0.00%), vitamin A 27.00mcg (±8.00; 12.86%)vitamin C 3.00mg (±1.02; 23.08%), vitamin D 0.00mcg (±0.33; 0.00%), vitamin E 0.38mg (±0.42; 7.60%), vitamin K 0.19mcg (1.56; 0.63%), riboflavin 0.11mg (±0.30; 27.50%), niacin 2.20mg (±1.45; 44.00%), vitamin B12 0.00mg (±0.10; 0.00%) and folate 0.00mcg (±0.22; 0.00%).

Nutrient/ day	DRIs age group 4 to 8' years	ECD 1 menu mean intake	% contribution of ECD 1 menu to daily needs of the children (DRIs)	ECD 2 menu mean intake	% contribution of ECD 2 menu to daily needs of the children (DRIs)	ECD 3 menu mean intake	% contribution of ECD 3 menu to daily needs of the children (DRIs)	ECD 4 menu mean intake	% contribution of ECD 4 menu to daily needs of the children (DRIs)	ECD 5 menu mean intake	% contribution of ECD 5 menu to daily needs of the children (DRIs)	ECD 6 menu mean intake	% contribution of ECD 6 menu to daily needs of the children (DRIs)	ECD 7 menu mean intake	% contribution of ECD 7 menu to daily needs of the children (DRIs)	ECD 8 menu mean intake	% contribution of ECD 8 menu to daily needs of the children (DRIs)	ECD 9 menu mean intake	% contribution of ECD 9 menu to daily needs of the children (DRIs)
Energy(kJ) (EER)	Boys	1050 ±88.96	14.35%	1135 ±92.53	15.51%	858 ±62.54	11.73%	1071 ±92.90	14.64%	925 ±85.72	12.64%	922 ±67.78	12.60%	960 ±71.03	13.12%	467 ±119.39	6.38%	708 ±96.68	9.68%
	Girls	1050 ±88.96	15.23%	1135 ±92.53	16.46%	858 ±62.54	12.44%	1071 ±92.90	15.53%	925 ±85.72	13.41%	922 ±67.78	13.37%	960 ±71.03	13.92%	467 ±119.39	6.77%	708 ±96.68	10.27%
Total protein(g) (RDA)	19	7.60 ±1 51	40.00%	8.60 ±0.92	45.26%	8.40 ±0.88	44.21%	10.10 ±1.09	53.16%	9.70 ±1.21	51.05%	5.50 ±0.78	28.95%	7.10 ±1.10	37.37%	3 50 ±0.75	18.42%	3.70 ±1.45	19.47%
Carbohydrate, total(g) (EAR)	100	31.80 ±6 32	31.80%	28.70 ±12.65	28.70%	36.40 ±3.66	36.40%	31.70 ±2.83	31.70%	34.40 ±5.82	34.40%	22.30 ±3.87	22.30%	33.70 ±1.90	33.70%	16.10 ±0.65	16.10%	35.20 ±4.59	35.20%
Total dietary fibre(g) (AI)	25	1.50 ±0 52	6.00%	1.40 ±0.64	5.60%	1.90 ±1.20	7.60%	1.50 ±0.75	6.00%	1.40 ±1.42	5.60%	1.30 ±0.2	5.20%	1.40 ±0.44	5.60%	0 90 ±1.05	3.60%	2.70 ±0.95	10.80%
Calcium (mg) (AI)	800	18.00 ±3 97	2.25%	46.00 ±4.51	5.75%	104.00 ±2.96	13.00%	25.00 ±2.74	3.13%	89.00 ±5.67	11.13%	6.00 ±1.62	0.75%	16.00 ±3.76	2.00%	8 00 ±1.67	1.00%	11.00 ±2.45	1.38%
Iron (mg) (EAR)	4.1	0.80 ±0.41	19.51%	1.00 ±0.38	24.39%	0.70 ±0.38	17.07%	0.90 ±0.49	21.95%	1.90 ±0.54	46.34%	0.70 ±0.45	17.07%	2.00 ±1.12	48.78%	0 50 ±30.00	12.20%	1.30 ±0.43	31.71%
Phosphorus (mg) (EAR)	405	86.00 ±5 94	21.23%	118.00 ±8.05	29.14%	146.00 ±7.03	36.05%	78.00 ±3.91	19.26%	164.00 ±8.23	40.49%	36.00 ±3.67	8.89%	58.00 ±3.71	14.32%	37.00 ±2.99	9.14%	58.00 ±3.81	14.32%
Zinc (mg) (EAR)	4.0	0.74 ±0.43	18.50%	1.20 ±0.52	30.00%	1.19 ±0.82	29.75%	1.30 ±0.45	32.50%	1.92 ±0.61	48.00%	0.60 ±0.33	15.00%	0.53 ±0.46	13.25%	0.45 ±0.22	11.25%	0.81 ±0.62	20.25%
Iodine (mg) (EAR)	65	2.00 ±0 50	3.08%	3.00 ±0.73	4.62%	0.00 ±0.03	0.00%	3.00 ±0.55	4.62%	3.00 ±0.86	4.62%	2.00 ±0.62	3.08%	2.00 ±0.55	3.08%	1 00 ±0.20	1.54%	0.00 ±0.10	0.00%

Table 4.18: Nutrient intake analysis for children 4 - 8 years old at ECD centres 1- 9 (breakfast and lunch)

Nutrient/ day	DRIs ag 4 group t<8' years	ECD 1 menu mean intake	% contribution of ECD 1 menu to daily needs of the children (DRIs)	ECD 2 menu mean intake	% contribution of ECD 2 menu to daily needs of the children (DRIs)	ECD 3 menu mean intake	% contribution of ECD 3 menu to daily needs of the children (DRIs)	ECD 4 menu mean intake	% contribution of ECD 4 menu to daily needs of the children (DRIs)	ECD 5 menu mean intake	% contribution of ECD 5 menu to daily needs of the children (DRIs)	ECD 6 menu mean intake	% contribution of ECD 6 menu to daily needs of the children (DRIs)	ECD 7 menu mean intake	% contribution of ECD 7 menu to daily needs of the children (DRIs)	ECD 8 menu mean intake	% contribution of ECD 8 menu to daily needs of the children (DRIs)	ECD 9 menu mean intake	% contribution of ECD 9 menu to daily needs of the children (DRIs)
Vitamin A (RE)(mcg) (EAR)	275	83.00 ±4.60	30.18%	64.00 ±3.21	23.27%	196.00 ±8.66	71.27%	24.00 ±3.27	8.72%	57.00 ±3.37	20.72%	218.00 ±9.03	79.27%	173.00 ±14.56	62.91%	30.00 ±2.91	10.91%	27.00 ±2.75	9.82%
Vitamin C (mg) (EAR)	22	3.00 ±0.91	13.64%	1.00 ±0.67	4.55%	3.00 ±1.52	13.64%	3.00 ±1.66	13.64%	4.00 ±2.25	18.18%	2.00 ±0.99	9.09%	5.00 ±2.65	22.73%	4.00 ±2.89	18.18%	3.00 ±1.69	13.64%
Vitamin D (mcg) (AI)	5.0	0.47 ±0.19	9.40%	0.17 ±0.41	3.40%	1.18 ±0.78	23.60	0.14 ±0.10	2 80%	0.32 ±0.13	6.40%	0.40 ±0.10	8.00%	0.05 ±0.42	1.00%	0.06 ±0.27	1.20%	0.00 ±0.00	0.00%
Vitamin E (mg) (EAR)	6.0	0.40 ±0.22	6.66%	0.55 ±0.54	9.17%	0.32 ±0.24	5.33%	1.75 ±0.96	29.17%	0.27 ±0.10	4.50%	2.11 ±1.79	35.17%	1.37 ±1.55	22.83%	0.88 ±0.69	14.67%	0.32 ±0.14	5.33%
Vitamin K(mcg) (AI)	55	4.97 ±1.99	9.04%	2.92 ±1.73	5.31%	1.56 ±0.67	2.84%	1.55 ±0.71	2 82%	2.45 ±1.17	4.45%	3.80 ±1.12	6.91%	1.29 ±0.77	2.35%	1.10 ±0.04	2.00%	0.22 ±0.11	0.40%
Thiamine (mg) (EAR)	0.5	0.12 ±0.43	2.40%	0.07 ±0.10	14.00%	0.12 ±0.05	24.00%	0.10 ±0.43	20.00%	0.22 ±0.72	44.00%	0.09 ±0.03	18.00%	0.09 ±0.10	18.00%	0.08 ±0.90	16.00%	0.14 ±0.10	28.00%
Riboflavin (mg) (EAR)	0.5	0.06 ±0.01	12.00%	0.08 ±0.21	16.00%	0.16 ±0.34	3.20%	0.07 ±0.45	14.00%	0.18 ±0.62	36.00%	0.06 ±0.01	12.00%	0.05 ±0.03	10.00%	0.03 ±0.07	6.00%	0.05 ±0.12	10.00%
Niacin (mg) (EAR)	6.0	3.40 ±0.75	56.66%	2.40 ±0.56	40.00%	1.90 ±0.39	31.66%	2.20 ±0.48	36.66%	2.00 ±0.24	33.33%	2.00 ±0.23	33.33%	2.60 ±1.47	43.33%	1.50 ±0.98	25.00%	1.20 ±0.99	20.00%
Vitamin B6 (mg) (EAR)	0.5	0.17 ±0.41	3.42%	0.17 ±1.12	34.00%	0.21 ±0.77	42.00%	0.19 ±0.47	38.00%	0.12 ±0.36	24.00%	0.17 ±0.24	34.00%	0.19 ±0.23	0.38%	0.13 ±0.45	26.00%	0.15 ±0.98	30.00%
Vitamin B12(mcg) (EAR)	1.0	0.00 ±0.02	0.00%	0.40 ±0.22	40.00%	0.50 ±0.39	50.00%	0.30 ±0.78	30.00%	0.50 ±0.20	50.00%	0.00 ±0.03	0.00%	0.00 ±0.00	0.00%	0.00 ±0.01	0.00%	0.00 ±0.00	0.00%
Folate, total (mcg) (EAR)	160	0.84 ±0.95	0.53%	0.08 ±0.04	0.05%	2.49 ±1.98	1.56%	0.03 ±0.34	0 02%	1.09 ±0.99	0.68%	0.5 ±0.10	0 31%	0.36 ±0.14	0.23%	0.04 ±0.01	0.03%	0.04 ±0.10	0 03%

EAR: Estimated Average Requirement
EER: Estimated Energy Requirement
kJ: Kilojoules
SD: Standard Deviation
AI: Adequate Intake
g: grams
RE: Retinol equivalent
RDA: Recommended Dietary Allowance

Less than 60%of DRIs | Above 60% of DRIs | Exceeding 100% of DRIs

4.6 Microbial analysis

This section will briefly discuss the microbial swabbing which was conducted at each ECD centre on chopping boards, FHs' hands and on the food surface areas where food was prepared.

Table 4.19: Occurrence of *Staphylococcus aureus* results on chopping boards from all the ECD centres

Name of ECD	Before	After
ECD 1	3.06 ± 0.22dx	0.00 ± 0.00ay
ECD 2	4.29 ± 0.03ex	0.00 ± 0.00ay
ECD 3	2.54 ± 0.54cx	0.00 ± 0.00ay
ECD 4	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 5	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 6	3.06 ± 0.22dx	0.00 ± 0.00ay
ECD 7	2.00 ± 0.00bx	0.00 ± 0.00ay
ECD 8	0.00 ±0.00ax	0.00 ± 0.00ax
ECD 9	0.00 ± 0.00ax	0.00 ± 0.00ax

Data is shown as mean ± SD (n=2); different letters indicate significant differences between ECDs 1-9 (a, b, c, d, e) before and after cleaning (x, y).

Table 4.19 illustrates the average occurrence of pathogenic microorganisms (*Staphylococcus aureus*) on chopping boards. The results of *S. aureus* tested on chopping boards of ECDs 1, 2, 3, 6 and 7 showed a range from 2.00 - 4.29 log CFU/mL before washing with soap and water. The after-washing result indicated no growth of *S. aureus* observed (0.00 CFU/mL).

Table 4.20: Occurrence of *Staphylococcus aureus* results on the hands of food handlers from all the ECD centres

Name of ECD	Before	After
ECD 1	2.93 ± 0.45cx	0.00 ± 0.00ay
ECD 2	3.85 ± 0.13dx	0.00 ± 0.00ay
ECD 3	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 4	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 5	3.24 ± 0.46cx	0.00 ± 0.00ay
ECD 6	2.00 ± 0.00bx	0.00 ± 0.00ay
ECD 7	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 8	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 9	2.30 ± 0.00bx	0.00 ± 0.00ay

Data is shown as mean ± SD (n=2); different letters indicate significant differences between ECDs 1-9 (a, b, c, d) before and after cleaning (x, y)

Table 4.20 illustrates the average occurrence of pathogenic microorganisms (*Staphylococcus aureus*) on the hands of food handlers. The results of *S. aureus* tested on food handlers' hands of ECDs 1, 2, 5, 6 and 9 showed a range from 2.00 - 3.85 log CFU/mL before washing with soap and water. The afterwashing result indicated no growth of *S. aureus* observed (0.00 CFU/mL).

Table 4.21: Occurrence of *Staphylococcus aureus* results on the left-hand side of the food surface area from all the ECD centres

Name of ECD	Before	After
ECD 1	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 2	3.68 ± 0.08ex	0.00 ± 0.00ay
ECD 3	2.85 ± 0.00cx	0.00 ± 0.00ay
ECD 4	3.11 ± 0.00dx	0.00 ± 0.00ay
ECD 5	3.83 ± 0.13fx	0.00 ± 0.00ay
ECD 6	2.60 ± 0.00bx	0.00 ± 0.00ay
ECD 7	2.85 ± 0.00cx	0.00 ± 0.00ay

Table 4.21: Occurrence of *Staphylococcus aureus* results on the left-hand side of the food surface area from all the ECD centres continue

Name of ECD	Before	After
ECD 8	3.11 ± 0.00dx	0.00 ± 0.00ay
ECD 9	0.00 ± 0.00ax	0.00 ± 0.00ax

Data is shown as mean ± SD (n=2); different letters indicate significant differences between ECDs 1-9 (a, b, c, d, e, f) before and after cleaning (x, y).

Table 4.21 reported the average occurrence of pathogenic microorganisms (*Staphylococcus aureus*) on the left-hand side of the food contact surface area in the ECD centres. The results of *S. aureus* tested on ECDs 2, 3, 4, 5, 6, 7, 8 indicated a range of 2.60 - 3.83 log CFU/mL before washing of the left-hand side of the surface area. The after-washing result indicated no growth of *S. aureus* detected (0.00 CFU/mL).

Table 4.22: Occurrence of *Staphylococcus aureus* on the middle section of the food contact surface area at all the ECD centres

Name of ECD	**Before**	**After**
ECD 1	3.24 ± 0.47cx	0.00 ± 0.00ay
ECD 2	3.10 ± 0.02cx	2.95 ± 0.00ay
ECD 3	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 4	2.85 ± 0.00bx	0.00 ± 0.00ay
ECD 5	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 6	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 7	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 8	2.85± 0.00bx	0.00 ± 0.00ay
ECD 9	0.00 ± 0.00ax	0.00 ± 0.00ax

Data is shown as mean ± SD (n=2); different letters indicate significant differences between ECDs 1-9 (a, b, c) before and after cleaning (x, y).

Table 4.22 illustrated the average occurrence of pathogenic microorganisms *(Staphylococcus aureus)* on the middle section of the contact surface area. The results of *S. aureus* tested on the middle section of the food surface area at ECDs 1, 2, 4 and 8 showed a range of 2.85- 3.24 log CFU/mL before washing with soap and water. However, the after-washing result indicated that ECD 2 showed a range of 2.95 log CFU/mL, therefore one could conclude that ineffective washing took place.

Table 4.23: Occurrence of *Staphylococcus aureus* on the right-hand side of the food contact surface area from all the ECD centres

Name of ECD	Before	After
ECD 1	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 2	3.60 ± 0.00cx	0.00 ± 0.00ay
ECD 3	3.60 ± 0.00cx	0.00 ± 0.00ay
ECD 4	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 5	3.11 ± 0.00bx	0.00 ± 0.00ay
ECD 6	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 7	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 8	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 9	0.00 ± 0.00ax	0.00 ± 0.00ax

Data is shown as mean ± SD (n=2); different letters indicate significant differences between ECDs 1-9 (a, b, c) before and after cleaning (x, y).

Table 4.23: illustrates the average occurrence of pathogenic microorganisms (*Staphylococcus aureus*) on the right-hand side of the food contact surface area. The results of *S. aureus* tested on food handlers of ECDs 2, 3 and 5 showed a range from 3.11 - 3.60 log CFU/mL before washing hands with soap and water. The after-washing result indicated a significant decrease of *S. aureus* as observed on all ECD centres (0.00 CFU/mL).

Table 4.24: Occurrence of *E. coli* on chopping boards at all the ECD centres

Name of ECD	Before	After
ECD 1	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 2	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 3	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 4	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 5	0.00 ± 0.00ax	0.00 ± 0.00ax

Table 4.24: Occurrence of *E. coli* on chopping boards at all the ECD centres continue

Name of ECD	Before	
ECD 6	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 7	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 8	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 9	0.00 ± 0.00ax	0.00 ± 0.00ax

Data is shown as mean ± SD (n=2); different letters indicate significant differences between ECDs 1-9 (a, b, c) before and after cleaning (x, y).

Table 4.24 revealed that there was no trace of *E. coli* on the tests conducted on the chopping boards at each ECD centre as there was a 0.00 log CFU/mL

Table 4.25: Occurrence of *E. coli* on the hands of the food handlers

Name of ECD	**Before**	**After**
ECD 1	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 2	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 3	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 4	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 5	1.15 ± 1.15bx	0.00 ± 0.00ay
ECD 6	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 7	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 8	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 9	0.00 ± 0.00ax	0.00 ± 0.00ax

Data is shown as mean ± SD (n=2); different letters indicate significant differences between ECDs 1-9 (a, b, c) before and after cleaning (x, y).

Table 4.25 reported that there was 1.15 log CFU/mL *E. coli* present at ECD 5 before hand washing; however, a 0.00 log CFU/mL was revealed after washing.

Table 4.26: Occurrence of *E. coli* on food surface areas at ECD centres

Name of ECD	Before	After
ECD 1	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 2	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 3	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 4	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 5	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 6	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 7	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 8	0.00 ± 0.00ax	0.00 ± 0.00ax
ECD 9	0.00 ± 0.00ax	0.00 ± 0.00ax

Data is shown as mean ± SD (n=2); different letters indicate significant differences between ECD centres (a, b, c) before and after cleaning (x, y).

Table 4.26 shows the results of *E. coli* on the food surfaces before washing and after washing. A 0.00 log CFU/mL was observed before washing and after washing, indicating no trace of *E. coli* present on the left-hand side, the middle and the right-hand side of the food surface areas at the centres.

4.7 Discussion of results

4.7.1 Demographic information

Nine (9) non registered ECD centres with eleven (11) FHs participated in the study. Altogether there were nine (n=9) ECD managers/ owners who were also food handlers and two assistant food handlers. Ten (n=10) of the FHs at these centres were female. These results were consistent with the findings conducted in Slovenia (88.8%) and Ghana (76.6%) where the majority of the food handlers were females (Jevsnik, Hlebec and Raspor 2008: 1110; Akabanda, Hlortsi and Owusu-Kwarteng 2017: 3 and Sibanyoni, Tshabalala and Tabit, 2017: 1398). All the FHs were above 30 years of age and this was consistent with the findings of the study conducted by Jianu and Chis (2012: 152) where most of the food handlers who participated in their study were above 30 years old. The highest level of education reached by eight (n=8) FHs was high school, with two (n=2) obtaining a college certificate and one (n=1) who had completed her primary level of education. This was also evident in research conducted by Lee, Halim, Thong and Chai (2017: 4) where 55.2% of the respondents had reached high school level, 17.9% college level and 10.5% primary school. Eight (n=8) of the FHs had no previous experience in the food preparation/ services industry; however, they were able to provide job opportunities for employees. Similar findings were noted in a study conducted in Mpumalanga where the majority

(51.8%) of FHs in school feeding programmes had no previous experience in the food service industry (Sibanyoni, Tshabalala and Tabit, 2017: 1399).

In the current study all the ECD centres had access to clean cold water; eight (n=9) obtained from a kitchen tap within the premises, while one (n=1) came from a water tank which was not far from the centre. This result was similar to that of Ababio and Adi (2012: 37) where they reported that in the Kumisa metropolis of Ghana, 79.6% of the water supply was pipe-borne, 8.7% used wells and 10% used boreholes to access water for the preparation of food. Seven (n=7) of the FHs preferred using a gas stove as their source of power for preparing meals in the centres and only three (n=3) used a twoplate electric stove. This was similar to a study conducted by Nzama and Napier (2015: 134) where 60% of the childcare facilities (CCFs) used gas burners while 40% used an electric stove as their source of energy for cooking.

4.7.2 Food safety knowledge

This questionnaire was self-administered by the FHs to establish their knowledge on food safety. The FHs' responses to using separate utensils and containers for raw and cooked food indicated that although they may not have had training on food safety, nine (n=9) of them responded correctly by saying that separate utensils and containers should always be used with raw and cooked foods. This was also demonstrated in a study by Mgqibandaba, Madilo, Du-Preez, Mjoka and Unathi (2020: 9) on primary schools in Soweto where the majority (84.6%) of the FHs agreed that to prevent the transfer of bacteria, it was important to separate raw and cooked foods at all times. Eleven (n=11) of the respondents agreed that raw and cooked food should be stored separately. Studies conducted by Walker, Pritchard and Forsythe (2003: 341) on small food businesses in the United Kingdom and Woh, Thong, Nehnke, Lewis and Zain (2016: 66) on food establishments in Malaysia showed that 97% and 85% of the FHs knew that it was important to separate raw and cooked food as raw food contained high levels of microorganisms that could lead to cross-contamination. Five (n=5) of the FHs indicated that when washing cooking utensils during preparation, a combination of cold water and detergent should be used. Similar findings were noted in a study conducted by Osaili, Jamous, Obeidat, Bawadi, Tayyem and Subih (2013: 147) on food workers in Jordan, USA where 48.4% reported that utensils such as kitchen knives were best washed with water and soap before being used to chop vegetables.

Eleven (n=11) FHs incorrectly stated that the same cutting board could be used for both raw and cooked food provided it looked clean. This is, however, false because using the same chopping board to prepare both cooked and raw food presents a risk of cross-contamination and the boards would need to be vigorously scrubbed, first in water with dish-washing soap, followed by thorough rinsing and sanitizing (Starovoytova 2019: 47). Furthermore, Starovoytova (2019: 47) reiterated that it was common practice in most households to thoroughly clean chopping boards to make sure that the contact surface did not become a vector in the spread of foodborne illness. Therefore, it was important to realise that chopping or cutting boards did not need to just look clean but should be thoroughly cleaned and sanitized as well. According to Jianu and Chris (2012: 153), colour coding of utensils and equipment

could eliminate cross-contamination while contributing to safer food preparation in specific areas and alternatively, the cleaning and sanitation of these utensils and equipment was strongly recommended. Eight (n=8) of the FHs only washed the utensils after food preparation, posing a potential threat to the lives of young children as they could be exposed to microbiological contamination of food.

According to Soares, Almeida, Cerqueira, Carvalho and Nunes (2012: 210), the best way to defrost, or thaw food was to place it in a clean container filled with cold water. However, Annor and Baiden (2011: 833) recommended that the safest way to thaw any frozen meat product would be in a refrigerator and not at room temperature. This was done to prevent any bacterial growth later causing food spoilage. When the FHs were asked about the thawing process, six (n=6) incorrectly agreed that it was best done on the kitchen counter. The FHs at schools in Brazil incorrectly indicated that food was best thawed at room temperature (Soares *et al.* 2012: 210). This method of thawing frozen food items poses an extremely high risk to food safety and could cause foodborne diseases.

The majority of perishable and non-perishable food items were purchased at the end of each month from formal retailers. This was also recorded in a study on childcare centres in the United States by Chriqui, Schermbeck and Leider, (2018: 377) where 59% of FHs purchased their groceries for the preparation of meals from local grocery stores. Furthermore, Skinner (2016: 8) indicated that this buying behaviour might be linked to the bulk buying of staple foods at supermarkets and relying on tuck-shops for other food items such as bread and vegetables as shown in this study.

The temperature control for safe food preparation practices was not implemented as there were no internal temperature control measures in place. Six (n=6) of the FHs agreed that cooked food that had cooled down did not need to be thoroughly reheated. However, this was the temperature range where optimum bacterial multiplication takes place, therefore reheating of food at 65˚C would destroy bacteria that may be present in food. This was evident in a study conducted by Faour-Klingbeil, Kuri and Todd (2015: 168-169) on food handlers in Lebanon where they reported that 57.5% of the respondents were not aware of what the words 'Danger Zone' implied. Food safety training and education was significantly important amongst food handlers as this was an effective tool to help increase the FHs' knowledge and awareness of hygiene practices, and to enable them to apply such knowledge during food preparation (Sani and Siow 2014: 212).

Nine (n=9) FHs in this study had no formal food safety and hygiene training. This immediately suggested that food safety compliance was not being implemented and that the children could become vulnerable to foodborne illnesses because of undertrained food handlers at childcare centres (Enke, Briley, Curtis, Greninger and Staskel 2007: 81). Knight, Worosz and Todd (2007: 477) mentioned that food poisoning could happen at any stage in the food chain. This could include the outbreak of *E. coli* which was mainly found in eggs and poultry items. The food handlers' responsibility in food preparation was to be equipped with good basic knowledge and training on how food needed to be handled to eliminate illnesses. Therefore, a more proactive approach by government departments on food safety training

needed to be implemented urgently to not only empower food handlers but also to help curb foodborne illnesses that could cause harm to children.

It is important to note that eleven (n=11) FHs correctly agreed on the practice of thoroughly washing fruit and vegetables before preparing and eating them, inspecting raw and cooked food during storage and throwing away food that had reached its expiry date. All this demonstrated good knowledge with regard to protecting food from contamination. In a study conducted by Tomaszewska, Trafialek, Suebpongsang and Kolanowski (2018: 80) where the aim was to compare knowledge between Polish and Thai consumers on hygiene practices during meal preparation, it was noted that 93% of Polish consumers washed fresh fruits and vegetables before consuming them. Hot, ready-to-eat, or cooked food needed to be kept at 65˚C (Soares *et al*. 2012:209) to prevent microorganisms from growing. When the FHs were asked how prepared food was kept before serving, ten (n=10) of them indicated that it was left on the stove in a pot with the lid tightly closed for 15-30 minutes and sometimes longer. This showed poor administration of temperature control in these ECD centres. The ECD centres had adequate space for food preparation as seven (n=7) of the ECD centres had a designated kitchen area where nine (n=9) of the FHs who prepared these meals were also managers. There were also adequate cooking utensils and serving bowls for the FHs. According to a study conducted by Lambrechts, Human, Doughari and Lues (2014: 756), the fundamental items that were important for washing of hands were hand soap and hot and/or cold water. Ten (n=10) of the participants reported that they generally washed their hands after a visit to the toilet, after handling rubbish bins and before preparing food. The findings presented by Mgqibandaba, Madilo, Du Preez, Mjoka and Unathi (2020: 9) demonstrated that a large percentage (71%) of the respondents practised washing their hands with soap and water. Pivarnik, Richard, Patnoad and Gable (2012: 302) reported that 83% of the respondents in their study washed their hands with soap and warm water before food preparation. However, upon observation it was noted that less than half of the FHs in this study employed the proper hand washing technique and it was neglected by most of the food handlers. The FHs washed their hands with soap and water in the morning before food preparation and during the day they only rinsed their hands with water. This is why five (n=5) of the ECD centres reported that hand-washing soap was available for hand washing although it was not an antibacterial soap. Studies by Woh, Thong, Nehnke, Lewis and Zain (2016: 67), Al-shabib, Mosilhey and Husain (2016: 214), Moreb, Priyadarshini and Jaiswal (2017: 345) and Sani and Siow (2014: 212) indicated that a high percentage of respondents practised washing their hands with soap and water before preparation of food, after visiting the toilet and after handling waste. In another study, six (n=6) of the FHs indicated that they had no antibacterial soap available during hand washing which would have assisted in reducing the coliform counts on their hands and prevented the spread of diarrhoeal disease in the childcare facilities (Akabanda, Hlortsi and Owusu-Kwarteng, 2017:4). A study by Nzama (2015: 133) also indicated that 80% of the CCFs had no proper hand-washing soap in their food stations. Another study by Mgqibandaba *et al.* (2020: 9) also demonstrated that the majority (84.6%) of the kitchen sinks had no soap and disposable paper towels available. Eleven (n=11) of the respondents agreed that frequent hand-washing was worth taking the extra time to do this. This was also evident in a study conducted by Kunadu, Ofosu, Aboagye and Tano-Debrah (2016: 128) on food

handlers in institutional food service in Ghana, where it was reported that 92% of the participants practised frequent handwashing as this was critical in preventing the spread of microorganisms.
With regard to the storage areas and stock rotation, eleven FHs in nine (n=9) ECD centres mentioned that they did not have a cleaning schedule in place. The storage area was cleaned by two (n=2) FHs every day of the week and only once a week by seven (n=7) FHs. Ten (n=10) of the FHs had stock rotation in place which was done every day of the week by five (n=5) of the participants; however, no stock take was done as the manager of the ECD centres only bought products to last for a month. The majority of the raw foodstuffs like meat (n=7), vegetables (n=7) and groceries (n=6) were bought from formal retailers, dry materials like maize meal (n=5) were bought from wholesalers as it was cheaper there and they used more of this product in their daily cooking and the least used item which was bread (n=4) was bought at informal tuck-shops.

It was noted that nine (n=9) of the FHs correctly stated that wiping cloths could spread micro-organisms. This was also shared by Akabanda, Hlortsi and Owusu-Kwarteng, (2017: 6) who conducted a study on food handlers in institutional food service in Ghana where it was found that 71.5% of the respondents were mindful of the fact that a dish cloth could carry pathogens that could contaminate food. There was consistent understanding of the clean-as-you-go principle and this was because they were aware that regular cleaning not only removed dirt but also sanitized surfaces and killed bacteria. This is why eleven (n=11) FHs admitted to keeping kitchen surface areas clean in any food preparation area to reduce illnesses. Akabanda, Hlortsi and Owusu-Kwarteng 2017: 2) reported that keeping food contact surfaces hygienically clean could reduce transmission of foodborne pathogens. Seven (n=7) of the FHs also indicated that the storeroom was cleaned once a week. Eight (n=8) of the FHs had the correct cleaning detergents like bleach and dishwashing liquid available as well as adequate cleaning tools such as a broom and a mop to clean the kitchen area.

4.7.3 Food safety practices

A self-reported questionnaire on personal hygiene practices revealed that all the FHs were neatly dressed in their aprons; however, they were not wearing the correct PPE. Seven (n=7) of the ECD kitchens were clean with utensils and equipment neatly placed in eight (n=8) of them and adequate cleaning chemicals in seven (n=7) of the ECD centres stored away from food products. Nine (n=9) of the ECD centres kept cooked food separate from raw food in the refrigerator. In addition, the preparation area was cleaned frequently in five (n=5) of the ECD centres by FHs but this could have been done because the researcher was present. The observation report furthermore showed that more than eight (n=8) of the FHs and the children did not wash their hands before serving and eating respectively. The lack of hand washing implied that no regular hand washing was practised even though hands could spread pathogens and infect others. In addition, seven (n=7) of the ECD centres had no soap available for hand washing even though all centres (n=9) had easy access to water. Three (n=3) of the food preparation areas in each ECD centre were never sanitized by the FHs, which placed the kitchens at high risk of foodborne diseases.

Seven (n=7) of the ECD centres had adequate space for food preparation and serving as well as enough eating and serving utensils. Nine (n=9) the centres did not have recipes available therefore no standardization of portion sizes was implemented. Portion sizes were estimated by the FHs using their own judgement to determine whether or not the serving size was appropriate for each child. Surprisingly, at nine (n=9) the ECD centres all the food that was prepared was served to the learners who seemed to enjoy their meals as did the staff that worked at these centres. It was also observed in Table 4.11 that in seven (n=7) of the centres, learners finished all their food, leaving minimum food waste being recorded at three (n=3) of the ECD centres.

With regard to receiving and storage it was noted that all the storage areas were neatly arranged, and seven (n=7) of the centres the food items had an expiry date clearly labelled on them. Nine (n=9) the ECD centres had products that were transferred to storage containers with lids on them but no expiry date was recorded. Temperature checks on prepared food were not implemented but food was left in pots with closed lids on the kitchen stove, possibly inhibiting the growth of microorganisms if left for too long under favourable condition (Mkhungo, Oyedeji and Ijabadeniyi 2018: 129). No products in nine (n=9) centres visited had passed their expiry date nor were expired products used for food preparation, and no evidence of unpleasant odour or signs of decay were present in the storage areas. It was evident that stock rotation was in place since old stocks of food were used before the new stocks (FIFO). It was observed that four (n =4) of the centres stored food products directly on the floor. It was also observed that nine (n=9) ECD centres had a designated rubbish bin present, although in eight (n=8) of the centres the bins were cleaned while one (n=1) had pest infestations present. The overall observation assessment revealed that the FHs lacked basic food safety knowledge and proper hygiene training, particularly as there was no soap available for the washing of the FHs' hands and the children's hands before serving the food. Work areas and cooking utensils were not sanitized as frequently as they should be. Food handlers lacked knowledge on cooking, reheating and storage temperatures of food (time/temperature) which could contribute to food spoilage causing illness in the children.

Table 4.27: Comparison between the FHs' responses and the researcher's observational findings

Variables	FH's responses (n=11)	Observational findings (n=9)
Food safety knowledge and hygiene training	Nine of the FHs (n=9) indicated that they used separate utensils and containers for raw and cooked foods.	Knowledge on food safety was correctly demonstrated especially in making sure that cross-contamination did not occur during food preparation and storage of raw and cooked food items.
	On the issue of washing hands, ten (n=10) mentioned that this was done after a visit to the toilet and before food preparation.	Eight of the FHs (n=8) used a 5lt bucket (there were no hand basins for the washing of hands) to rinse their hands without using hand soap before serving. It was also observed that the children did not wash their hands before eating. Even though all the FHs agreed that frequent hand washing was worth the extra time, it was not practised.
	Six (n=6) of the FHs agreed that food that was cooked did not need to be thoroughly reheated, while five (n=5) admitted that cooked food could be left out of the fridge to cool overnight before refrigeration.	Temperature control was not implemented as most of the FHs were not aware that an inadequate cooking temperature could cause foodborne illnesses during storage. Knowledge on food safety and hand washing was poorly demonstrated in all the centres.
	Six of the FHs (n=6) admitted to thawing food on the kitchen counter as they thought it was the correct procedure to defrost frozen meat.	The majority of the FHs in the centres defrosted their raw meat in a microwave while others did so in a dish filled with water.
	The majority of the FHs indicated that they had never received training in most of the hygiene and food safety aspects.	There was no sanitation of utensils and food surface areas. Only three (n=3) of the centres sanitised their work areas after food preparation.
Storage and stock taking	Eleven (n= 11) FHs agreed that no cleaning schedule was in place; however, the storage area was cleaned once a week by seven (n=7) of the FHs. Nine (81.8%; n=9) FHs indicated that stock take was never done but FIFO was in place.	There was no cleaning schedule visible in any of the centres visited. However, all the centres were clean and tidy. FIFO was implemented when the researcher was present.

Table 4.27: Comparison between the FHs' responses and the researcher's observational findings continue

Variables	FH's responses (n=11)	Observational findings (n=9)
Food preparation	Food was prepared by seven of the FHs (n=7) in a designated kitchen in an outside building.	A large number of FHs prepared food in a designated kitchen area away from where the children were placed.
	Ten FH's (n=10) indicated that there was adequate space for food preparation.	Between seven and six FHs (n=7 and n=6) had adequate space for food preparation and for serving/ portioning.
Food holding, serving and wastage	Six (n=6) of the FHs indicated that the holding time after cooking and before serving was more than 15 minutes.	Meals prepared for breakfast and lunch were kept on the stove in the pot with the lid tightly closed until serving time.
	Eight (n=8) of the FHs indicated that there were enough serving utensils.	The researcher observed that there were seven (n=7) and nine (n=9) adequate serving and eating utensils in all the centres.
	Eleven FHs (n=11) felt that the children were generally happy with the portion sizes.	A large number of the children finished their food in seven (n=7) of the ECD centres while three (n=3) of the nine ECD centres experienced food waste.
	Eleven (n=11) the FHs agreed that there were designated rubbish bins even though only seven (n=7) centres had a tight fitting lid.	All the centres had a designated rubbish bin although seven (n=7) had no lids but the plastic bags were tightly closed and disposed of at the end of each day. There was no waste lying outside the dustbins.
Cleaning and sanitation	Ten (n=10) of the FHs reported that they had enough cleaning tools for cleaning.	Adequate cleaning materials for cleaning were observed.
	Five of the FHs (n=5) indicated that they did not sanitize their work areas, although six (n=6) sanitised the areas every morning before preparation of food.	There was no sanitation in place in all the ECD centres visited.

4.7.4 Nutrition knowledge

The promotion of good nutrition knowledge was important for the healthy growth of young children (Robert, Creed-Kanashiro, Villasante, Narro and Penny 2017: 2). Therefore, adding variety to a diet would assist in optimum growth as the food handlers were responsible for the nutritional adequacy of the meals served in the centres. In order to test the FHs' nutrition knowledge a few questions were asked based on the South African Food Based Dietary Guidelines. Ten (n=10) of the FHs stated that starches or carbohydrates should be included with every meal as they were important for good health and should form part of an everyday meal. The high consumption of this food group would ensure that children received adequate energy for optimum development. This was also reiterated in the study by Zenebe, Gebremedhin, Henry and Regassa (2018: 4) on improving the dietary diversity of school children where 93.8% of the children consumed mostly grains on the day of the survey. Ten (n=10) of the FHs were aware that 7-9 glasses of water should be drunk per day. This was confirmed by the WHO (2016: 1) which reported that two (2) litres of water should be drunk each day.

The FHs were asked to mention which food group they should eat mostly from and ten (n=10) of them correctly mentioned that starches were the main source of energy when digested so they should be consumed on a daily basis (Khan 2018: 1) although eating a variety of foods also helped increase nutrient intake. Nzama and Napier (2015: 112,116) and Kwinda, Van der Spuy and Viljoen (2011: 62) also reiterated in their studies that the majority of the meals prepared for breakfast and lunch were starch-based. Furthermore, it was noted that the top 2 foods mostly consumed were rice and maize meal. Seven (n=7) of the FHs stated that canned beans, peas or lentils were healthy choices to eat in place of meat or chicken as they offered value for money. In a report on food consumption changes in South Africa by Ronquest-Ross, Vink and Sigge (2015: 6), it was pointed out that consumption of canned or preserved beans had increased by more than 50% between 1999- 2012. The respondents were asked whether tinned fish was a healthy choice to replace meat or chicken with and seven (n=7) agreed with this statement. Hartwell, Lugosi and Edwards (2011: 100) reported in their study that tinned fish (sardines, tuna) was one of the preferred fish products. In another study on canned fish in Poland it was confirmed that canned fish was packed with nutrients and that consuming canned fish outweighed any risk associated with the packaging of canned foods (Usydus, Szlinder-Richert, Polak-Juszczak, Kanderska, Adamczyk, Malesa-Ciecwierz and Ruczynska 2008: 556). Further research indicated that canned fish was a healthier alternative compared to processed foods and that it made up about 1525% of the recommended amount of fish consumed particularly in the Pacific Islands (Bell, Sharp, Havice, Batty, Charlton, Russell, Adams, Azmi, Romeo, Wabnitz and Andrew 2019: 183). In a study on registered childcare facilities it was suggested that a high intake of canned fish might not necessarily increase the protein intake among young children (Nzama and Napier 2015: 142).

Fruit and vegetables are packed with essential nutrients and vitamins required by our bodies and should be included daily in adequate amounts. Thus it was alarming that only two (n= 2) of the FHs agreed that only 1-2 servings of fruit and vegetables should be consumed each day. According to the South

African Food Based Dietary Guidelines (SAFBDGs), a variety of 4 to 5 or more servings of 80g each (320g-400g /day) of fruit and vegetables should be consumed daily by both preschool children and adults (Vorster, Badham and Venter 2013: S51). Naudé (2013: S50-S51) also recommended that fruits and vegetables should be regularly eaten as they contained high levels of vitamins, minerals and fibre. In another study it was suggested that the low consumption of fruit and vegetables could be due to the low level of education and low income of the childrens' parents (Caraher, Jaksic, Dolciami, Wynne and Stracci 2017: 00139).

Appropriate preparation of meals for children by the FHs was important because they needed to know what went into each meal they prepared, especially if it was meant to contribute to their overall nutritional intake to assist their physical and mental development (Radcliffe, Cameron and Baade 2002:187). Most of the time people eat because they are hungry. They have developed eating patterns which have divided food intake into three meals: breakfast, lunch and supper offered at certain times with a snack in-between. It was found that nine (n=9) of the FHs agreed that peanuts and raisins were a healthier snack than cheese curls. Peanuts and raisins were nutrient-dense foods rich in unsaturated fatty acids and dietary fibre and were beneficial to an increased quality of nutrition status among children (Arya, Salve and Chauhan 2016: 35; Patel, Bellissimo, Luhovyy, Bennett, Hurton, Painter and Anderson 2013: A5). It was noticed that three (n=3) of the FHs were aware of what a balanced diet was. Five (n=5) of the FHs agreed that starchy foods were the most important source of energy for the body as they were energy dense. According to Namgung, Kim and Hong's study (2019: 1) on early childhood education institutions in Korea, it was revealed that a well-balanced diet should provide young children with all the nutrients needed by their bodies. In this study the overall quality of food served and consumed by the children did not meet the dietary guidelines as fruits and vegetables were limited in their diet.

4.7.5 Dietary analysis

4.7.5.1 Menu analysis

According to the DSD guidelines, ECD centres that are open for eight hours and longer should provide children with two meals (breakfast and lunch) and two snacks in-between. The top food items mostly consumed in this study were maize meal and rice. These food items were consumed during breakfast and lunch time. This was also the case in registered childcare centres at Inanda where maize meal was consumed almost every day (Nzama 2015: 142). An alternative to maize was maltabella porridge. Maize meal consumed in the form of porridge is a staple food commonly cooked in the majority of South African households and is known for its high energy content. In South Africa, the food fortification programme in respect of maize meal and other food items was introduced in 2003 in an effort to alleviate nutrient deficiency (Kruger 2016: 9) in lower income households. A study in the USA on childcare centres illustrated that the serving of preschool children with nutrient-dense meals packed with a variety of micronutrients and macronutrients was important as it ensured that the nutrients went towards meeting their daily intake requirement (Rasbold, Adamiec, Anderson, Campbell, Horm, Sitton and Sisson 2016:1504).

In almost all the ECD centres in the current study, the same meals were provided which meant the children were not provided with a variety of food items. This was also noted in a similar study by Nzama and Napier (2015: 140) on registered ECD centres at Inanda where the menus served to children aged 2-5 years lacked variety. Gerritsen, Dean, Morton and Wall (2017: 348) also reiterated in their study that children at early education services in New Zealand (NZ) were provided with an insufficient quality and variety of menus to meet the nutritional needs of preschoolers in respect of the various food groups. During the serving stage, portion control was not implemented as the portion size for cooked starch was above the recommended half a cup for children two to six years old. The portion sizes for meat dishes should be 30–60g. According to Vorster, Badham and Venter (2013: S51), preschool children should consume at least 320g of fruits and vegetables, which is a serving of 80g. The portion of milk to be served to children should be 200 ml, or 3 to 5 servings, in order to meet their daily requirements. The general recommended guideline for the nutrition of children stated that because skimmed milk powder was cheap, it should be given to children to drink freely (South Africa. Department of Social Development 2006a: 75).

4.7.5.2 Nutrient analysis

A deficiency of essential micronutrients affecting young children was prevalent globally among low and middle income countries. This had contributed to the risk of nutrient deficiency caused by a lack of vitamins A, C and E, zinc, iron, calcium, folate, niacin and riboflavin as reported in the 1999 NFCS (Senekal, Nel, Malczyk, Drummond and Steyn 2020: 1). Numerous initiatives have been implemented in South Africa to address micronutrient deficiency but some may not have improved the dietary intake of children.

According to the American Dietetic Association (ADA), ECD providers that operate for eight hours and longer should provide two meals and a snack. These meals should meet at least one half to two thirds (50%- 66%) of the children's daily nutrient requirements while the balance could be consumed at home (Neelon and Briley 2011: 607). A comparison of 60% DRIs was used to assess the nutrient adequacy of meals served at each ECD centre. It was noted that there was a significant difference between the meals served and consumed among the children between the ages of 1 and 3 years. The results from the plate waste study showed that the portion sizes of the meals consumed were smaller than the portion sizes served to the children. The majority of the menus at all the non-registered ECD centres in Ntuzuma served to the children in the age groups 1-3 and 4-8 years did not meet the general guidelines set by the DSD (Appendix H) as a snack was not provided by the centres and meals lacked a variety of starches and leafy vegetables. Protein, on the other hand, was relatively above the 60% DRIs mark at the majority of the ECD centres within the 1-3-year-old age group. The recommended daily intake for protein is 30-60g, or 2 servings for children 2-6 years old but the centres recorded between 97g to 168g, which was 3 to 5 servings. Furthermore, the inadequate intake of energy, carbohydrates, dietary fibre, calcium, phosphorus, iodine, vitamins C, D, E and K, riboflavin and folate was evident in the age group 1-3 years. The study conducted by Nzama and Napier (2015: 141) on registered childcare centres also indicated that nutrients such as energy, fibre, calcium and vitamin E were below 60% of the DRIs.

According to Kirk and Kirk (2018: 159), the consumption of carbohydrates and certain vitamins was significantly low among early childhood centres located on a university campus in Illinois, indicating that the recommended dietary intake was not met by the children and contributed to a potential health risk. The majority of the ECD centres had a low iron, thiamin and niacin intake with only a few centres reaching above 60% of the DRIs. The majority of the ECD centres had a zinc, vitamin A, vitamin B6 and B12 intake which was above the DRIs with only a few not reaching the recommended intake. This was also evident in a study by Bailey, Catellier, Jun, Dwyer, Jacquier, Anater and Eldridge (2018: 1559S) where the intake of vitamin A was excessively high in the older pre-school age group (36-47.9 months).

The ECD centres did not provide adequate carbohydrates and vitamin E food sources like oats, green leafy vegetables and brown bread on their menus to contribute to the children's energy levels, resulting in an exceedingly low intake of energy at all the ECD centres. None of the meals in the 4-8 year-old age group met the DRIs for protein, dietary fibre, calcium, iron, phosphorus, zinc, iodine, vitamins C, D, E and K, thiamin, riboflavin, niacin, vitamin B6, vitamin B12 and folate. There were only two ECD centres that had reached the 60% DRIs recommendation for Vitamin A. The lack of calcium intake was supported by the lack of milk intake across all the centres for boys and girls. Iodine intake was also extremely low, indicating that table salt was inadequate in the meals consumed. Vegetables, preferably dark green and deep yellow, were also inadequate in all the meals consumed, resulting in a low intake of fibre, folate, iron, vitamin C and vitamin K. These results were similar to a study by Nzama (2015: 142) where small amounts of vegetables were incorporated in soups and curries, contributing to the low intake of riboflavin and other essential vitamins. Furthermore, Kwinda, Van der Spuy and Viljoen (2011: 62) also suggested that meals served at crèches had an inadequate intake of fruit and vegetables which then caused a deficiency in vitamin A.

In the current study maize meal was mainly offered daily at breakfast as porridge and at lunch as soft pap or crumbly phutu in the majority of the ECD centres. Other food items mostly consumed were rice and maltabella, which also contributed to the total energy intake in both age groups. However, in this study the intake was less than double the DRIs. Since maize meal is a staple food in South Africa, it resulted in five ECD centres meeting the recommended intake for zinc and six ECD centres having an adequate vitamin B6 intake compared to NICUS on children in both the age groups. Zinc is an essential nutrient for recovery and growth; however, a deficiency can have harmful effects such as stunting during the growth process while increasing exposure to infection and diseases (Ritchie and Roser 2017: para 25 line 6). According to Nzama and Napier (2017: 81), childcare facilities exceeded the daily requirements of zinc for children aged 2-5 years. The nutrient analysis of iron was also low across both boys and girls in both the age groups. This was observed in a study by Goldbohm, Rubingh, Lanting and Joosten (2016: 11) where the intake of iron was significantly low, raising concern particularly in respect of young children in the Netherlands. In another study on childcare centres across Oklahoma, it was revealed that inadequate iron and folate intake was consumed among children 3-5 years old during their attendance at a childcare centre (Sisson, Kiger, Anundson, Rasbold, Krampe, Campbell, DeGrace and Hoffman (2017: 35). This was also the case in the current study as the folate and iron

intake was extremely lower than the recommended amount. These results showed that non-registered ECD centres in Ntuzuma were no different from the rest of the world, particularly in so far as the nutrient adequacy of meals served to children was concerned.

In this study the protein intake at ECDs 2, 3, 4, 5, 6, 7 and 9 met more than the 60% DRIs for protein and three ECD centres did so for vitamin A. There was only one ECD centre that met the carbohydrate intake above the DRIs of 60% but the rest were all below. The high protein intake was because of the variety of rich animal food sources such as poultry, red meat and fish consumed while the high vitamin A intake was due to carrots being incorporated into the curries during food preparation. Makanjana and Naicker (2020: 4, 8) found in their study that the mean intake for protein was generally higher than the recommended RDA for children 1-3 years old. Furthermore, they reported that the vitamin A intake met more than the recommended EAR for the same age group of 1-3 years. None of the ECD centres met the daily recommended intake for calcium in both the age groups as the mean intake was lower than the EAR. The nutrients required to ensure optimal bone health and brain development are iron, calcium and zinc. The low calcium intake was due to the low level of milk which was consumed when added to the maize meal porridge in the morning for breakfast. No other rich calcium food items were incorporated into the meals of these children.

The current study also revealed that none of the ECD centres provided a piece of fruit to children as a snack while vegetables were used in small quantities in curries and stews. Samp and beans were seldom included in meals offered at one ECD centre. This clearly indicated that the consumption of fruit and vegetables was substantially less than was recommended and which resulted in an inadequate intake of vitamin C, E, thiamine, riboflavin and niacin. Another study showed that nutrition education could help create awareness on the importance of consuming adequate fruit and vegetables that were easily available at the time daily (Schmitt, Bryant, Korucu, Kirkham, Katare and Benjamin 2019: 33). However, there were three ECD centres that met the required vitamin A intake needed per day as demonstrated in Table 4.16. This high vitamin A intake in some of the centres could have been due to maize meal being consumed on a daily basis. Cuadrado-Soto, Risica, Gans, Mena, Ellis, Araujo, Lofgren, Stowers and Tovar (2019: 9) showed in their study that the Vitamin D intake was low compared to the recommended intake among preschool children while the current study also reported that all the meals consumed by the children in both age groups had not met the AI for vitamin D.

From this study it could be concluded that dietary fibre was inadequately consumed by the children throughout all the ECD centres as the mean amount contributed was less than AI of 19g/day, which could have been due to brown bread not being consumed at all. This was evident in a study on childcare centres in New York where a low 20-27% of the DRI for fibre was consumed by the children attending a childcare centre (Dixon, Breck and Khan 2016: 2452). Another study by Ward, Belanger, Donovan, Vatanparast, Engler-Stringer, Leis and Carrier (2017: 342) revealed that meals offered were low in fibre (<7g). Protein intake was well above the DRIs of 13g/ day in the age group 1-3 years but was low in the age group 4-8 years. Maize meal porridge and chicken were some of the items which contributed mostly to the protein intake; however, eggs were not on the menu and fish was only eaten once a week. This

was also reported by Steyn, Nel, Malczyk, Drummond and Senekal (2020: 14) where protein exceeded the acceptable macronutrient distribution ranges (AMDR) for children 1-3 years old.
Early childhood is the most critical developmental stage in a child's life, and ultimately every child should be provided with meals that have adequate nutrients from several food groups to help them grow and be free from malnutrition deficiencies. Furthermore, the quality and the diversity of the diet is largely associated with academic performance and cognitive functioning ability, which in the long run affects the development and growth of young children. The majority of the meals analysed in this study lacked essential macro- and micronutrients especially in the age group 4-8 years old due to limited food intake. This was evident in a study by Visser, Van Zyl, Hanekom, Baumgartner, Van der Hoeven, TaljaardKrugell, Smuts and Faber (2019: 198) where a number of nutrients did not meet half of the EAR for vitamin B12, vitamin C, folate and iron of young children under 12 years old in South Africa. This then exposed the young children to risk factors such as anaemia and scurvy. The FBDGs were issued many years ago with the aim of promoting good nutrition in developing countries but most of the time these guidelines were not properly implemented at grass roots level. This is why it is so important that FHs also undergo extensive nutrition education training and are motivated so that they, too, can make informed and healthy food choices when preparing meals for these young children and handling food in the correct manner. Nevertheless, it could therefore be confirmed that the creation of new menus with different varieties of food items such as more fruit and green leafy vegetables, milk, nuts and eggs could help to curb the inadequacy of nutrients in meals eaten at the non-registered ECD centres visited in this study. This varied diet needed to be appealing, nutritionally dense, widely accessible and affordable to the rural community (Miller and Welch 2013: 124) so that these young children could reach their daily intake requirements.

The portion sizes recorded (Table 4.15) of meals served to children in the ECDs were higher than the recommended intake. The recommended serving of starch (maize meal, porridge or rice) was ¼- 1/2 a cup; however, the children were served with an average portion size of 163g and 165g. This portion size was almost the same as 3 servings per meal. A vegetable curry dish prepared by some of the ECD centres weighed 68g -180g. The recommended portion size for vegetables is 36g-48g, or 2 servings, and this excludes vegetable soups. The recommended daily intake for protein is 30-60g, or 2 servings for children 2-6 years old but the centres recorded between 97g to 168g, which was 3 to 5 servings.

4.7.6 Microbial assessment

Hygiene practices are a critical component in preventing foodborne illnesses and the hands are a major contributor to the transmission of infection. Food contact surfaces and chopping boards have been flagged as the drivers of cross-contamination in food preparation because they have a large surface area for bacterial growth (Mahyudin, Sahil, Radu, Mahmud and Rashid 2019: 50). One of the most common causes of foodborne illnesses was contamination of food products with pathogenic bacteria such as *Staphylococcus aureus.* Staphylococcal food poisoning, an example of food intoxication or food poisoning, was caused by staphylococcal enterotoxins released in the contaminated food by microorganisms (Mostafa, Al-Askar, Almaary, Dawoud, Sholkamy and Bakri 2018: 361). Food infection,

on the other hand, was a global threat affecting human health and causing an increase in morbidity and mortality every year (Abuelnaga, Atta, Rabie, Bakry, Hedia and Hakim 2020: 27). Government Regulation 962 of 2012, made under section 15 of the Foodstuffs, Cosmetics and Disinfectants Act 1972 of the Republic of South Africa, stated that FHs were required to wash their hands with soap and hot and/ or cold water before handling or preparing food. It also stated that 2log CFU/cm2 for an aerobic plate count on food contact surfaces and hands of FHs was an acceptable limit. Therefore, it is imperative to put these food preparation regulations into practice every day to prevent any infections that could be detrimental to the lives of young children. *S. aureus* was a bacterium that exists in air, dust, water, in food and on surfaces, and that was why it was one of the biggest causes of food poisoning because of the lack of frequent hand washing. Contamination with *S. aureus* could be introduced by food handlers' direct contact with food, and by sneezing and coughing (Novakovic and Grujic 2017: 23). The detection of *S. aureus* on visibly clean chopping boards, preparation areas and the hands indicated that although they may look clean, they could be contaminated. The swabbing of these food preparation items was conducted to obtain a clearer insight into the current food safety practices in these ECD centres. The findings revealed that the majority of the chopping boards, surface areas and the FHs' hands had traces of *S. aureus* present before washing; however, after washing with detergents some the ECD centres experienced a significant decrease in microbial load. According to Akabanda, Hlortsi and Owusu-Kwarteng (2017: 4, 6), the implication of a decreased microbial load was that it would help reduce the spread of foodborne diseases and ultimately diarrhoea, while eliminating any possible cross-contamination of food. In Table 4.17 the majority of the chopping boards at the ECD centres showed the presence of *S. aureus* before washing; however, after washing there were no traces of bacterial growth. This was evident in a study conducted by Biranjia- Hurdoyal and Latouche (2016: 4) where the prevalence of *S. aureus* on chopping boards was significantly high and this could have been due to the same chopping boards being used for the preparation of both meat and vegetables. However, after washing with antibacterial washing liquid there was a reduction of *S. aureus* on the chopping boards.

The results show a significant increase in the number of *S. aureus* on FHs' hands before washing; however, after hand washing a decrease in the contamination was observed. In a study by Nhlapo, Lues and Groenewald (2014: 2) it was reported that FHs' hands yielded lower counts of *S. aureus* possibly due to the effective hand washing that was administered.

The finding indicated that the majority of the ECD centres had high traces of *S. aureus* before the contact surface was cleaned and no contamination was detected after cleaning. In a study by Mohammed, Ayansina, Mohammed, Oyewole and Shaba (2018: 47), the results showed that there was no contamination of *S. aureus* present on the food contact surfaces of the kitchen tables at Kaduna State University after cleaning and sanitation. However, this was not the case for ECD 2 (Table 4.20) where, after washing, there was a reduction from 3.10-2.95 log CFU/mL. In a study by Sibanyoni and Tabit (2019: 96-97) on food contact surfaces in school feeding programmes, *S. aureus* had the highest (25.5%) incidence of contamination detected on food contact surfaces (benchtops and dry storage shelves) which were mostly in contact with raw food after preparation. The high prevalence of *S. aureus* could be due to inadequate cleaning and sanitation of food contact surfaces.

Escherichia coli continued to be a health hazard particularly in the food industry where there was likely a lack of hygiene and sanitation measures. *E. coli* has become the organism most characterized because of its rapid growth and other versatile properties (Pontrelli, Chiu, Lan, Chen, Chang and Liao, 2018: 16). Table 4.22 illustrates that of the entire set of samples that were analyzed, none tested positive for traces of *E. coli*. on the chopping boards and food surface areas at the ECD centres. As illustrated in Table 4.23, the detection of *E. coli* (1.15 log CFU/mL) on the hands of food handlers before washing at ECD 5 was an indication of possible faecal contamination or the presence of other dangerous pathogenic microorganisms which could compromise the health and wellbeing of the children likely to consume the food. According to Mohammed, Ayansina, Mohammed, Oyewole and Shaba (2018: 478), the presence of *E. coli* after cleaning of food contact surfaces could have been the result of water contaminated with faeces used to clean surfaces, inadequate cleaning and sanitation or possibly, poor hygiene practices displayed by FHs on food contact surfaces.

It is important that high standards are followed and maintained in respect of cleanliness and hygiene practices as the results of this study could be seen as somewhat unsatisfactory. Food handlers still need to be trained on the proper handling of food as well as good sanitation and hand washing techniques as an initiative to prevent possible infections and destroy pathogens before they spread and cause harm.

4.8 Conclusion

Based on the findings of this study it was concluded that there was an urgent need for training on food safety and hygiene practices of the FHs at non-registered ECD centres. Egan, Raats, Grubb, Eves, Lumbers, Dean and Adams (2007: 1187) reiterated the need for FHs to be trained on food hygiene so that they could filter the knowledge down to other staff members and create better food handling practices. Judging from the obtained results and observations, the lack of resources such as basic food safety training could be the leading cause of poor food safety knowledge, attitudes and practices amongst FHs in the ECD centres. Compliance with these recommendations is imperative to ensure proper food handling and personal hygiene which in turn will prevent foodborne illnesses especially among young children. Therefore, it was seen as important to note that food safety was everyone's responsibility especially those who come into contact with food.

Unhygienic practices during food preparation, handling and storage enable pathogenic bacteria to come into contact with not only the hands of FHs but also contact surface areas. The separation of cooked and raw foods was carefully monitored by all FHs although improper thawing of frozen raw food items on kitchen counters was observed. It is essential that this process is carefully observed while handling raw items because it allows for pathogenic microorganisms to grow under ambient temperatures. Mkhungo, Oyedeji and Ijabadeniyi (2018: 129) recommended that the correct thawing procedure was to suspend the raw food item in in its original packaging in cold water or alternatively to use a microwave oven. The abuse of time-temperature also accounts for the outbreak of foodborne diseases. In this study the majority of the centres had no knowledge of temperature control. Emphasis needs to be

placed on monitoring food temperatures at these centres as it is unacceptable for cooked food to be served without any knowledge of its temperature. This would also serve as a reassurance that the food served to the children was safe and potentially harmless to their health.

The FHs lacked good knowledge and practice regarding hand washing because although they all agreed that frequent hand washing was worth the extra time, on observation it was noted that only eight of eleven of the FHs practised hand washing. The majority of the centres did not have all the required items needed for effective hand washing. Jay, Comar and Govenlock 1999: 925) reported in their study that warm water, soap or a detergent together with 20 seconds of scrubbing or rubbing was the hygienic way to wash hands during food handling. During observation it was noted that all the centres did not allow the children to wash their hands before eating. Chopping boards, kitchen utensils and surface areas are easy targets for cross-contamination to take place, leading to serious illnesses. Based on the results, the majority of the centres had incorrect chopping boards (plastic plates) for chopping food items during food preparation. This could cause cross-contamination of food from the hands to the surface area. The food contact surface area was only sanitized every morning before food preparation which permitted cross-contamination and could cause infectious illnesses. Good hygiene practices are imperative to minimize the bacterial count on chopping boards, surface areas and hands.

The overall results indicated that all the microbial swabs tested had higher counts of *E. coli* and *S. aureus* than the acceptable levels. This indicated an urgent need for the improvement of safe food handling at these ECD centres. According to Ali and Immanuel (2017: 7), a high *E. coli* count suggested a possible health risk of contamination from chopping boards and contact surfaces due to inappropriate cleaning during food preparation or possibly poor hygiene practices by FHs. *S. aureus* has caused about 97% of cases of food poisoning due to inappropriate handling of food by FHs which had led to food being contaminated with pathogenic microorganisms such as enterotoxins (Erdogan and Pamuk, 2019: 73-74). After the washing of the chopping boards and hands, it was noted that there was a reduction of *E. coli* and *S. aureus*. The food handlers played an important role in making sure that food safety during food preparation was observed. Therefore, it was important that these items were properly washed with a disinfectant and sanitized during food preparation and not after food preparation as was stated by the FH in this study.

Research has indicated that ECD centres were required to provide well-balanced nutritious meals which included plenty of fruits and vegetables, whole and unrefined cereals, meat, dairy products and plantbased protein. The FHs' nutrition knowledge was inadequate, particularly when they were asked questions relating to the SAFBDGs. This was observed when only two (n=2) of the eleven FHs knew how many pieces of fruit and vegetables should be eaten daily. Furthermore, vegetables were not served as a side dish but incorporated into the protein dish in all the centres visited. No snacks were provided by all the centres even though the DSD guidelines stated that two snacks should be provided by the centre if they are operating for more than five hours (DSD 2016). The average portion sizes established during plate waste were more than the recommended daily intake per child in the meals prepared. In the United Kingdom and Ireland, a study was conducted on portion size guidance, and it

was reported that this guidance assisted caregivers in providing children 1-5 years with appropriate portion sizes to avoid over-feeding while eliminating deficiencies (Porter, Kipping, Summerbell, Dobrescu and Johnson 2020:13). However, when the dietary analysis was reported, it suggested that the meals provided inadequate nutrient intake. This indicated that children developed food preferences at an early age and therefore it would be beneficial to educate caregivers and food handlers about the importance of the recommended feeding patterns (Fox, Gearan, Cannon, Briefel, Deming, Eldridge and Reidy 2016: 8). Nutrition and food safety education programmes could play a vital role in improving the food safety and nutrient intake of children. They should also aim to provide good hygiene and sanitation, and acceptable food waste removal procedures and storage conditions. In so doing this would prevent foodborne diseases and force FHs to implement food hygiene regulations and food safety systems (Sezgin and Sanlier 2016: 4079).

Chapter 5: Conclusion and Recommendations

5.1 Introduction

Chapter four discussed and presented the findings of the study, with emphasis on food safety practices, nutrition knowledge and menu adequacy in non-registered ECD centres in the Ntuzuma area of Durban. This chapter will report on the conclusions that were obtained from the data as well as make recommendations based on an analysis of the study.

5.2 The aim of the study

The aim of the study was to determine the current food handling and safety practices and nutrition knowledge of the FHs as well as to assess the extent to which the menus contributed to the daily nutrient requirements of children aged 1-5 at non-registered ECD centres in the Ntuzuma area, Durban. A total of nine non-registered ECD centres were visited by the researcher, questionnaires were administered to the FHs and observations conducted at each ECD centre. The areas of focus were food safety and hygiene practices, nutrition knowledge of the FHs and the adequacy of meals served at these centres. The interpreted results of this study would assist in the formulation of practical recommendations. The outcomes from the study corresponded with the objectives as outlined in Chapter 1 and the findings are outlined in this chapter.

5.3 Limitations of the study

A number of limitations were taken into account during the course of the study.

- At the time of the study the ECD centres provided by DSD were sourced and approached as not registred at that point in time.
- All of the 10 non-registered ECD centres from the DSD list agreed to participate in the study, even though it was a small sample size. However, it was convenient for the researcher to access the 10 listed non-registered ECD centres as Ntuzuma was the area of focus in this study.
- Due to the small sample size, the results from this study cannot be generalized to all ECD's in S.A but only to those who participated in the study, however these results still provide a snapshot of the state and challenges non-registered ECDs are facing.
- ECD managers misinterpreted this study as a way to obtain some form of funding from the DUT institution.
- Poor infrastructure may have contributed to some of the ECD centres refusing to work with the researcher as they felt that whatever information they shared with the researcher would somehow reach the DSD or its officials.
- Only meals (breakfast and lunch) served to the children while at the ECD were analysed for adequacy while the meals consumed at home were not considered part of the study.

5.4 Main findings

A total of nine (9) ECD centres with eleven (11) FHs were part of the study. The majority of the FHs were female, above the age of 30 and had obtained some form of education. It was also noted that the owners of the ECD centres were also FHs who had no previous knowledge of or experience in the food service industry. Most of the ECD centres had a designated kitchen area outside the establishment for the preparation of meals away from the children with running tap water easily available.

Food safety and hygiene practices were the main focuses for the FHs. Data showed that the FHs were more knowledgeable on certain aspects of food safety as the majority of the FHs were aware that raw and cooked food needed to be placed separately during storage and the use of separate utensils to prevent cross-contamination was necessary. The vast majority of the centres had adequate space and utensils for cooking but had insufficient chopping boards.

Furthermore, the FHs were able to demonstrate simple hygiene practices such as washing of hands after a visit to the toilet and before food preparation, and making sure that kitchen surfaces were always kept clean. However, there were no designated hand washing stations for effective hand washing and no antibacterial soap was available. To ensure food safety, washing hands regularly with soap and water is an important factor in the elimination of microbial growth.

The FHs displayed a lack of knowledge on temperature control as all cooked foods should be kept very hot before serving; however, the centres kept their food warm by leaving it in the pots on the stove with the pot lid securely on during the holding stage. Most of the FHs were not aware that cooked food needed to be thoroughly reheated before it was consumed and that it was important for cooked food to be refrigerated at an appropriate temperature and not left out on the kitchen counter in a warm place for a long period of time. The main reason for this was identified as the lack of food safety training provided on temperature monitoring, posing a threat to the health of the young children. As has been proved, food spoilage is the result of a lack of temperature control of cooked food that has been exposed to favourable conditions for microbial growth which then results in food poisoning and diarrhoea. The data gathered from this study indicated that the FHs at all the non-registered ECD centres needed to attend intensive formal training on food safety and hygiene practices including all the different aspects of food safety.

Cleanliness was seen to be practised as most of the centres' premises were neatly swept and free from rodents. Although the preparation areas were clean, no sanitization was practised at the majority of the centres. The appropriate cleaning chemicals were available at most of the ECD centres.

The vast majority of the FHs showed commendable knowledge on questions relating to the SAFBDGs, such as being aware that starches or carbohydrates should form part of your everyday meal, and that samp, stiff pap and rice were categorized as the starch, or carbohydrates food group. However, the poor response given by the FHs indicated that they were not aware that an average human being needed to drink at least eight glasses of water every day and that cheese was a good source of protein. But overall responses suggested that the FHs' nutrition knowledge was generally satisfactory.

The results from the dietary analysis confirmed that the meals served at these non-registered ECD centres did not provide sufficient quality or menu variety to meet the nutritional needs of preschool children. The findings clearly showed low consumption of fruit and vegetables, preferably dark green and deep yellow, lack of milk intake across all the centres for boys and girls, and an extremely low table salt intake in all the ECD centres, with all these factors contributing to the poor nutritional status of the young children attending these non-registered ECD centres.

Maize meal and rice was offered daily as the main starch dish in all the ECD centres, indicating that the children's diet was largely carbohydrate-based. However, this was not the case when nutrients were analysed. It was noted that there was a significant difference between the meals served and consumed among the children between the ages of 1 and 3 years. The portion sizes of the meals consumed were smaller than the portion sizes served to the children as was observed from the plate waste study, resulting in an inadequate intake of energy, carbohydrates, dietary fibre, calcium, phosphorus, iodine, vitamins C, D, E and K, riboflavin and folate. However, protein intake was relatively above the 60% DRI mark in the 1-3-year-old group at the majority of the ECD centres. In the age group of 4-8 years old none of the meals met the DRIs for protein, dietary fibre, calcium, iron, phosphorus, zinc, iodine, vitamins C, D, E and K, thiamin, riboflavin, niacin, vitamin B6, vitamin B12 and folate. There was an exception in that only two ECD centres had reached the 60% DRI recommendation for Vitamin A.

The findings from the microbial analysis revealed that the average occurrence of the pathogenic microorganism *S. aureus* tested on the chopping boards, surface areas and the hands of FHs had traces of *S. aureus* present before washing. However, after washing with water and detergent there were some ECD centres that had a significant decrease in microbial load with others indicating no growth observed (0.00 CFU/mL). The middle section of the food surface area at ECD 2 showed a range of 2.95 log CFU/mL after washing, indicating that ineffective washing had taken place.

There was no trace of *E. coli* on the tests conducted on the chopping boards and food surface areas before and after food preparation at each ECD centre as there was a 0.00 log CFU/mL. However, ECD 5 reported that there was 1.15 log CFU/mL *E. coli* present before hand washing but after effective hand washing a 0.00 log CFU/mL was observed.

5.5 Observational findings

During the study, the observational findings were that all the FHs did not wash their hands properly or frequently enough with soap and water and a dry towel. The children's hands were also not washed prior to eating, creating a lack of awareness around personal hygiene. Overall, it was the FHs' responsibility to engage children in actions that would encourage good personal hygiene behaviour, using soap and water to wash their hands, and to promote hygienic sanitation.

It was also observed that the majority of the ECD centres had sufficient cooking utensils but inadequate chopping boards as in one of the centres a plastic plate was used for chopping vegetables during food preparation.

Poor temperature control during food holding was another observation that was made. Meals were prepared well in advance and kept on the stove top in the pot with the lid closed and at one ECD a wonder-bag was used to keep the food warm. There was no reheating of the meal during serving to kill any microorganisms that may have been present. This exposed the meals to food spoilage and food poisoning as the food was kept at room temperature for an extended period of time, allowing microorganisms to manifest.

The cold chain was broken during transportation as FHs purchased raw materials from formal retailers at the end of each month using public transport and this exposed food items to the high risk of bacterial growth throughout transportation, storage, handling and cooking. In addition, it was observed that perishable food items were stored in suitably cold refrigerators while some non-perishable food items were stored in cupboards and others in containers and buckets with lids on the floor underneath the work surfaces because of space constraints; however, production and expiry dates were not recorded on any of the containers.

5.6 Conclusion

It can be concluded that the overall aim of the study was to determine the food safety practices and nutrition knowledge of food handlers and assess the menu adequacy of meals served at non-registered ECD centres to make recommendations. The objectives included the following: determining the food safety and hygiene practices as well as the nutrition knowledge, assessing the menu adequacy of meals and analysing microbial swabs to assess the bacterial count at these non-registered ECD centres. These objectives were obtained through the implementation of a methodology discussed in Chapter 3.

The overall results showed that managers and FHs need to be educated and equipped to understand, implement and promote adequate food safety and hygiene practices. This would help prevent the outbreak of foodborne diseases that could be harmful to these young children. Furthermore, meals prepared at all the non-registered ECD centres had not met the DRI, had a high consumption of carbohydrates and less calcium intake which were signs that indicated that more nutrition based training needed to be conducted at these non-registered ECD centres. Therefore, practical recommendations to ECD managers can be suggested

5.7 Recommendations

5.7.1 Recommendations to government organisations (Department of Social Development and Department of Health)

- All the non-registered ECD centres had poor infrastructure even though they were operational. The researcher would recommend that DSD officials work more closely with these nonregistered ECD centres to improve the structural issues in order to meet departmental regulations and bring them up to standard so that they, too, could register as fully certified centres because the children's health and ultimately their lives are at stake.

- The majority of these non-registered ECD centres are in need of some form of funding while they try to get registered on the DSD database. They are surrounded by poor households and the monthly school fees are low, resulting in fees being allocated solely to the purchasing of food.
- ECD managers need to adhere to the guidelines set by the Department of Social Development on Early Childhood Development so they too can get some form of funding
- ECD managers at non-registered ECD centres need to make sure that they attend annual intensive training programmes organized by The Department of Social Development together with the Department of Health. Topics to be included in the training programme should include nutrition knowledge, meal planning and the preparation, holding, serving and storage of food to prevent outbreaks of foodborne illnesses.
- The Department of Social Development together with the Department of Health should provide information and/or training on the different types of microorganisms and how they affected children's health so that FHs are made aware of the role they play during food preparation.
- The poor sanitation observed could be the result of the FHs' inadequate knowledge of the consequences of not washing hands frequently enough. This is why it so important that the DSD should play a crucial role in supporting managers/ FHs with, among other activities, onthe-job hand-washing training.
- Food handlers need to be taught about standardized portion sizes for children younger than five to prevent malnutrition.
- The Department of Social Development needs to provide funding or some form of subsidy to ECDs that are in the process of getting themselves registered for meals or other essential food items such as fruit and vegetables to improve the intake of essential nutrients.

5.7.2 Recommendations for ECDs

The ECD centres in Ntuzuma are owned by women within the community who saw the need to open such centres for children while offering their services to the parents who are living in poverty.

- In order to offer an opportunity to increase the vitamin and mineral content in meals nonregistered ECD centres need to be encouraged to grow vegetables in their gardens and then use the money allocated to buying vegetables to buy other necessities needed by the centres. By doing this, the meals would be more cost effective and fresh vegetables would be accessible.
- Maize meal was served for breakfast at the majority of the ECD centres. Managers could add a variety of other food items to their 5-day meal cycle to prevent over-consumption of maize meal. Maize meal porridge could be interchanged with other breakfast cereals such as oats or cornflakes with full cream milk, or brown bread with margarine and peanut butter. The variety of food items could help increase the children's fibre and calcium intake.

- Training on food safety and nutrition knowledge needs urgent attention so that the food prepared in the kitchens is safe for consumption. This would also broaden the managers'/ FHs' knowledge.

5.8 Recommendations for future research

- More research on non-registered ECD centres in other provinces is crucial in order to compare the results while engaging other government stakeholders such as the DSD and the DoH in order to contribute to already existing knowledge and to promote further improvement in food preparation and serving practices.
- Further research needs to be conducted into the food items packed in lunch boxes that are offered as snacks at non-registered ECD centres in Ntuzuma. This research would also indicate whether these snacks contributed to the daily nutrient intake of young preschool children.

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ANNEXURE A

LETTER OF INFORMATION

Dear ECD Manager

Thank you for giving me the opportunity to explain my research to you and how you can participate in this important study. My name is Gugu Shabangu, I am a student studying at the Durban University of Technology (DUT) for a Master's Degree. The title of my Research Study is:

Food safety practices, nutrition knowledge and menu adequacy at non-registered Early Childhood Development centres in the Ntuzuma area, Durban

Principal Investigator/s/researcher:
Gugu Shabangu, BTech: Consumer Sciences: Food and Nutrition

REC 7/18

Co-Investigator/s/supervisor/s:
Dr. Heleen Grobbelaar
Professor Carin Napier

Why is it important to do this study
Early Childhood Development managers are in charge of the everyday running within their ECD centre. The responsibility lies with them to ensure that the children are in a safe and healthy environment since they spend a large part of their day away from home. All meals and snacks should meet the nutritional requirements of the children and the amount of food and drink provided for children must be adequate for their age. Illnesses spread easily among children in childcarechildcare facilities therefore food handlers need to ensure safe food preparation and handling at all times to avoid foodborne diseases and food poisoning.

What will it involve:

- You will need to sign a consent form to indicate that you agree to participate in the study as soon as I have explained the procedure to you.
- Participation is voluntary and you can withdraw at any time during the study.
- If you agree to participate, you will be asked to participate in a one-on-one interview with the researcher where you will need to complete a manager's questionnaire.
- There will be no risk as the data collected will be treated confidentially and only the researcher and the supervisor will have access to it.
- No names will be used in the study. You will be given a participant number.

- Hand swabs from the ECD practitioners and surface swabs in your food preparation area will be taken by the researcher.

Benefits of the research

You will be a part of a study where you could also gain some insight knowledge. The results of the study will be reported to everyone as a group and not individually. Recommendations will be made should the need arise.

Please note the following:

- There will be no pay or monetary or other type of remuneration offered or given to participants for participating in the study.
- It will not cost you anything to participate in the study.
- There will be no discomfort or any related injury as a result of your participation.
  Participation is voluntary and you can withdraw at any time during the study.

Research-related injury

For any questions or concerns please feel free to contact me, my supervisor or our Ethics committee.

Supervisor: Dr. Heleen Grobbelaar
031 373 2326 / 073 727 2136

heleeng@dut.ac.za

Researcher: Gugu Shabangu
072 529 0008

The Institutional Research Ethics Administrator 031 373 2375.

Complaints can be reported to the Director: Research and Postgraduate Support, Prof C. Napier on 031 373 2577 or carin.napier@auckland.ac.nz

If you are willing to participate in the study, please read and sign the consent form.

THANK YOU

ANNEXURE B

Sawubona Mphathi Wenkulisa

Ngiyabonga ukungipha ithuba lokuchaza kabanzi ngocwaningo

Ucwaningo lwami lubizwa ngokuthi: “Food safety practices, nutrition knowledge and menu adequacy at non-registred Early Childhood Development (ECD) centres in the Ntuzuma area, Durban”.

Okungukuthi: “Imikhuba yokupheka kokudla, ulwazi lokudla okunomsoco kanye nokufaneleka kwemenyu ezinkulisa ezingabhalisiwe nomyango obhekelela abantwana endaweni yase Ntuzuma, eThekwini.”

REC 7/18

Umcwaningi omkhulu:

Mina, Gugu Shabangu (B. Tech: Consumer Sciences Food and Nutrition) ngizoba umcwaningi omkhulu ngiphathwe ngu Solwazi Heleen Grobbelaar (PhD Food and Nutrition) kanye no Solwazi Oluwatosin Ijabadeniyi (PhD Biotechnology and Food Technology).

Isingeniso Nenhloso Yocwaningo:

Izigidi zezingane ziyathinteka ekungondleki kahle eningizimu ye-Afrika kanti lokhu kuyinkinga ekhulayo kakhulu. Izimbangela ezimbili ezimbi kakhulu zokungondleki kahle ezinganeni kakhulukazi zasezinkulisa azidli ngokwanele ukudla okunomsoco kanye nezifo ezithathelwanayo ezifana nesifo sohudo.

Abaphathi bezinkulisa zezingane babhekene nokusebenza kwansuku zonke kwezikhungo zezingane ngakho-ke umthwalo wemfanelo ukhona kubaphathi ukuqinisekisa ukuthi izingane zisendaweni ephephile futhi enempilo njengoba besebenzisa ingxenye enkulu yosuku lwabo kude nekhaya. Konke ukudla kanye neziphuzo kufanele zihlangabezane nezidingo zomsoco wezingane futhi zanele ngokwanele. Izifo zisabalala kalula phakathi kwezingane ezikhungweni zokunakekelwa kwengane ngakho-ke abaphatha ukudla kudingeka baqinisekise ukulungiswa kokudla okuphephile nokuhlanzeka kokudla ngasosonke isikhathi.

Okuhlelwe ukuba kulandelwe:

- Ngizodinga ukuba usayini incwadi yesivumelwano esho ukuthi uyavuma ukuba yingxenye yocwaningo, lokhu kuzokwenzeka uma sengikuchazele konke okuzolandelwa.
- Umangabe uvuma ukuba yingxenye yalolucwaningo ngizocela ukuthi siphendule imibuzo ngendlela yokuxoxisana. Lokhu kungathatha ihora linye nje.
- Imibuzo izoqhamuka kulamaquestionnaire:
    - Managers Questionnaire: Imibuzo ebhekene nomphathi wesikhungo sezingane
    - Food Handlers Questionnaire: Imibuzo ebhekene nomphathi wokudla enkulisa

- Awuphoqiwe ukuba yingxenye yalolucwaningo, Uyazikhethela wena. Uvunyeliwe futhi ukuhoxa ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.

Ingozi kulowo oyingxenye yocwaningo:

Konke okuhleliwe kuzokwenziwa ngaphakathi kwesikhungo sezingane sakho. Akulindelekile ukuba ulimale ngokuba yingxenye yalolucwaningo.

Okuzozuzwa/ Ukusizakala:

Ngalolucwaningo sizothola imininingwane ngesimo sokudla okudliwa ezikhungweni zabantwana nokuphepha kwakho .

Imiphumela yalolucwaningo izodluliselwa kuwena mphathi wesikhungo kodwa igama lakho alizukubalulwa. Imiphumela siyothemba ukuthi izosetshenziswa ekukhuliseni isikhungo sakho nganoma iziphi izinkinga ezivelayo. Uma unemibuzo singabuya sizame ukukusiza uma sesiqedile ukuqoqa imininingwane.

Uyaziswa ukuthi:

- Awuphoqiwe ukuba yingxenye yalolucwaningo, Uyazikhethela wena. Uvunyeliwe futhi ukuhoxa ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.
- Awukho umuholo otholakala ngokuba ingxenye yalolucwaningo.
- Azikho izindleko othweswe zona mayelana nalolucwaningo.
- Konke okuzokwenziwa kuzokwenziwela ngasese, khona nomuntu azo khululeke. Kuyagcizelelwa futhi njengoba bekushiwo encwadini yokwazisa ukuthi oyingxenye yocwaningo uzothola inombolo kunokuba abhalwe/ aziwe ngegama. Lokhu kozoqinisiseka ukuthi imiphumela ingaziwa ukuthi ngekabani.

Okungalimaza ngocwaningo:

Akulindelekile ukuba ulimale ngokuba yingxenye yalolucwaningo.

Ungaxhumana nalaba uma unemibuzo:

USolwazi ungumphathi: Dr. Heleen Grobbelaar

031 373 2326 / 073 727 2136 heleeng@dut.ac.za

Umcwaningi: Gugu Shabangu

072 529 0008

Institutional Research Ethics Administrator

031 373 2375

Izikhalo ungazithumela ku Mqondisi: Research and Postgraduate Support, Prof C. Napier on 031 373 2577 noma uthumele iskhahlamezi ku carin.napier@auckland.ac.nz

Ukuba yingxenye yalolucwaningo kungathokozelwa kakhulu, ngiyabonga futhi ithuba lokuba ngichaze lolucwaningo kuwe.

ANNEXURE C

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC) CONSENT

MANAGERS CONSENT FORM

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, _____ (name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: **REC 7/18** ,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.

- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of the research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.

 I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	**Date**	**Time**	**Signature**

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full Name of Researcher	**Date**	**Signature**
Full Name of Witness (If applicable)	**Date**	**Signature**
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

ANNEXURE D

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC) CONSENT

Sawubona Mphati Wenkulisa

Isivumelwano sokuba yingxenye yocwaningo:

- Ngiyavuma ukuthi ngichazeliwe ngu _____ ngalolucwaningi. Research Ethics Clearance Number: REC 7/18

- Ngiyifundile imininingwane yalolu cwaningo, noma ngilalelile ngezwa kuchazwa ngokomlomo. Ngakho-ke futhi ngiyasho ukuthi ngiyayiqonda.
- Ngiyazi ukuthi imiphumela yocwaningo, kanye neminingwane yami ayizukudalulwa.
- Ngiyavuma ukuthi imininingwane yocwaningo ihlaziywe ngekhomputha ngumcwaningi.
- Angiphoqiwe ukuba yingxenye yalolucwaningo, Ngingahoxa ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.
- Lapho ebenginemibuzo khona, ngichazeliwe kabanzi. Ngiyazikhethela mina ukuba yingxenye yalolucwaningo.
- Imiphumela yalolucwaningo ephathelene nami ekuqhubekeni kwaocwaningo ngizokwazi ukuyithola.

_____ _____ _____ _____

Igama lakho eliphelele **Usuku Iskhathi** **Sayina**

Mina, _____ ngiyavuma ukuthi obhalwe ngaphezulu uchazelwe ngokuphelele ngalolucwaningo

_____ _____ _____ **Igama**

Iomcwaningi **Usuku** **Sayina**

_____ _____ _____ **Igama**

likafakazi **Usuku** **Sayina**

_____ _____ _____ **Igama**

likafakazi **Usuku** **Sayina** **ANNEXURE E**

LETTER OF INFORMATION

Dear ECD Practitioner

Thank you for giving me the opportunity to explain my research to you and how you can participate in this important study. My name is Gugu Shabangu, I am a student studying at the Durban University of Technology (DUT) for a Master's Degree. The title of my Research Study is:

Food safety practices, nutrition knowledge and menu adequacy at non-registered Early Childhood Development (ECD) centres in the Ntuzuma area, Durban

Principal Investigator/s/researcher:
Gugu Shabangu, BTech: Consumer Sciences: Food and Nutrition

REC 7/18

Co-Investigator/s/supervisor/s:
Dr. Heleen Grobbelaar
Professor Carin Napier
Dr. Oluwatosin Ijabadeniyi

Why is it important to do this study
Early Childhood Development practitioners play a significant role in the lives of children who spend most of their time at crèche, daycare or ECD centres. The dietary intake of these children depends heavily on the nutritional knowledge, menu planning and meal preparation skills of practitioners. Therefore, it's important that they are trained and educated to provide the basic nutritional needs of those in their care. Improper food handling is mainly what causes foodborne disease due to contaminated food.

What will it involve:

- You will need to sign a consent form to indicate that you agree to participate in the study as soon as I have explained the procedure to you.
- Participation is voluntary and you can withdraw at any time during the study.
- If you agree to participate, you will be asked to complete a food handlers' questionnaire in a one-on-one interview with the researcher.
- Microbial swabbing of hands will be done by means of a sterile swab before and after washing of hands.
- There will be no risk as the data collected will be treated confidentially and only the researcher and the supervisor will have access to it.
- No names will be used in the study. You will be given a participant number.

Benefits of the research
You will be a part of a study where you could also gain some insight knowledge. The results of the study will be reported to everyone as a group and not individually. Recommendations will be made should the need arise.

Please note the following:

- There will be no pay or monetary or other type of remuneration offered or given to participants for participating in the study.
- It will not cost you anything to participate in the study.
- There will be no discomfort or any related injury due to participation.
- Participation is voluntary and you can withdraw at any time during the study.

Research – related injury

For any questions or concerns please feel free to contact me, my supervisor or our Ethics committee.

Supervisor: Dr. Heleen Grobbelaar
031 373 2326 / 073 727 2136 heleeng@dut.ac.za

Researcher: Gugu Shabangu
072 529 0008

The Institutional Research Ethics Administrator 031 373 2975.

Complaints can be reported to the Director: Research and Postgraduate Support, Prof C. Napier on 031 373 2577 or carin.napier@auckland.ac.nz

If you are willing to participate in the study, please read and sign the consent form.

THANK YOU

ANNEXURE F

Sawubona Msizi Wenkulisa

Ngiyabonga ukungipha ithuba lokuchaza kabanzi ngocwaningo

Ucwaningo lwami lubizwa ngokuthi: “Food safety practices, nutrition knowledge and menu adequacy at non-registered Early Childhood Development (ECD) centres in the Ntuzuma area, Durban”.

Okungukuthi: “Imikhuba yokupheka kokudla, ulwazi lokudla okunomsoco kanye nokufaneleka kwemenyu ezinkulisa ezingabhalisiwe nomyango obhekelela abantwana endaweni yase Ntuzuma, eThekwini.”

Ref: REC 7/18

Umcwaningi omkhulu:

Mina, Gugu Shabangu (B. Tech: Consumer Sciences Food and Nutrition) ngizoba umcwaningi omkhulu ngiphathwe ngu Solwazi Heleen Grobbelaar (PhD Food and Nutrition) kanye no Solwazi Oluwatosin Ijabadeniyi (PhD Biotechnology and Food Technology).

Isingeniso Nenhloso Yocwaningo:

Izigidi zezingane ziyathinteka ekungondleki kahle eningizimu ye-Afrika kanti lokhu kuyinkinga ekhulayo kakhulu. Izimbangela ezimbili ezimbi kakhulu zokungondleki kahle ezinganeni kakhulukazi zasezinkulisa azidli ngokwanele ukudla okunomsoco kanye nezifo ezithathelwanayo ezifana nesifo sohudo.

Abaphathi bezinkulisa zezingane babhekene nokusebenza kwansuku zonke kwezikhungo zezingane ngakho-ke umthwalo wemfanelo ukhona kubaphathi ukuqinisekisa ukuthi izingane zisendaweni ephephile futhi enempilo njengoba besebenzisa ingxenye enkulu yosuku lwabo kude nekhaya. Konke ukudla kanye neziphuzo kufanele zihlangabezane nezidingo zomsoco wezingane futhi zanele ngokwanele. Izifo zisabalala kalula phakathi kwezingane ezikhungweni zokunakekelwa kwengane ngakho-ke abaphatha ukudla kudingeka baqinisekise ukulungiswa kokudla okuphephile nokuhlanzeka kokudla ngasosonke isikhathi.

Okuhlelwe ukuba kulandelwe:

- Ngizodinga ukuba usayini incwadi yesivumelwano esho ukuthi uyavuma ukuba yingxenye yocwaningo, lokhu kuzokwenzeka uma sengikuchazele konke okuzolandelwa.
- Umangabe uvuma ukuba yingxenye yalolucwaningo ngizocela ukuthi siphendule imibuzo ngendlela yokuxoxisana. Lokhu kungathatha ihora linye nje.
- Imibuzo izoqhamuka kulamaquestionnaire:
    - Nutrition Knowledge Questionnaire: Ukuthola ukuhluka kokudla okudlayo
    - Food Handlers Questionnaire: Imibuzo ebhekene nomphathi wesikhungo sezingane • Awuphoqiwe ukuba yingxenye yalolucwaningo, Uyazikhethela wena. Uvunyeliwe futhi ukuhoxa

ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.

Ingozi kulowo oyingxenye yocwaningo:

Konke okuhleliwe kuzokwenziwa ngaphakathi kwesikhungo sezingane sakho. Akulindelekile ukuba ulimale ngokuba yingxenye yalolucwaningo.

Okuzozuzwa/ Ukusizakala:

Ngalolucwaningo sizothola imininingwane ngesimo sokudla okudliwa ezikhungweni zabantwana nokuphepha kwakho.

Imiphumela yalolucwaningo izodluliselwa kuwena mphathi wesikhungo kodwa igama lakho alizukubalulwa. Imiphumela siyothemba ukuthi izosetshenziswa ekukhuliseni isikhungo sakho nganoma iziphi izinkinga ezivelayo. Uma unemibuzo singabuya sizame ukukusiza uma sesiqedile ukuqoqa imininingwane.

Uyaziswa ukuthi:

- Awuphoqiwe ukuba yingxenye yalolucwaningo, Uyazikhethela wena. Uvunyeliwe futhi ukuhoxa ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.
- Awukho umuholo otholakala ngokuba ingxenye yalolucwaningo.
- Azikho izindleko othweswe zona mayelana nalolucwaningo.
- Konke okuzokwenziwa kuzokwenziwela ngasese, khona nomuntu azo khululeke. Kuyagcizelelwa futhi njengoba bekushiwo encwadini yokwazisa ukuthi oyingxenye yocwaningo uzothola inombolo kunokuba abhalwe/ aziwe ngegama. Lokhu kozoqinisiseka ukuthi imiphumela ingaziwa ukuthi ngekabani.

Okungalimaza ngocwaningo:

Akulindelekile ukuba ulimale ngokuba yingxenye yalolucwaningo.

Ungaxhumana nalaba uma unemibuzo:

USolwazi ungumphathi: Dr. Heleen Grobbelaar

031 373 2326 / 073 727 2136 heleeng@dut.ac.za

Umcwaningi: Gugu Shabangu

072 529 0008

Institutional Research Ethics Administrator

031 373 2975

Izikhalo ungazithumela ku Mqondisi: Research and Postgraduate Support, Prof C. Napier on 031 373 2577 noma uthumele iskhahlamezi ku carin.napier@auckland.ac.nz

Ukuba yingxenye yalolucwaningo kungathokozelwa kakhulu, ngiyabonga futhi ithuba lokuba ngichaze lolucwaningo kuwe.

ANNEXURE G

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC) CONSENT

PRACTITIONERS CONSENT FORM

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, _____ (name of researcher), about the nature, conduct, benefits and risks of this study-Research Ethics Clearance Number: **REC 7/18**
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.

 I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	**Date**	**Time**	**Signature**

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full Name of Researcher	**Date**	**Signature**
Full Name of Witness (If applicable)	**Date**	**Signature**
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

ANNEXURE H

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC) CONSENT

Isivumelwano sokuba yingxenye yocwaningo: Msizi wenkulisa_____

- Ngiyavuma ukuthi ngichazeliwe ngu _____ ngalolucwaningi. Research Ethics Clearance Number: **REC 7/18**
- Ngiyifundile imininingwane yalolu cwaningo, noma ngilalelile ngezwa kuchazwa ngokomlomo. Ngakho-ke futhi ngiyasho ukuthi ngiyayiqonda.
- Ngiyazi ukuthi imiphumela yocwaningo, kanye neminingwane yami ayizukudalulwa.
- Ngiyavuma ukuthi imininingwane yocwaningo ihlaziywe ngekhomputha ngumcwaningi.
- Angiphoqiwe ukuba yingxenye yalolucwaningo, Ngingahoxa ukuba yingxenye yalolucwaningo nganoma yisiphi isikhathi ngaphandle kwokuhlawula noma ukulahlekelwa ukusizakala.
- Lapho ebenginemibuzo khona, ngichazeliwe kabanzi. Ngiyazikhethela mina ukuba yingxenye yalolucwaningo.
- Imiphumela yalolucwaningo ephathelene nami ekuqhubekeni kwaocwaningo ngizokwazi ukuyithola.

_____ _____ _____ _____

Igama lakho eliphelele **Usuku Iskhathi** **Sayina**

Mina, _____ ngiyavuma ukuthi obhalwe ngaphezulu uchazelwe ngokuphelele ngalolucwaningo,

_____ _____ _____

Igama lomcwaningi **Usuku** **Sayina**

_____ _____ _____

Igama likafakazi **Usuku** **Sayina**

_____ _____ _____

Igama likafakazi **Usuku** **Sayina**

ANNEXURE I

IMIBUZO NGOLWAZI KOKUDLA OKUNOMSOCO

NUTRITION KNOWLEDGE QUESTIONNAIRE FOR ECD PRACTITIONERS

Lemibuzo elandelayo ibhekiswe kumsizi wenkulisa, ihlose ukuthola ulwazi mayelana nokudla esikhungweni sezingane ezincane (ECD) sakho.

This questionnaire is for ECD practitioners, the purpose of this questionnaire is to assist the researcher in determining the nutrition knowledge of practitioners.

IMIYALELO

INSTRUCTIONS

Le-questionnaire iphethe imibuzo ekanjena:

This questionnaire contains the following types of questions:

Imibuzo lapho okumele ukhethe umbuzo noma imibuzo ocabanga ukuthi iyiyo bese ufaka uphawu (√) ebhokisini eliseduze nempendulo

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

Ngicela uphendule ngo Yebo noma Cha noma phendula okukodwa kulokhu okunikiwe.

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

USUKU/DATE:

DD	MM	YY

IGAMA LENKULISA/NAME OF ECD CENTRE: _____

NGICELA UPHENDULE YONKE IMIBUZO KWIPHEPHA NGALINYE NGAPHAMBI KOKUQHUBEKA KWELILANDELAYO IPHEPHA

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

1. Kumele udle ukudla okunama “starches” noma “cabohydrates” nokudla kwakho ngoba:

   You should have starches or “carbohydrates “with every meal because:

Kubalulekile empilweni yakho They are important for your health	

Kungaphazamisa isisindo sakho, phecelezi ukukhuluphala They can cause weight gain in small amounts	
Kubanga izifo They cause diseases	
Akukho kulokhu None of the above	

2. Ingabe lokukudla kutholakala eqembini le “sitashi” noma “ama-carbohydrates?

Do you think the following foods are in the “starchy” or “carbohydrate” food group?

Ngicela ufake uphawu (√) kukokonke lokhu okungenzanci

Please tick next to each food item

	Yebo/Yes	Cha/No	Anginaso isiqiniseko/Not sure
Ushizi Cheese			
Isitambu			
Samp			
Ipapa Stiff pap			
Ilayisi Rice			
Ibhotela Margarine			

Fishi osethinini Tinned fish			

3. Mangakanani amanzi okumele ngabe uyawaphuza ngosuku?

   How much water should you drink per day?

Akumele uphuze amanzi njalo You don't have to drink water everyday	
1 kuya ku 3 izingilazi 1 to 3 glasses	
4 kuya ku 6 izingilazi 4 to 6 glasses	
7 kuya ku 9 izingilazi 7 to 9 glasses	

4. Ikuphi ukudla okumele ukudle kakhulu?

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

Isinkwa, isipambu, ilayisi, iphalishi Bread, samp, rice, porridge (cereal and starch group)	
Ama-apula, ubhanana, isipinashi, ukherothi	
Apples, bananas, spinach, carrots (fruit and vegetable group)	
Ubisi, iyogathi, ushizi Milk, yogurt, cheese (dairy group)	
Inyama yenkukhu, ufishi, ubhontshisi, amaqanda Chicken, fish, beans, eggs	

Uswidi, amafutha, amakhekhe Sweets, fats and cakes	

5. Uma ucabangu ingabe lokukudla okubekiwe ngenzansi kuwumthombo omuhle noma omubi wama protein?

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

Ngicela ufake u √ kukokonke lokhu okungenzanci

Please tick next to each food item

	Umthombo omuhle Good source	Umthombo omubi Poor source	Anginaso isiqiniseko Not sure
Ushizi Cheese			
Inyama yenkukhu Chicken			
Ipapa Stiff pap			
Ilayisi Rice			
Izithelo Fruit			
Fishi osethinini Tinned fish			

6. Ubhontshisi osethinini, uphizi, noma ama lentils ayimpilo yini uma uzowadla esikhundleni senyama ebomvu noma yenkukhu:

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

Yebo True	Cha False	Anginaso isiqiniseko Not sure

7. Ingabe lingakanani ithanga okumele ngiliphake epileyitini?

How much pumpkin should I dish-up per plate?

1 isipuni sasetafuleni 1 tablespoon	
Uhafu wenkomishi Half a cup	
1 inkomishi 1 cup	
2 izinkomishi 2 cups	
Anginaso isiqiniseko Not sure	

8. Ingabe ikuphi ukudla okukunika amandla?

Which group of foods is the best source of energy?

Isinkwa, isitambu, irayisi, ipharishi, ibhotela, amafutha okupheka Bread, samp, rice, porridge, margarine, cooking oil	
Isipinashi, ukherothi, utamatisi Spinach, carrots, tomatoes	
Ubibi, iyogathi, ushizi Milk, yogurt, cheese	
Inyama yenkukhu, ufishi, ubhontshisi, amaqanda Chicken, fish, beans, eggs	

9. Ingabe iqanda linempilo yini ukundlula inyama ebomvu noma yenkukhu:

An egg is a healthy choice to eat in place of meat or chicken:

Yebo True	Cha False	Anginaso isiqiniseko Not sure

10. Ukubaluleka kokudla ukudla okunempilo ilokhu:

The key to a healthy way of eating is to:

Ukudla ukudla okuningi futhi okuhlukene Eat many different kinds of foods	
Ukudla okunye ukudla ngaphezulu kokunye Eat some foods more than other foods	
Ukudla okunye ukudla kancane Eat certain kinds of foods in moderation or small amounts	
Konke lokhu okungenhla All of the above	

11. Ukufaka ushukela omningi etiyeni noma ekhofini lakho kuzokunika yini umandla:

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

Yebo True	Cha False	Anginaso isiqiniseko Not sure

12. Ingabe ufishi osethinini unempilo kunenyama ebomvu noma yenkukhu:

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

Yebo True	Cha False	Anginaso isiqiniseko Not sure

13. Ingabe zingakhi izithelo nemifino okumele ngabe uyawadla ngosuku?

How many fruits and vegetables should be eaten per day?

1 - 2 izithelo nemifino ngosuku 1-2 fruit and vegetable per day	
3 - 4 izithelo nemifino ngosuku 3-4 fruits and vegetables a day	
5 noma ngaphezulu izithelo nemifino ngosuku 5 or more fruits and vegetables a day	
Asikho isidingo sokudla izithelo nemifino zinsuku zonke There is no need to eat fruit and vegetables daily	

14. Ukudla okunomsoco ilokhu:

A well balanced diet:

Ikakhulukazi okunenyama,inani elincane lesitashi, izithelo, imifino kanye nemikhiqizo yobisi Consists mostly of meat, with smaller amounts of starch, fruits, vegetables, and dairy	
Ikakhulukazi imifino, bese inani elincane lenyama nemikhiqizo yobisi Consists mostly of vegetables, and smaller amounts of meat and dairy	
Ikakhulukazi isitashi, imifino, izithelo, bese kuba inani elincane lenyama nezikhiqizo zobisi Consists mostly of starches, vegetables, fruits, with smaller amounts of meat and dairy products	

Akukho kulokhu okungenhla None of the above	

15. Iziphi izakhi zomzimba ezitholakala kakhulu kwizithelo kanye nemifino?

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

Fiber, i-vitamin A, no C Fibre, Vitamin A, Vitamin C	
Isitashi, mafutha, i-vitamin D Starches, fat, Vitamin D	
Amafutha, i-iron, i-calcium Fats, iron, calcium	
Akukho kulokhu okungenhla None of the above	

16. Kumele njalo ufake usawothi omningi ekudleni kwakho ngaphambi kokukudla?

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

Yebo True	Cha False	Anginaso isiqiniseko Not sure

17. Ukuze amasosha akho omzimba aphile ikuphi ukudla okumele ukudle:

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

Ikakhulukazi okunenyama,inani elincane lesitashi, izithelo, imifino kanye nemikhiqizo yobisi Consists mostly of meat, with smaller amounts of starch, fruits, vegetables, and dairy	
Ikakhulukazi imifino, bese inani elincane lenyama nemikhiqizo yobisi Consists mostly of vegetables, and smaller amounts of meat and dairy	
Ikakhulukazi isitashi, imifino, izithelo, bese kuba inani elincane lenyama nezikhiqizo zobisi Consists mostly of starches, vegetables, fruits, with smaller amounts of meat and dairy products	
Akukho kulokhu okungenhla None of the above	

18. Ingabe ikuphi ukudla okuno Vitamin A?

Which group of foods has the most Vitamin A?

Ipharishi le oats, isinkwa sokolo, irayisi, isitambu Oats, whole wheat bread, rice, samp	
Ukherothi, isipinashi, ithanga, ubhatata Carrots, spinach, butternut, sweet potatoes	
Ikhekhe lechokholethi,uphaya, u pudingi	
Chocolate cake, pies, baked pudding	
Akukho kulokhu okungenhla None of the above	

19. Ingabe ikuphi kulokhu okuwukudla okunempilo?

Which of the following is a healthy snack?

Ama-chips “Cheese curls” Cheese curls	
Amakinati anama raisins Peanuts and raisins	
Amazambane athosiwe Fried chips (hot chips)	
Ama-chips “Simba” “Simba” Chips	

20. Ukuzivocavoca kusho:

Being physically active means:

Ukuya egimini Going to the gym	
Ukuhamba kakhulu Walking a lot	
Ukudlala ezemindlalo njenge bhola Playing sports like soccer	
Konke lokhu okungenhla All of the above	

21. A) Ukuphuza iwayini, noma ubhiya zinsuku zonke kuvumelekile kuphela uma uzophuza ngokulinganisela:

Drinking wine, beer and cider every day is acceptable as long as it is in moderation:

Yebo True	Cha False	Anginaso isiqiniseko Not sure

B) Uma ngigula noma ngingaphathekile kahle empilweni, kuvumelekile yini ukuthi ngiphuze ngokulinganisekile:

When I am not feeling well, it is OK to drink alcohol moderately:

Yebo True	Cha False	Anginaso isiqiniseko Not sure

22. Uma udla ukudla okunempilo, asikho isidingo sokuthi uzivocavoce

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

Yebo True	Cha False	Anginaso isiqiniseko Not sure

23. Amafuruthi afureshi nama vegi kumele awashwe kuqala ngaphambi kokuwadla, nokuwaqoba:

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

Yebo True	Cha False	Anginaso isiqiniseko Not sure

24. Ukuze uvimbe ukudla kungatholi amagciwane kumele:

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

Uwashe izandla zakho ngasosonke isikhathingamanzi ashisayo, anencipho usalungisa ukudla	
Wash your hands regularly with hot, soapy water. while preparing food	
Usebenzise imimese, amabhodi okuqobela namabhodwe acocekile ngaso sonke isikhatha Always use clean utensils, cutting boards and pots.	
Kokubili okungaphezulu Both of the above statements are correct.	

25. Lokhu okulandelyo indlela yokuwasha izitsha kanye nezipuni emza kokudla:

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

Washa amapuleti nezipuni zokudla ngamanzi afudumele bese uzisula ngendwangu yezitsha ehlanzekile Wash the plates and eating utensils with warm water and dry with a clean dish cloth.	
Washa amapuleti nezipuni zokudla ngamanzi ashisayo futhi anensipho, rinsa bese uziyeke zizomele Wash the plates and eating utensils with very hot soapy water, rinse and allow to air dry.	
Susa ukudla okusale epuletini ukufake emgqonyeni wezibi, ugeze amapuleti kanye nezipuni ngamanzi ashisayo futhi anensipho, rinsa emanzini ashisayo bese uyasula ngendwangu eyomile ehlanzekile Scrape the left-over food into a waste bin, wash the plates and eating utensils with very hot soapy water, rinse in very hot clean water and dry with a clean dish cloth.	

IMIBUZO EMBALWA NGAWE

A FEW QUESTIONS ABOUT YOURSELF:

1. Ingabe ungu muntu

Are you

Owesilisa Male	
Owesifazane Female	

2. Uneminyaka emingakhi

How old are you?

Ngaphansi kuka 18 Less than 18	
18 - 24	
25 -34	
35 - 44	
45 - 54	
55 - 64	
65 - 74	
Ngaphezulu kuka 75 Older than 75	

3. Wagcina kuliphi izinga esikoleni

What is the highest level of education you have completed?

Isikole sebaga eliphansi **Primary school**	
Isikole sebanga eliphezulu **Secondary and High school** Isigaba owagcina kuso	
State standard or grade?	
Emazingeni aphezulu ekolishi noma enyuvesi **College or University :** Igama leziqu/State the name of the qualification	

Idiploma/ Diploma: Igama le diploma/State the name of the diploma:	
iDegree/Degree: Igama ledegree/ State the name of the degree	
Okunye njengama workshop noma ezinye izifundo/ Any other courses/workshops you attended (please specify):	

4. Unazo ezinye iziqu ezihlobene nokudla

   Do you have any health or nutrition related qualifications?

Yebo (chaza kabanzi) Yes (please specify)	
Cha No	

5. Ususebenze isikhathi esingakanani kulenkulisa yezingane

   How long have you worked as a practitioner at this ECD centre?

6. Siyini isihloko sakho emsebenzini

   What is your job title?

7. Uhlala ngaphalathi kwenkulisa

   Do you live on the premises of the ECD centre?

Yebo, uma usemsebenzini YES, when on duty	Cha, angikaze No, never

8. Ingabe kukhona okunye kulokhu okwenzayo esikhungweni sezingane? (ngicela ufake uphawu √)

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

Ekuhlela imenyu kulesi sakhiwo Menu planning for the facility	
Ukuthenga nokuhleleka kokudla Purchasing and ordering of food	
Ukulungiselela kokudla Preparation of food	
Ukuphaka kokudla Plating/ dishing up of food for meals	

Sekuphelile/The end

Ngiyabonga ngesikhathi sakho/Thank you very much for your time!

ANNEXURE J

MANAGERS QUESTIONNAIRE

Information to be obtained from the Owner/Manager of the ECD centre

INTERVIEW DATE: _____/_____/_____ DD/MM/YY INTERVIEWER'S NAME:	BUSINESS NAME/NO: BUSINESS ADDRESS:

PLEASE CIRCLE THE RESPONDENT'S ANSWERS

SECTION 1: GENERAL / MANAGEMENT

List the three most favourite dishes that children love in order of highest sales to lowest sales:

	What is the most favourite dish? (List in order of importance)	**Approximate % of total sales**
	e.g. Beef Stew 60 %	60%
1.		
2.		
3.		
4.		
5.		
	Total	**100%**

NO.	**QUESTIONS**	**ANSWERS**
1.	Are you the owner or the Manager of the business	a) Yes b) No c) Don't know
2.	How many employees including you does the business have?	a) One b) Two c) Three d) Four or more
3.	How long have you been running the business?	a) <One year b) One to two years c) Two to three years d) Three or more years
4.	Gender	a) Male b) Female
5.	Age of respondent	a) < 30 b) 30 and above
6.	What is your highest level of education?	a) No education b) Std 1/Grade 1-3 c) Std 2-5 Grade 4-7 d) Std 6-9 Grade 8-11

		e) Matric/Std 10/ Grade 12 f) Apprenticeship g) Post – matric diploma/Technikon h) University
7.	Do you have previous experience in food service?	a) Yes b) No
8.	Do you have a menu?	a) Yes b) No
9.	Why is this menu used?	a) Economical b) Locally accepted foods c) Locally available foods d) Favourite foods e) Other (please specify) …….
10.	Where does the ECD centre get water from?	a) Outside tap (i.e. running water) b) Kitchen tap (i.e. running water) c) Water tank d) Communal water supply (collected) e) Other (please specify) …….
11.	What power supply is used to prepare the food?	a) Electricity b) Gas c) Fire d) Other (please specify) …….
12.	How often do you monitor your staff regarding their duties?	a) Daily b) Weekly c) Monthly d) Once a term e) Seldom f) Never
13.	Do you delegate any of the monitoring duties to any staff members?	a) Yes b) No
14.	If yes, to whom?	a) Food handler b) Managers assistant c) Other (please specify) …….

SECTION 2: **TRAINING AND FOOD SAFETY ISSUES**

15. Have you had training in the last 6 months?

Yes	Y
No	N

16. Are there written policies and procedures regarding each of the following? (Answer all options)

16.1	Receiving	Y	N
16.2	Storage	Y	N
16.3	Serving	Y	N
16.4	Hygiene	Y	N
16.5	Administration	Y	N
16.5	Other (please specify)	Y	N

17. Has any training about food safety and hygiene been provided?

Yes	Y
No	N

18. Have you received training regarding the following? (Answer all options)

18.1	Menu planning	Y	N
18.2	Food preparation	Y	N
18.3	Prevention of food contamination	Y	N
18.4	Prevention of cross-contamination of food	Y	N
18.5	Illness in the workplace	Y	N
18.6	Injury in the workplace	Y	N
18.7	First aid	Y	N
18.8	Personal hygiene	Y	N
18.9	Hand washing	Y	N
18.10	Other (please specify)	Y	N

19. If you have received training, whom did you receive the training from? (Answer all options)

19.1	Department of Education	Y	N
19.2	Department of Health	Y	N
19.3	Another cook/ handler	Y	N
19.4	Previous employer	Y	N
19.5	Through and institution as part of studies		
19.5	Other (please specify)	Y	N

20. When last was training conducted? (Select one)

20.1	Ongoing	1
20.2	Last week	2
20.3	Last month	3
20.4	Last term	4
20.5	Last year	5
20.6	Never	6

21. How frequently is training conducted? (Select one)

Ongoing	1
Weekly	2
Monthly	3
Once a term	4
Once a year	5
Never	6

22. In the past, how frequently did a representative from the Department of Health visit your ECD centre?

Once a month	1
Once a term	2
Twice a year	3
Once a year	4
Less than once a year	5
Never	6
Do not know (not here at that time)	7

23. Do you or your workers have any further specific training needs? If so, please specify the three most important training needs you have.

	Training Needed		**Type of training needed**
	Yes	**No**	

Yourself			1.
			2.
			3.
Your workers			1.
			2.
			3.

SECTION 3: CLEANING AND HYGIENE

24. Is there soap available for hand washing?

Yes	Y
No	N

25. Is there running tap water available for hand washing? (Answer all options)

26.1	Hot	Y	N
26.2	Cold	Y	N
26.3	None	Y	N

26. How frequently are utensils washed? (Mark all relevant options)

During preparation	1
After the food is ready	2
After the work is finished	3

27. How frequently is the stove cleaned? (Mark all relevant options)

During preparation	1
After the food is ready	2
After the work is finished	3
No stove is cleaned	4

28. Are the correct cleaning chemicals available to clean the kitchen?

Yes	Y
No	N

29. Are there enough cleaning tools to clean the kitchen e.g. broom, mop, cloths, sponge, etc?

Yes	Y
No	N

30. How often is the preparation area cleaned? (Mark all relevant options)

During preparation	1
After the food is ready	2
After the work is finished	3

31. Are the work areas ever sanitised?

Yes	Y
No	N

32. If yes, how often? (Select one)

Frequently	1
Daily	2
Weekly	3
Seldom	4

33. How often is frying oil changed from the deep fat fryer

Frequently	1
Daily	2
Weekly	3
Seldom	4

SECTION 4: PURCHASING & RECEIVING

Mention & Circle those that apply

	QUESTIONS AND FILTERS	**FOOD ITEM**	**CODING CATEGORIES**
34a	Where do you obtain your raw materials from?	Chicken	a) Abattoir b) Formal retailer c) Wholesale stores d) Informal businesses e) Other (specify) ……
		Fish	a) Abattoir b) Formal retailer c) Wholesale stores d) Informal businesses e) Other (specify)
34b		Meat	a) Abattoir b) Formal retailer c) Wholesale stores d) Informal businesses e) Other (specify) ……
34c		Maize	a) Formal retailer b) Wholesale stores c) Informal businesses d) Other (specify) ……..

34d		Bread/ Rolls	a) Formal retailer b) Self (baked) c) Bakery d) Informal businesses e) Other (specify) ……
34e		Vegetables and fruit	a) Formal retailers b) Fruit & veg stores c) Direct from the farm d) Direct from the market e) Informal businesses
34f		Groceries	a) Formal retailer b) Wholesale stores c) Informal businesses

			d) Other (specify) ……
35.	Are there contracts with the suppliers?		a) Yes b) No
36.	Is there a planned delivery schedule?		a) Yes b) No
37.	Who delivers the supplies		a) Commercial supplier b) Local community member c) Both a & b d) Other (please specify)
38.	How is the non-perishable food delivered?		a) Open truck b) Closed truck c) Car d) Other (please specify) ……
39.	How is the perishable food delivered?		a) Open truck b) Closed truck c) Refrigerated truck d) Car e) Other (please specify) ……
40.	Is the food of adequate quality?		a) Yes b) No

41.	Where do you store your perishable products? (Interviewer explains the term perishable). Circle all that apply.		a) Fridge/freezer b) Cooler box c) Newspaper d) Other (specify) ……
42.	How is the quality of the food assessed? (Mark all relevant options)		a) Brand b) Expiry date c) Grade d) Visually e) Other (please specify) ……
43.	What happens to the food that is judged to be of inadequate quality? (Mark all relevant options)		a) Returned to supplier b) Received and used c) Received and thrown away d) Other (please specify) ……
44.	Who receives the deliveries?		a) Owner b) Manager/supervisor c) Food handler d) Other (please specify) ……
45.	Is it the same person every time?		a) Yes b) No
46.	Do you have a food specification manual to check the quality of food against?		a) Yes b) No
47.	Does the delivery note / invoice get checked		a) Yes b) No
48.	Are all the food items checked		a) Yes b) No
49.	If yes, how (mark all relevant options)		a) Weighed b) Counted c) Both a & b d) Other (please specify) ……

SECTION 5: FOOD SAFETY & HYGIENE KNOWLEDGE

50.	Do you use separate utensils/containers for raw products and cooked foods?	a) Yes b) No
51.	How are cooking utensils washed?	a) Hot water & detergent

		b) Cold water & detergent c) Other (specify) ……
52.	When should you wash your hands?	a) After visiting the toilet b) Before preparing food c) Both a & b d) Neither e) Don't know f) Other (specify) ……
53.	Wiping cloths can spread microorganisms	a) Yes b) No
54.	The same cutting board can be used for raw foods and cooked foods provided it looks clean	a) Yes b) No
55.	Raw foods need to be stored separately from cooked food	a) True b) False
56.	Cooked foods do not need to be thoroughly reheated	a) True b) False
57.	Cooked meat can be left out of the fridge to cool overnight before refrigerating	a) True b) False
58.	Cooked foods should be kept very hot before serving	a) True b) False
59.	Wash fruits and vegetables before eating/preparing	a) True b) False
60.	Safe water can be seen by the way it looks	a) True b) False
61.	Frequent hand washing during food preparation is worth the extra time	a) Agree b) Not Sure c) Disagree
62.	Keeping kitchen surfaces clean reduces the risk of illness	a) Agree b) Not Sure c) Disagree
63.	Keeping raw and cooked foods separate helps to prevent illness	a) Agree b) Not Sure c) Disagree
64.	Thawing food can be done on the counter	a) Agree b) Not Sure c) Disagree
65.	I think that it is unsafe to leave cooked food out of the refrigerator for more than two hours	a) Agree b) Not Sure c) Disagree

66.	I separate raw and cooked food during storage	a) Most Times b) Sometimes c) Never
67.	I inspect food for freshness to ensure quality ingredients	a) Agree b) Not Sure c) Disagree
68.	I think it is important to throw away foods that have reached their expiry date	a) Agree b) Not Sure c) Disagree

SECTION 6: STORAGE

69. Where are the perishable food supplies stored? (Mark all relevant options)

Kitchen	1
Designated store room	2
Cooler boxes	3
Storage containers	4
Other (please specify)	5

70. Where are the non-perishable food supplies stored? (Mark all relevant options)

Kitchen	1
Designated store room	2
Cooler boxes	3
Storage containers	4
Other (please specify)	5

71. Is there a regular cleaning schedule for the storage areas?

Yes	Y
No	N

72. How often is the storage area cleaned?

Less than once a week	1
Once a week	2
Twice a week	3
Three times a week	4
Four times a week	5
Every day of the week	6

73. How often is the stock checked for quality and expiry dates? (Select one)

Not checked	1
Once a month	2
Twice a month	3
< Once a week	4
Once a week	5
Twice a week	6
Three times a week	7

Four times a week	8
Every day of the week	9

74. How often is stock – take done? (Select one)

Not done	1
Once a month	2
Twice a month	3
< once a month	4
Once a week	5
Twice a week	6
Three times a week	7
Four times a week	8
Every day of the week	9

75. Is stock rotation in place?

Yes	Y
No	N

76. If yes, how is this done? (Select one)

Delivery dates	1
Expiry dates	2
Correct storage on delivery	3
First In First Out	4
Other (please specify)	5

Thank you for your participation

ANNEXURE K

FOOD HANDLERS QUESTIONNAIRE

ECD centre #	

Information to be obtained from the Food Handlers at the ECD centre

Imininingwane edingekayo kubapheki esikhungweni sezingane ezincane

Explain the following to the interviewee:

Chazela umuntu loku okulandelayo:

The following set of questions aims to investigate some of the aspects of the day to day running at your ECD centre.

Lemibuzo elandelayo ihlose ukuthola ngezinto ezenzekayo nsukuzonke esikhungweni sezingane ezincane (ECD) sakho.

Please answer only Yes or No or answer one of the choices you are given. You will be given the chance to make other comments at the end.

Ngicela uphendule ngo Yebo noma Cha noma phendula okukodwa khalokhu okunikiwe. Uzonikezwa ithuba lokuphawula ekugcineni.

Please insert the interviewee's answer to the following questions by placing a cross (X) in the right hand box or filling in the relevant information e.g. number. Y = Yes and N = No.

Faka izimpendulo zobuzwayo kumibuzo elandelayo ngokubeka isiphambano ebhokisini elingakwesokudla noma ugcwalise imininingwane efanele njenge nombolo, Y=Yebo kanye no C=Cha

General information required from the food handler at the ECD centre *Imininingwane*

edingekavo kubapheki esikhungweni sezingane ezincane

SECTION 1:

GENERAL

OKUJWAYELEKILE

1. How many cooks/ food handlers are working at this establishment?

   Bangaki abapheki abakhona?

Number /*Nombolo*	

2. How long have you been a cook/ food handler for? Record the number of years and months.

   Sewunesikhathi esingakanani upheka? Bhala inombolo yeminyaka kanye nezinyanga.

	FH 1	FH 2	FH3	FH4
Years/*Iminyaka*				
Months/*Izinyanga*				

3. Do you have previous working experience in food service?

   Unalo yini ulwazi ngaphambilini lokusebenza ngokudla?

Yes/*Yebo*	Y
No/*Cha*	C

4. Is there a menu?

   Likhona yini iphepha ekubhalwe kula ukudla okuzodliwa ngokulandelana kwakho?

Yes/*Yebo*	Y
No/*Cha*	C

SECTION 2:

FOOD STORAGE

INDAWO YOKUGCINA UKUDLA

5. Are the expiry dates checked on the foods?

   Niyakuqikelela ukubheka imibhalo emaphaketheni okudla eshoyo ukuthi ukudla konakala nini?

Yes/*Yebo*	Y
No/*Cha*	C

General information required from the food handler at the ECD centre *Imininingwane*

edingekavo kubapheki esikhungweni sezingane ezincane

SECTION 1:

GENERAL

OKUJWAYELEKILE

6. How many cooks/ food handlers are working at this establishment?

   Bangaki abapheki abakhona?

Number /*Nombolo*	

7. How long have you been a cook/ food handler for? Record the number of years and months.

   Sewunesikhathi esingakanani upheka? Bhala inombolo yeminyaka kanye nezinyanga.

	FH 1	FH 2	FH3	FH4
Years/*Iminyaka*				
Months/*Izinyanga*				

8. Do you have previous working experience in food service?

   Unalo yini ulwazi ngaphambilini lokusebenza ngokudla?

Yes/*Yebo*	Y
No/*Cha*	C

9. Is there a menu?

   Likhona yini iphepha ekubhalwe kula ukudla okuzodliwa ngokulandelana kwakho?

Yes/*Yebo*	Y

No/*Cha*	C

SECTION 2:

FOOD STORAGE

INDAWO YOKUGCINA UKUDLA

10. Are the expiry dates checked on the foods?
    Niyakuqikelela ukubheka imibhalo emaphaketheni okudla eshoyo ukuthi ukudla konakala nini?

Yes/*Yebo*	Y
No/*Cha*	C

11. If the expiry date on the food packaging is 16 AUG 2007, what does this mean?
    (Take a sample and show it to the cook / food handler)
    Uma usuku lokonakala ephaketheni lokudla lingu 16 AUG 2007, kusho ukuthini? (Thatha isampula utshengise umpheki)

……

FOOD PREPARATION

UKULUNGISA UKUDLA

12. Where is the food prepared? (Select one) *Kulungiselwa kuphi ukudla? (Khetha okukodwa)*

Designated kitchen	*Endlini yokupkekela*	1
Temporary/make-shift kitchen	*Ekhishini lesikhashana*	2
Classroom	*Endili yokufundela*	3
Outbuilding	*Endlini engaphandle*	4
Outside	*Ngaphandle*	5
Other (please specify)	*Okunye (Chaza)*	6

13. Who prepares the food?
    Ubani olungisa ukudla?

The owner/ manager	*Umphathi wenkulisa*	1
The cook/ food handler	*Umpheki*	2

Teacher	*Uthisha*	3
Community volunteer	*Ilunga lomphakati elisizayo*	4
Other (please specify)	*Omunye (Chaza)*	5

14. Is there adequate space for food preparation?
    Yanele yini indawo yokulungisela ukudla?

Yes/*Yebo*	Y
No/*Cha*	C

15. Is there adequate space for cooking?
    Yanele yini indawo yokuphekela?

Yes/*Yebo*	Y
No/*Cha*	C

16. Is there enough water for food preparation?
    Anele yini amanzi okulungisa ukudla?

Yes/ *Yebo*	Y
No/*Cha*	C

17. Are there enough food preparation utensils? (Answer all options)
    Zanele yini izitsha zokulungisa ukudla? (Phendula konke okunikiwe).

Knives	*Imibese*	Y	C
Chopping Boards	*Amabhodi okuqobela*	Y	C
Measuring equipment	*Izitsha zokukala*	Y	C
Serving spoons	*Izipuni zokuphaka*	Y	C
Mixing tools	*Amathuluzi okuhlanganisa*	Y	C

18. Are recipes available?
    Ikhona yini indlela yokupheka ukudla ebhalwe phansi?

Yes/Yebo	Y
No/Cha	C

19. Are the recipes used?
    Ziyasetshenziswa yini izindlela zokupheka ukudla ezibhalwe phansi?

Yes/Yebo	Y

No/Cha	C

20. Where were these recipes obtained?
Zatholakala kuphi lezizindlela zokupheka ukudla?

Department of Health	*Kumnyanga wezeMpilo*	1
Department of Social Development	*Kumnyango weZokuthuthukiswa komphakathi*	2
The owner/ manager	*Kumphathi*	3
The cook/ food handler	*Kumpheki*	4
Other (please specify)	*Kumunye (Chaza)*	5

SECTION 3:

FOOD HOLDING

UKUGCINWA OSEKUPHEKIWE

21. How long is the food held after cooking and before serving? (Select one).
Kubekwa isikhathi esingakanani ukudla emva kokuphekwa naphambi kokuphakwa? (Khetha okukodwa).

Less than 15 minutes	*Ngaphansi kwemizuzu engu15*	1
15-30 minutes	*Phakathi kwemizuzu engu 15 kuya kwewu 30*	2
30-45 minutes	*Phakathi kwemizuzu engu30 kuya kwewu45*	3
More than 45 minutes	*Ngaphezulu kwemizuzu engu45*	4

22. How is the food kept warm?
Kugcinwa kanjani kufudumele ukudla?

……

SERVING

UKUPHAKWA KOKUDLA

23. Is there adequate space for serving / portioning? *Yanele yini indawo yokuphaka?*

Yes/Yebo	Y
No/Cha	C

24. Are there adequate food serving utensils? (Answer all options)
Zanele yini izitsha zokuphaka? (Phendula konke okunikiwe)

Ladles	*Iziphuni ezinkulu*	Y	C
Measuring equipment	*Izitsha zokukala*	Y	C
Serving spoons, forks, knives	*Izipuni zokuphaka, izimfoloko, imibese*	Y	C
Cups	*Izinkomishi*	Y	C
Plates, bowls	*Amapuleti nezindishi*	Y	C

25. In your opinion are the children happy with the portion sizes of their food?
Ingabe isikhathi esiningi abafundi bayasijabulela yini isikali sokudla abasitholayo?

Yes/*Yebo*	Y
No/*Cha*	C

WASTE

UKUDLA OKUMOSHEKILE

26. What happens to the food that is prepared but the children do not finish i.e. left overs? (Mark all relevant options).
Kwenzekalani ngokudla okuphakwayo kodwa abafundi bangakuqeda? (Kusho okusala endishini). (Khetha konke okufanele).

Thrown away	*Kuyalahlwa*	1
Given to a friend	*Kunikezwa umngani*	2
Taken home	*Kuthunyelwa emakhaya nabantwana*	3
Kept for the next day	*Kuyabekwa, kusebenziswe usuku olulandelayo*	4
Cooks/food handlers eat it	*Abapheki bayakudla*	5
Other ([please specify)	*Okunye (Chaza)*	6

27. How much left-over food is thrown away after serving i.e. left over or not served? (Select one).
Kungakanani ukudla okulahlwayo emuva kokuphakwa, kusho okungaphakwanga. (Khetha okukodwa).

None	*Akukho*	1
Minimal/Little	*Kuncane*	2
Half	*Kuwuhafu*	3
More than half	*Kungaphezulu kukahafu*	4
Don't know	*Angazi*	5

28. Is left over food reheated and served the following day?
Ngabe ukudla okusalile kuyafudunyezwa bese kuyaphakwa ngosuku olulandelayo?

Yes/*Yebo*	Y
No/*Cha*	C

29. If yes, how is it reheated?
Uma impendulo kunguyebo, kufudunyezwa kanjani?

On the stove	*Esitofini*	1
In the microwave	*Kwi-microwave*	2
Other (please specify)	*Okunye (Chaza)*	3

30. Is there a designated rubbish area?
Ngabe ikhona yini indawo eyakhiwe yokulahla udoti?

Yes/*Yebo*	Y
No/*Cha*	C

31. If yes, where is it situated?
Uma uphendule uyebo, uhlalakuphi umqhomo wodoti?

In the kitchen food preparation area	*Ekhishini*	1
In the serving area	*Lapha okuphakwa khona*	2
Outside the centre	*Ngaphandle kwenkulisa*	3
Other (please specify)	*Okunye (Chaza)*	4

32. How often is it removed /cleaned?
Uwashwa kangakhi umqhomo wodoti?

Once a day (morning / afternoon)	*Kanye ngosuku (ekuseni nantambama)*	1
Twice a day (midday & afternoon)	*Kabili ngosuku (emini nantambama)*	2
Once a week	*Kanye ngeviki*	3
Other (please specify)	*Okunye (Chaza)*	4

30. Do the rubbish bins have tightly fitting lids?

Siyavaleka yini isivalo somqgomo wodoti?

Yes/*Yebo*	Y
No/*Cha*	C

SECTION 4:

TRAINING & FOOD SAFETY

UKUQEQESHA NOKUPHEPHA KOKUDLA

31. Have you received any training about food safety and hygiene?

Ngabe kukhona yini ukuqeqeshwa ngokuphepha nangokuhlanzeka kokudla?

Yes/*Yebo*	Y
No/*Cha*	C

32. Have you received training regarding the following? (Answer all options)

Usuke wakuthola yini ukuqeqeshwa mayelana nalezinto ezilandelayo? (Phendula konke okunikiwe)

Menu planning	*Ngohlelo olulandelwayo lokupheka*	Y	C
Food preparation	*Ngokulingisela ukudla*	Y	C
Prevention of food contamination	*Ngokuvikela ukudla emagciwaneni*	Y	C
Prevention of cross-contamination of food	*Ngokuvikela ukushintshana kwamagciwane ekudleni*	Y	C
Illness in the workplace	*Ngokugula endaweni yokusebenza*	Y	C
Injury in the workplace	*Ngokulimala endaweni yokusebenza*	Y	C

First aid	*Ngosizo lokuqala*	Y	C
Personal hygiene	*Ngokuhlanzeka komuntu*	Y	C
Hand washing	*Ngokugeza izandla*	Y	C
Other (please specify)	*Ngokunye (Chaza)*	Y	C

33. If you have received training, whom did you receive the training from? (Answer all options) *Uma wakuthola ukuqeqeshwa, ingabe wakuthola kubani? (Phendula kukho konke)*

Department of Education	*Kumnyango wezemfundo*	Y	C
Department of Health	*Kumnyango wezeMpilo*	Y	C
Another cook/ handler	*Omunye umpheki*	Y	C
Community member	*Ilunga lomphakathi elisizayo*	Y	C
Other (please specify)	*Okunye (chaza)*	Y	C

34. When last was training conducted? (Select one)

Ukuqeqeshwa wawukugcine nini? (Khetha okukodwa)

Ongoing	*Kuyaqhubeka*	1
Last week	*Ngeviki elidlule*	2
Last month	*Ngenyanga eyendlule*	3
Last term	*Ngethemu edlule*	4
Last year	*Ngonyaka odlule*	5
Never	*Akukaze kubekhona*	6

35. How frequent is training conducted? (Select one)

Ngabe ukuqeqeshwa kwenziwa kangaki? (Khetha okukodwa)

Ongoing	*Kusaqhubeka*	1
Weekly	*Njalo ngeviki*	2
Monthly	*Njalo ngenyanga*	3
Once a term	*Kanye ngethemu*	4
Once a year	*Kanye ngonyaka*	5

Never	*Akukaze kubekhona*	6

36. Is there soap available for hand washing?
Ngabe ikhona insipho yokugeza izandla?

Yes/*Yebo*	Y
No/*Cha*	C

37. Is there running tap water available for hand washing? (Answer all options) *Ngabe akhona yini amanzi okugeza izandla? (Phendula konke okunikiwe).*

Hot	*Ashisayo*	Y	C
Cold	*Abandayo*	Y	C
None	*Awekho*	Y	C

38. How frequently are utensils washed? (Mark all relevant options)
Zigezwa kangaki izitsha? (Khetha konke okufanele)

During preparation	*Ngesikhathi kulungiswa ukudla*	1
After the food is ready	*Uma ukudla sekulungile*	2
After the work is finished	*Ekugcineni komsebenzi*	3

39. How frequently is the stove cleaned? (Mark all relevant options)
Sihlanzwa kangaki isitofu? (Khetha konke okufanele)

During preparation	*Ngesikhathi ulungisa ukudla*	1
After the food is ready	*Uma ukudla sekulungile*	2
After the work is finished	*Ekugcineni komsebenzi*	3
Not cleaned	*Asikho*	4

40. Are the correct cleaning chemicals available to clean the kitchen? *Ngabe imithi yokuhlanza ikhishi okuyiyo ikhona?*

Yes/*Yebo*	Y
No/*Cha*	C

41. Are there enough cleaning tools to clean the kitchen e.g. broom, mop, cloths, sponge, etc?
Anele yini amathuluzi okuhlanza ikhishi njenge mishanelo, imophu, izindwangu zezitsha, isiponji nokunye?

Yes/*Yebo*	Y
No/*Cha*	C

42. How often is the preparation area cleaned? (Mark all relevant options)
Indawo yokulungisa ukudla ihlanzwa kangaki? (Khetha konke okufanele)

During preparation	*Ngesikhathi kulungiswa ukudla*	1
After the food is ready	*Uma ukudla sekukungile*	2
After the work is finished	*Ekugcineni konsebenzi*	3

43. Are the work areas ever sanitised?
Iyasetshenziswa yini imithi yokubulala amagciwane?

Yes/*Yebo*	Y
No/*Cha*	C

44. If yes, how often? (Select one)
Uma kunjalo, kangaki? (Khetha okukodwa)

Frequently	*Njalo*	1
Daily	*Nsukuzonke*	2
Weekly	*Masonto onke*	3
Seldom	*Akuvamile*	4

SECTION 5:

FOOD SAFETY & HYGIENE KNOWLEDGE

UKUQEQESHA NOKUPHEPHA KOKUDLA

45.	Do you use separate utensils/containers for raw products and cooked foods? *Usebenzisa izitsha ezihlukene yini ukufaka ukuhla okuphekiwe nokungaphekiwe?*	c) Yes /*Yebo* d) No/*Cha*
46.	How are cooking utensils washed? *Uwawasha kanjani amabhodwe yanke nezitsha zokuphekela?*	*d)* Hot water & detergent/ N*gamanzi ashisayo nensipho* e) Cold water & detergent/ *Ngamanzi abandayo nensipho*

		f) Other (specify)/ *Okunye (chaza)* …….
47.	When should you wash your hands? *Kumele uzigeze nini izandla zakho?*	g) After visiting the toilet/ *Emva kokuvakashela endlini engasese* h) Before preparing food/*Ngaphambi kokulungisa ukudla* i) Both g & h/*Izimpendulo zobhili u- g & h* j) Neither/ *Ayikho impendulo*

		k) Don't know/ *Anginalo ulwazi* l) Other (specify)/ *Okunye (chaza)* …….
49.	Wiping cloths can spread microorganisms *Izindwangu zokusula zandisa amagciwane*	c) Yes/*Yebo* d) No/*Cha*
50.	The same cutting board can be used for raw foods and cooked foods provided it looks clean *Ibhodi lokuqobela lingasetshenziswa ekudleni okungaphekiwe kanye nokuphekiwe kuphelanje uma libukeka lihlanzekile*	c) Yes/*Yebo* d) No/*Cha*
51.	Raw foods need to be stored separately from cooked food *Ukudla okungaphekiwe kumele kuhlaliswe ngokuhlukana nokudla okuphekiwe*	c) True/*Kuyiqiniso* d) False/*Amanga*
52.	Cooked foods do not need to be thoroughly reheated *Ukudla okuphekiwe akudingi ukushisiswa kahle*	c) True/*Kuyiqiniso* d) False/*Amanga*
53.	Cooked meat can be left out of the fridge to cool overnight before refrigerating *Inyama ephekiwe ingashiywa ngaphandle kwefiriji khona izophola ubusuku bonke ngaphambi kokuyifaka ifirijini*	c) True/*Kuyiqiniso* d) False/*Amanga*
54.	Cooked foods should be kept very hot before serving *Ukudla okuphekiwe kumele kuhlale endaweni eshisayo ngaphambi kokukuphaka*	c) True/ *Kuyiqiniso* d) False/*Amanga*
55.	Wash fruits and vegetables before eating/preparing *Hlanzisisa izithelo nemifino ngaphambi kokuzidla noma ukuzilungisa*	c) True/*Kuyiqiniso* d) False/*Amanga*

56.	Safe water can be seen by the way it looks *Amanzi aphephile abonakala ngendlela abukeka ngayo*	c) True/*Kuyiqiniso* d) False/*Amanga*
57.	Frequent hand washing during food preparation is worth the extra time *Ukugeza izandla njalo ngesikhathi ulungiselela ukuphatha ukudla kuyisidingo esikhulu*	d) Agree/*Ngiyavumelana* e) Not Sure/*Anginaso isiqiniseko* f) Disagree/*Angivumelani*
58.	Keeping kitchen surfaces clean reduces the risk of illness *Ukugcina izindawo ezise khishini naphezu kwamakhabethe zihlanzekile kwehlisa izifo nokugula*	d) Agree/*Ngiyavumelana* e) Not Sure/*Anginaso isiqiniseko* f) Disagree/*Angivumelani*
59.	Keeping raw and cooked foods separate helps to prevent illness *Beka ukudla okungakaphekwa ukuhlukanise nokuphekiwe ukuvikela izifo*	d) Agree/*Ngiyavumelana* e) Not Sure/*Anginaso isiqiniseko* f) Disagree/*Angivumelani*
60.	Thawing food can be done on the counter *Ncibilikisa ukudla ukubeke phezulu kwekhabethe*	d) Agree/*Ngiyavumelana* e) Not Sure/*Anginaso isiqiniseko* f) Disagree/*Angivumelani*
61.	It is unsafe to leave cooked food out of the refrigerator for more than two hours *Akuphephile ukushiya ukudla okuphekiwe ngaphandle kwefiliji*	d) Agree/ *Ngiyavumelana* e) Not Sure/ *Anginaso isiqiniseko* f) Disagree/ *Angivumelani*
62.	Do you separate raw and cooked food during storage? *Uyakuhlukanisa yini ukudla okungaphekiwe nokuphekiwe uma usakubekile*	d) Most Times/ *Ezikhathini eziningi* e) Sometimes/ *Ngezinye izikhathi* f) Never/ *Angikaze*
63.	Do you inspect food for freshness to ensure quality ingredients? *Uyakuhlolisisa yini ukudla ukuthi kusakulungele yini ukudliwa*	d) Agree/ *Ngiyavumelana* e) Not Sure/ *Anginaso isiqiniseko* f) Disagree/*Angivumelani*
64.	I think it is important to throw away foods that have reached their expiry date. *Ngicabanga ukuthi kusemqoka ukulahla ukudla osekudlulelwe isikhathi sakho*	d) Agree/ Ngiyavumelana e) Not Sure/ Anginaso isiqiniseko f) Disagree/ Angivumelani

SECTION 6:

FOOD STORAGE

INDAWO YOKUGCINA UKUDLA

65. Where are the perishable food supplies stored?

Kuhlalaphi ukudla okomisiwe?

Kitchen/ *Ekhishini*	1
Designated store room/ *Igumbi okugcinwa kulo ukudla*	2
Storage containers/ *izitsha zokufaka ukudla*	3
Other (please specify)/ *Okunye (chaza)*	4

67. Is there a regular cleaning schedule for the storage areas?

Likhona yini uhlelo lokuhlanza egumbini lokubeka ukudla?

Yes/*Yebo*	Y
No/*Cha*	N

68. How often are the storage areas cleaned?

Lihlanzwa kangakhi igumbi lokubeka ukudla?

Less than once a week/ *Ngaphansi kwesonto*	1
Once a week/ *Kanye ngesonto*	2
Twice a week/ *Kabili ngesonto*	3
Three times a week/ *Kathathu ngesonto*	4
Four times a week/ *Izikhathi ezine ngesonto*	5
Every day of the week/ *Nsuku zonke zesonto*	6

69. How often is the stock checked for quality and expiry dates? (Select one)

Ngabe ukuhlola ikhwalithi nokuphela kwesikhathi kuyenziwa na empahleni? (Khetha okukodwa)

Not checked/ *Akuhlolwa*	1
Once a month/ *Kanye ngenyanga*	2
Twice a month/ *Kabili enyangeni*	3
Less than once a week/ *Ngaphansi kwesonto*	4
Once a week/ *Kanye ngesonto*	5
Twice a week/ *Kabili ngesonto*	6
Three times a week/ *Kathathu ngesonto*	7

Four times a week/ *Izikhathi ezine ngesonto*	8
Every day of the week/ *Nsuku zonke zesonto*	9

70. How often is stock – take done? (Select one)

Ukuthatha isitoko sokudla kwenziwa kangakhi? (Khetha okukodwa)

Not done/ *Akwenziwa*	1
Once a month/ *Kanye ngenyanga*	2
Twice a month/ *Kabili enyangeni*	3
Less than once a month/ *Ngaphansi kwenyanga*	4
Once a week/ *Kanye ngesonto*	5
Twice a week/*Kabili ngesonto*	6
Three times a week/ *Kathathu ngesonto*	7
Four times a week/ *Izikhathi ezine ngesonot*	8
Every day of the week/ *Nsuku zonke zesonto*	9

71. Is stock rotation in place?

Ingabe impahla iyajikelezwa, ingabe kusetshenziswa okungene kuqala na?

Yes/ *Yebo*	Y
No/*Cha*	N

72. If yes, how is this done? (Select one)

Uma impendulo kungu yebo, ijikelezwa kanjani impahla? (Khetha okukodwa)

Delivery dates/ Ngosuku ethumelwe ngayo	1
Expiry dates/ Ngosuku lokonakala	2
First In First Out/*Okungene kuqala akuphume kuqala*	3
Other (please specify)/ *Okunye (chaza)*	4

Thank you for your participation

Ngiyabonga ngesikhathi sakho

ANNEXURE L

SECTION 5: PRACTICES – OBSERVATION CHECKLIST

OBSERVATION	YES	NO	N/A	COMMENTS
GENERAL / MANAGEMENT				
1. Is there a menu?	Y	N		
2. Is there evidence of monitoring procedures?	Y	N		
3. Is there evidence of policies and procedures? (ask)	Y	N		
4. Is there service learning agreement between DUT & the ECD centres?	Y	N		
RECEIVING				
5. Is the delivery date written onto the product?	Y	N		
6. Are the delivery temperatures checked?	Y	N		
7. If yes how?				
STORAGE				
8. Is the perishable food stored in a cold room/fridge/freezer?	Y	N		
9. Is the non-perishable foods stored in a separate room?	Y	N		
10. Are cleaning items stored with food?	Y	N		
11. Are the storage areas kept locked?	Y	N		
12. Is there adequate light in the storage areas?	Y	N		
13. Is there adequate space in the storage areas?	Y	N		
14. Is the food stored in original packaging?	Y	N		
15. Are the products clearly labeled?	Y	N		
16. Are there expiry dates on food items?	Y	N		
17. Have some food passed the expiry dates?	Y	N		
18. If products are transferred to storage containers, is the expiry date recorded?	Y	N		
19. Are any foods that are past their expiry date used?	Y	N		
20. Are all containers covered?	Y	N		
21. Is any of the food old or stale?	Y	N		
22. Is there any evidence of decay in the fresh produce?	Y	N		
23. Are the storage areas clean?	Y	N		
24. Are the storage areas neatly arranged?	Y	N		
25. Is any food stored directly on the floor?	Y	N		
26. Is refrigerated storage available	Y	N		
27. If yes, is the refrigerated storage in working order?	Y	N		
28. Is the stock sheet kept? (ask)	Y	N		
29. Is the old stock of food used before the new stock (FIFO)? (ask)	Y	N		
30. Is there any evidence pest (rodents/insects) infestation?	Y	N		
31. Are there any unpleasant odours in the storage area?	Y	N		
FOOD PREPARATION				
32. Is there adequate space for food preparation?	Y	N		

33. Is there adequate space for serving / portioning?	Y	N		
34. Are recipes available?	Y	N		
35. Are the recipes standardized?	Y	N		
36. Are there adequate food preparation utensils?	Y	N		
37. What fuel source is used for cooking? (e.g. wood, gas, electricity)	Type:			
38. Is the internal temperature of the food checked?	Y	N		
39. Is there easy availability to water for cooking?	Y	N		
HOLDING				
40. Is the food served immediately following cooking?	Y	N		
41. How long is the food held between cooking and serving?	Time:			
42. Is the food kept warm at this time?	Y	N		
43. If yes, how is the food kept warm?				
44. If yes, is the internal temperature checked?	Y	N		
SERVING				
45. Are there adequate food serving utensils?	Y	N		
46. Are there adequate eating utensils?	Y	N		
47. Are the portion sizes standardized?	Y	N		
WASTE				
48. Is all the prepared / cooked food served?	Y	N		
49. If not, is the left-over food stored properly	Y	N		
50. Is the internal temperature of reheated food checked? (ask)	Y	N		
51. Do the students finish their food?	Y	N		
52. Is there any plate waste/ food thrown away?	Y	N		
53. Is there a designated rubbish bin?	Y	N		
54. Are the dust bins covered?	Y	N		
55. Are the dust bins clean?	Y	N		
56. Is there waste lying outside the dustbins?	Y	N		
HYGIENE	Y	N		
57. Are the kitchens utensils clean?	Y	N		
58. Is the kitchen equipment clean?	Y	N		
59. Are there correct cleaning chemicals available?	Y	N		
60 Are there adequate cleaning supplies e.g. cloths, scourers, etc?	Y	N		
61. Are the work areas clean?	Y	N		
62. Is the area cleaned frequently during preparation?	Y	N		
63. Is the area sanitized following food preparation?	Y	N		
64. Is there water available for cleaning?	Y	N		
65. Do the food handlers wash their hands regularly	Y	N		
66. Is there water available for the food handlers to wash their hands?	Y	N		
67. Is there soap available for hand washing?	Y	N		
68. Are the food handler's overalls/ clothes clean?	Y	N		
69. Do the servers wash their hands before serving?	Y	N		
70. Do the students wash their hands before eating?	Y	N		
71. Is cooked food kept separately from raw food items?	Y	N		

Do you have any questions/comments/suggestions?

_____

_____

_____ THE

END

ANNEXURE M

Food Weighed recording sheet

ECD Centre: _____ Date: _____ Researcher:_____

Breakfast		Lunch		Snack	

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

APPENDIX 1

Heleen Grobbelaar

From: GUGU SHABANGU <gugu.shabangu@yahoo.com>
Sent: 25 April 2018 08:49 AM
To: Heleen Grobbelaar
Subject: Fw: food safety questionnaire

On Monday, May 22, 2017 12:04 PM, GUGU SHABANGU <gugu.shabangu@yahoo.com> wrote:

Good day
Thank you so much to you both for allowing me permission to use the questionnaires. I really appreciate it.

Yours sincerely
Gugu Shabangu

On Saturday, May 20, 2017 9:29 AM, Penny Campbell <Penny.Campbell@health.gov.za> wrote:

Good Day Gugu,

You are welcome to utilize the Questionnaire.

Please keep me abreast of your research findings.

Best Wishes

Penny

>>> GUGU SHABANGU <gugu.shabangu@yahoo.com> 05/15/17 12:56 AM >>>
Good day
My name is Gugu Shabangu, currently enrolled for my M-Tech in Food and Nutrition: Consumer Sciences this year. I would like to use some of your questionnaires especially food safety practices as my research topic is Nutrition knowledge and food safety practices in informal ECDs in Ntuzuma area.

It would be much appreciated if you could grant me permission to used your questionnaires. Please can you also attach the questionnaire upon your approval.

Yours sincerely
Gugu Shabangu
072 529 0008